



SCHEME OF TEACHING AND EXAMINATION – 2021
Choice Based Credit System (CBCS) (Effective from the academic year 2020-21)
I SEMESTER

I Semester B.E.(Common to All Branch) (CHEMISTRY CYCLE)						Teaching Hours/week				Examination			
Sl No	Course Code		Course Title	Teaching Department	Board of Exam	L	T	P	C r	CIE	SEE	Total Mark s	Exa m Hour s
01	BS	BS- MA101	Calculus and Linear Algebra	MA	MA	3	1	-	4	50	50	100	3
02	BS	BS- CH1 04	Engineering Chemistry	CH	CH	3	-	-	3	50	50	100	3
03	ES	ES- EC102	Basic Electronics	EC	EC	3	-	2	4	50	50	100	3
04	ES	ES- ME 103	Mechanical Engineering Science	ME	ME	3	-	-	3	50	50	100	3
05	ES	ES- CS105	Programming with Problem Solving	CS	CS	3	1	-	4	50	50	100	3
06	BS	BS- CH1 06	Engineering Chemistry Lab	CH	CH	-	-	2	1	50	50	100	3
07	ES	ES- CS107	Programming Lab	CS	CS	-	-	2	1	50	50	100	3
08	HS	HS- CP104	Constitution of India and Professional Ethics	HS	HS	2	-	-	0				
Total													
L-Lecture, T-Tutorial, P-Practical, CIE-Continuous Internal Evaluation, SEE-Semester End Examination													

Note: HS103 Kannada will be the Entrance Examination to all the student before semester classes start



Syllabus for the Academic Year - 2021 - 2022

Department: Mathematics

Semester: I

Subject Name: Calculus and Linear Algebra

Subject Code: BS-MA101

L-T-P-C: 3-1-0-4

Course Objectives : The purpose of this course is to make students to

1	Master the basic tools of differential and integral calculus.
2	Study the differential equations and its applications.
3	Study the infinite series.
4	Study the elementary linear algebra and become skilled for solving problems arising in science and Engineering.

Course Outcomes

CO1	Understand the concepts of calculus, differential equations, infinite series and linear algebra.
CO2	Analyze the first order linear differential equations and infinite series using standard methods.
CO3	Apply the concepts of calculus, differential equations and matrix method to Engineering problems.
CO4	Demonstrate the matrix method and Jacobians using alternative tools.

UNIT	Description	Hours
I	Differential Calculus : Review of elementary calculus, polar curves- angle between the radius vector and tangent, angle between two curves, Length of the perpendicular from pole to the tangent. Curvature and radius of curvature-Cartesian and polar forms (without proof)-problems.	10
II	Linear Algebra: Rank of the matrix, Echelon form. Solution of system of linear equations by Gauss-Elimination method, Gauss-Jordan method and Gauss-Seidel method. Eigen values and Eigen vectors, Rayleigh's Power method. Diagonalization of a square matrix of order two.	12
III	Partial differentiation: Definition of Partial differentiation, Total derivatives - differentiation of composite functions. Jacobians, Maxima and Minima for a function of two variables, Method of Lagrange's multipliers with one subsidiary condition.	10
IV	Infinite Series- Convergence and divergence of positive infinite series- P-series test, Comparison test, Cauchy's root test and D'Alembert's ratio test, Raabe's test(without proof)- problems. Series: Taylor's and Maclaurin's series expansions for one variable(Statement only)-problems.	10
V	Ordinary Differential Equations (ODE): Review of Differential equation, Bernoulli's differential equation. Exact differential equation and reducible to Exact differential equation of the Types: $(i) \frac{M_y - N_x}{N} = g(x) (ii) \frac{N_x - M_y}{M} = h(y)$. Application of ODE's-Orthogonal trajectories, Newton's law of cooling, flow of electricity, law of decay and growth.	10



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Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers, 43 rd Edition Khanna Publications, 2015.ISBN:9788174091956
2	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons, 10 th Edition JonWiley&Sons,2015. ISBN:9780470913611

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett	McGraw-Hill Book Co., New York, 6 th Edition. 1995, ISBN:9780071135436.
2	A Text Book of Engineering Mathematics	N.P.Bali and Manish Goyal	Laxmi Publishers 7 th Edition Lakshmi Publishers, 2010, ISBN:9788131808030.
3	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw-Hill, 1st Edition, TataMcGraw-Hill, 2006, ISBN:9780070634190
4	Calculus and Analytical Geometry	Thomas G. B and Finney R. L	Pearson, 9 th Ed. 2012.ISBN:0201400154.



ENGINEERING CHEMISTRY

Subject Code: BS-CH104/204

L T P Cr

Total Hours: 40

3 -0-0-3

Course Objectives

CO1	Use of free energy in equilibria, rationalize bulk properties and processes using the thermodynamic considerations, electrochemical energy systems.
CO2	Enable the students to understand the role of engineering materials, energy storage devices, instruments and study the theory of corrosion
CO3	Realize the social issues such as water contamination and use of chemical fuels.
CO4	Facilitate the student for the importance of chemical reactions that are used in the synthesis of molecules such as Polymers and Drugs.

Course Outcomes

CO1	Acquire the knowledge on basic concept of chemistry in daily life.
CO2	Rationalise bulk properties and processes using thermodynamic considerations.
CO3	List major chemical reactions that are used in the synthesis of molecules
CO4	Account for the applications of smart materials.
CO5	Appreciate the advantages of energy storage devices

UNIT	Description	Hours
I	USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA Thermodynamic functions: Definitions of energy, free energy, entropy, Cell potential - Derivation of Nernst equation for single electrode potential and Nernst equation for a cell. Concentration cell – definition and derivation of equation for concentration cell. Numerical problems on E , E^0 , EMF & concentration cell. Electrodes - Types of electrodes. Reference electrode - Calomel electrode – construction, working and applications. Ion selective electrode - Glass electrode - construction and principle, determination of pH using Glass electrode.	8
II	ENERGY SYSTEMS AND CORROSION STUDIES Energy Storage System – Battery - definition, principal components of battery, Classification - primary, secondary and reserve batteries with examples. Characteristics of a battery. Ni-MH and Li-MnO ₂ , Zn- Air batteries - construction, working & applications. Fuel Cells – Introduction, definition, advantages of fuel cells, working of Methanol-Oxygen fuel cell, differences between battery and fuel cell Metallic Corrosion - Definition, electrochemical theory of corrosion. Factors affecting the rate of corrosion – ratio of anodic to cathodic area, nature of corrosion product, reduction potential, pH, temperature.	8
III	NATURAL RESOURCES Chemical Fuels - Introduction, fuels - definition, classification with examples. Calorific value – definition, Gross & Net calorific value, units (SI). Experimental determination of calorific value of Solid fuel by Bomb Calorimeter, Numerical problems. Knocking - definition, mechanism, ill effects. Prevention of knocking - antiknocking agents, unleaded petrol, power alcohol. Water Chemistry – Introduction, sources and impurities in water - Water analysis - determination of different constituents in water – hardness by EDTA method, fluoride by colorimetry and sulphate by gravimetry. Definition of BOD	8



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	and COD, determination of Chemical Oxygen Demand, Numerical problems on COD. Purification of water - Sewage treatment, Reverse osmosis.	
IV	ORGANIC REACTIONS AND SYNTHESIS OF DRUG MOLECULE Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, and ring openings. Synthesis of a commonly used drug molecule - Paracetamol and Aspirin - using acetic anhydride - properties, applications and their side effects.	08
V	INSTRUMENTAL METHODS OF ANALYSIS & SMART MATERIAL Instrumental methods of analysis - Introduction, advantages of instrumental methods over conventional methods. Colorimetry - derivations of Beer-Lambert's law. Principle, instrumentations and applications of Colorimetry, Potentiometry and Conductometry. Smart Materials - Introduction - Definitions importance of smart materials, new material requirements, properties, classification of smart materials – piezoelectric, electrostrictive, magnetostrictive materials. shape memory alloys, optical fibers and their applications in various fields.	08

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Chemistry	Putti R. Vijayasarathy	
2	Chemistry for Engineering Students	B.S. Jaiprakash, Venugopal, Shivakumaraiah and Pushpa Iyengar	

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Chemistry	Wiley India	
2	Physical Chemistry	P. W. Atkins	
3	Organic Chemistry	Paula Yurkanis Bruice	
4	Foundation of Materials Science and Engineering	William F. Smith	Tata McCraw Hill, 1998



Syllabus for the Academic Year - 2021 - 2022

Department: ECE

Semester: I/II

Subject Name: BASIC ELECTRONICS

Subject Code: ES-ECI102/202

L-T-P-C: 3-0-2-4
(39 Hours)

Course Objectives:

Sl.No	Course Objectives
1	Study the basic characteristics and operation of electronic devices.
2	Study the transistor configuration, biasing techniques.
3	Understand the working principle of amplifier, oscillators & applications of op-amp
4	Learn the importance and fundamental of digital electronics.

Course Outcomes:

Course Outcome	Descriptions
CO1	Explain the characteristics and operation of the Electronic devices and circuits.(L2)
CO2	Apply the knowledge of engineering fundamentals to analyze the electronic circuits. (L2)
CO3	Apply Boolean algebra to simplify logic circuit and compare the basic building blocks in digital electronics. (L3)
CO4	Demonstrate the basic analog electronics circuits and digital circuits experimentally. (L2)

UNIT	Description	Hours
I	UNIT – I: Semiconductor Diode and its applications: Introduction to P-N junction diode, VI Characteristics, Parameters, Diode current equation, Diode approximations, Applications: Half-Wave Rectifier, Bridge Rectifier (no derivations), Capacitor filter circuit, Zener diode as a voltage regulator, Problems. <i>Experiment: Half Wave Rectifier and Bridge Rectifier.</i>	08
II	UNIT-II: Bipolar Junction Transistors : Introduction to Bipolar junction transistor, Transistor voltages and currents, characteristics of common emitter configuration and Common base configuration, DC load line and operating point, Biasing techniques: Fixed bias, voltage divider bias, Problems. <i>Experiment: Characteristics of NPN transistor in CE Configuration.</i>	08
III	UNIT-III: Operational Amplifier : Introduction to Op-amp, Basic block diagram of an Operational amplifier, Ideal characteristics, Operational amplifier as a Voltage follower, Inverting and Non-inverting amplifier, Adder, Integrator and differentiator. <i>Experiment: Voltage follower, Inverting and Non-inverting amplifier</i>	08



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IV	UNIT-IV: Amplifier and Oscillators: Introduction, Single stage RC coupled amplifier and its frequency response Numerical Problems Introduction, Types of feedback, Barkhausen criteria for oscillations, Hartley, Colpitt's oscillator and Crystal Oscillator, Problems. <i>Experiment: Hartley oscillator</i>	07
V	UNIT-V: Digital Electronics: Introduction, Number system: Decimal, Binary, Octal and Hexadecimal, subtraction using 1's and 2's complement method, logic gates, NAND and NOR as universal gate (as OR, AND & NOT), Boolean Algebra, De-Morgan's theorem, Half adder, Full adder. <i>Experiment: Verification of logic gates, Half adder and Full adder</i>	08

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Electronic Devices and Circuit Theory	Robert L Boylestad, Louis Nashelsky	Pearson Publication 11 th Edition 2013 ISBN: 978-0-13-262226-4
2	Digital Principles and Design	Donald D. Givone	Tata McGraw- Hill 2003 ISBN 0-07-052906.

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Basic Electronics	D P Kothari, I J Nagrath	McGraw Hill Education 2014 ISBN: 978-93-329-0158-2
2	Op-Amp and Linear Integrated Circuits	Ramakant A. Gayakwad	Prentice Hall India 2011 4 th Edition 978-81-203-2058-1
3	Electronics Devices and Circuits	David A. Bell	Prentice Hall India 2008 5 th Edition ISBN: 978-0-19-569340-9



Syllabus for the Academic Year – 2021 – 2022

Subject Name: FUNDAMENTALS OF MECHANICAL ENGINEERING SCIENCE

Subject Code: ES-ME-103/203

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	This course is intended to give a rudimentary introduction to various topics like formation of steam, steam boiler and the principles underlying the inter conversion of these energy sources using heat engines and heat pumps etc
2	This course provides basic Manufacturing Processes and simple machine tools.
3	This course also introduces elementary concepts of mechanical power transmission
4	This course also introduces the elementary concepts of manufacturing processes and Power absorbing mechanical devices

Course Outcomes

Course Outcome	Descriptions
CO1	Understand properties of steam, Steam Boilers and associated principles and Working of Turbines.
CO2	Understand working principles of internal combustion engines and basic principles of Refrigeration and Air Conditioning, Electronic Cooling
CO3	Understand the working principle of basic Manufacturing Processes and simple machine tools.
CO4	Understand the Power Transmission systems like belt, gear drives etc., and an awareness of general working principles of brakes, Clutches and Bearing.

UNIT	Description	Hours
I	Properties of Steam, Steam Generators and Mechanical Power generating Machines:- Steam: Formation of steam, Properties of Steam. Steam boilers: Classification, Lancashire boiler, Babcock and Wilcox boiler, Boiler mountings, Accessories, (No sketches for mountings and accessories) Steam turbines: Classification, Working Principle and operation of Impulse and reaction steam turbine. Water turbines: Classification, working Principle and operations of Pelton wheel and Francis turbine.	8
II	Heat Engines and Heat Pumps:- IC Engines: Classification, I.C. Engines parts, 4 Stroke Petrol and 4-stroke diesel engines Refrigeration: Definitions - Refrigerating effect, Types of Refrigerants, Properties of refrigerants, Principle and working of Vapour compression refrigeration and Vapour absorption refrigeration. Principle and working of Room air conditioner (Split Air conditioner), Introduction to Electronic cooling (Heat Sink).	8



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III	Manufacturing Process:- Metal Casting and Joining Process: Sand-Casting terminology, types of moulds, Classification and method of welding, Soldering & Brazing with, applications, Brief description of Arc welding & Oxy-Acetylene gas welding. Machining: Lathe: Principle of working of a centre lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Taper turning (Tailstock offset method) Drilling Machine: Principle of working and classification of drilling machines. Bench drilling Machine, Operations on drilling machine -Drilling, Boring, Reaming and Tapping Grinding Machine: Principle and classification of Grinding Machines, Principle and working of surface grinding & Cylindrical grinding operations .	9
IV	Mechanical Power Transmission:- Belt Drives: Open and Crossed belt drive, Classification and applications, Idler pulley, stepped Cone pulley and Fast & loose pulley, Slip & Creep, Simple problems on velocity ratio. Gears: Types of gear drives (Spur, Bevel, Helical, worm and worm wheel, Rack & Pinion). Gear Trains: Simple and Compound gear Trains, Simple problems on velocity ratio.	8
V	Introduction to Clutches, Brakes & Bearings:- Clutches: Introduction, Friction Clutches- Cone Clutch, Plate Clutches Brakes: Introduction, Internal Expanding Brakes and Disc Brakes Bearings: Introduction, Journal and Ball Bearings	7

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Elements of Mechanical Engineering	Kestoor Praveen	Interline Publishing 2006 2 nd edition
2	Elements of Mechanical Engineering	K.R. Gopalakrishna	Subash Publishers, Bangalore.2018

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Elements of Workshop Technology-Vol-I and II,	S.K Hajra Choudhary	Media Promoters and Publisher Pvt .Ltd 1997 4 th Edition
2	Elements of Mechanical Engineering	S. Trymbaka Murthy	I .K. International Publishing House Pvt. Ltd., New Delhi.2006 3 rd Edition
3	Elements of Mechanical Engineering	Sadhu Singh	S. Chand Publishing 2010



Syllabus for the Academic Year - 2021 - 2022

Department: Computer Science and Engineering

Semester: I/II

Subject Name: Programming with Problem Solving

Subject Code: ES-CS105/205

L-T-P-C: 3-1-0-4

Course Objectives:

Sl No	Course Objectives
1	To impart adequate knowledge on the need of programming languages and Problem solving techniques.
2	To develop programming skills using the fundamentals and basics of C Language.
3	To understand the effective usage of data types, operators, decision making and looping statements.
4	To enable effective usage of arrays, strings, functions, pointers, structures, Unions and files.

Course Outcomes

Course outcome	Descriptions
CO1	Identify, abstract the programming task and write flowchart/algorithm/pseudo code for the same
CO2	Choose the right data representation format based on the requirement of the problem.
CO3	Write the program, compile, debug and execute
CO4	Select right programming constructs for the given task.

UNIT	Description	Hours
I	Problem solving through algorithm, flowchart and pseudocode Introduction: Writing Algorithms, Flowcharts and pseudo code for a given problem. Problem Formulation and Planning a Program, Structure of C program, Constants, Variables and Data Types: Character Set, C-Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Defining Symbolic Constants, Declaring a Variable as Constant, Declaring a Variable as Volatile. Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators. Type Conversion in Expressions, Operator Precedence and Associativity. Example programs. Managing Input and Output Operations: Unformatted and Formatted Input and Output statements. Example programs.	11



II	Decision making: branching and looping Decision Making and Branching: Decision Making with Simple if Statement, if...else Statement, Nesting of if...else statements, else...if Ladder, switch Statement, goto statement. Example programs. Decision Making and Looping: Introduction, The while Statement, The do Statement, The for Statement, Jumps in Loops with break and continue statement. Example programs.	11
III	Arrays and Strings Arrays: One-Dimensional Arrays - Declaration and Initialization of One-Dimensional Arrays, Two-Dimensional Arrays - Declaration and Initialization of Two-Dimensional Arrays. Strings: Declaring and Initializing String Variables, Reading and Writing Strings, Arithmetic Operations on Characters, String-Handling Functions, Table of Strings. Example programs	10
IV	Pointers and Functions Pointers: Understanding Pointers, Accessing the Address of a Variable, Declaring Pointer Variables, Initialization of pointer Variables, Accessing a Variable through its Pointer. Functions: Need for User-Defined Functions, Elements of User Defined Functions, Category of Functions, Recursion, Passing Arrays to Functions, Passing Strings to Functions, The Scope, Visibility and Lifetime of Variables.	10
V	Structure, Union and File management Structures and Unions: Defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Arrays of Structures, Arrays within Structures, Structures within Structures, Structures and Functions, Unions, Example programs. File Management: Introduction, Defining and Opening a File, Closing a File, Input/output Operations on Files.	10

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Programming in ANSI C	E. Balagurusamy	7th Edition, Tata McGraw-Hill Publication, 2017 ISBN-10: 933921966X ISBN-13: 978-9339219666

Reference Book:

Sl. No.	Reference Book title	Author	Volume and Year of Edition
1	Schaum's outlines, Programming with C	Byron Gottfried	3rd Edition, Tata McGraw-Hill Publication, 2017. ISBN-10: 0070145903 ISBN-13: 978-0070145900
2	C : How to Program	Paul Deffell and Harvey Deitel	8 edition, Pearson, 2015. ISBN-10: 9780133976892 ISBN-13: 978-0133976892
3	Let us C	Yashwant Kanetkar	15th Edition, BPB Publication, 2016. ISBN-10: 8183331637. ISBN-13: 978-8183331630.



ENGINEERING CHEMISTRY LABORATORY

Subject Code: BS-CH106/206

L T P Cr

0 - 0 - 2 - 1

Course Objectives

CO1	Analysis of certain solutions to find their composition by instrumentation method and also by volumetric method.
CO2	Investigate the source of pollutants such as water contaminants and take appropriate preventive measures.

Course Outcomes:

CO1	Analyze certain solutions to find their composition by various methods
CO2	Investigate the pollutants of water and its prevention

	Part-A
1	Determination of pKa value of a given weak acid by using pH meter
2	Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution
3	Colorimetric estimation of copper
4	Determination of Viscosity Coefficient of given organic liquid using Ostwald's Viscometer
5	Conductometric estimation of acid mixture against strong base
	Part-B
1	Determination of total hardness of a sample of water using disodium salt of EDTA
2	Determination of Calcium Oxide in the given sample of cement solution (Rapid EDTA method)
3	Determination of percentage of copper in brass using standard Sodium Thiosulphate solution
4	Determination of Iron in the given sample of Haematite Ore solution (External Indicator method) using $K_2Cr_2O_7$ solution
5	Determination of Chemical Oxygen Demand of the given Industrial waste water sample

Reference Book:

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Vogel's Text Book of Quantitative Inorganic Analysis	J.Basset, R.C.Denny, G.H.Jaffery,	4th Edition. (revised)

Note: For Examination, one of the experiments will be given among the parts A and B.



Syllabus for the Academic Year - 2020 - 2021

Department: Computer Science and Engineering

Semester: I/II

Subject Name: Programming Lab

Subject Code: ES-CS107

L-T-P-C: 0-0-2-1

Course Objectives:

Sl. No	Course Objectives
1	To introduce to students to the field of programming using C language.
2	To enhance their analyzing and problem solving skills and use the same for writing programs in C.
3	To enable effective use of branching and looping concepts in developing programs.
4	To understand and able to develop programs using different features of C language.

Course Outcomes

Course outcome	Descriptions
CO1	Analyze the given problem and design a suitable algorithm and flowchart.
CO2	Implement C programs to provide better solutions for different real world problems.
CO3	Apply the different features of C programming to develop efficient programs.

Design and Develop C programs on the following concepts

Lab Cycles	Description
I	Simple mathematical computations. Different types of operators. Different Input/output operations.
II	Decision making and branching. Decision making and looping. Arrays and Strings.
III	Functions and Pointers. Structures and Unions. File handling.



Syllabus for the Academic Year – 2020- 2021

Department: Physics Semester: I/II

Subject Name: CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Subject Code: HS-CP101/201

L-T-P-C:2-0-0-1

Course Objectives:

Sl.No	Course Objectives
1	To be familiar with basic information about the constitution of India.
2	To understand the basic rights guaranteed in fundamental rights to the citizen of India.
3	To understand the relevance of directive principles under part-IV, and the responsibilities of the individuals towards society.
4	To provide aims and scope, and different impediments of engineering ethics.

Course Outcomes

Course Outcome	Descriptions
CO1	Have general knowledge and legal literacy and thereby to take up competitive examinations
CO2	Understand the freedom, rights and restrictions including directives, through fundamental duties
CO3	Understand the importance of the three main organs of the constitution, Viz- the legislature, the executive and the judiciary.
CO4	Understand the power and functions of political institutions established throughout the country. and understands the professional ethics and engineer's responsibilities.

UNIT	Description	Hours
I	Introduction, Meaning and definitions. Salient features, Sources, Constituent Assembly, Drafting Committee. Preamble to the constitution of India.	5
II	Fundamental rights under part III – details of exercise of rights, Scopes & Limitations and, important cases Relevance of directive principles of state policy under part-IV Fundamental duties and their significance-part-IV A	6
III	Union Executive- President, Prime minister, Parliament and Supreme Court of India. State Executive – Governors, Chief Ministers, State legislature and High Courts.	5
IV	Constitutional Provisions for Scheduled Castes and Tribes, Women, Children and backward classes. Emergency provisions under Part XVIII. Electoral process, Amendment procedure, 42 nd , 44 th , 74 th , 76 th , and 91 st Constitutional amendments.	5
V	Scope and aims of engineering ethics, responsibility of engineers, Impediments to responsibility. Honesty, integrity and reliability, risks, safety, and liability, in engineering.	5



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Text Books

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to the Constitution of India” (student edition)	DurgaDas Basu	Prentice-Hall EEE, 19 th /20 th Edn., 2001.
2	Engineering Ethics	Charles E Haries, Michael, S Pritchard and Michael J	Robins Thompson Asia .Volume-2 2003-08-05

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	An Introduction to Constitution of India	MV Pylee.	Vikas Publishing, Volume-1 2002.
2	An Introduction to Constitution of India	Brij kishore Sharma	prentice-Hall of India, Volume-1 2002.
3	Constitution of India and Professional Ethics	V. Rajaram	New Age International Publication. 2011 Second Edition
4	Engineering Ethics	M Govindarajan V S Senthikumar,	Prentice-hall of India Pvt Ltd , New Delhi, First edition 2004 .

I Semester B.E.(Common to All Branch) (PHYSICS CYCLE)						Teaching Hours/week				Examination			
Sl No	Course Code		Course Title	Teaching Department	Board of Exam	L	T	P	Cr	CIE	SEE	Total Marks	Exam Hours
01	BS	BS- MA101	Calculus and Linear Algebra	MA	MA	3	1		4	50	50	100	3
02	BS	BS- PH104	Engineering Physics	PH	PH	3			3	50	50	100	3
03	ES	ES- EE102	Basic Electrical Engineering	EE	EE	3		2	4	50	50	100	3
04	ES	ES- CV103	Elements of Civil Engineering	CV	CV	3			3	50	50	100	3
05	ES	ES- ME105	Computer Aided Engineerin g Design	ME	ME	2		4	4	50	50	100	3
06	BS	BS- PH106	Engineerin g Physics	PH	PH	0		2	1	50	50	100	3
07	ES	HS- EN108	Profession al English	HS	HS	2			1	50	50	100	2
08	HS	HS- EV102	Environme nt al Studies	HS	HS	2			0				
Total						18	01	8	20	350	350	700	
L-Lecture, T-Tutorial, P-Practical, CIE-Continuous Internal Evaluation, SEE-Semester End Examination													



Syllabus for the Academic Year – 2020 - 2021

Department: Mathematics

Semester: I

Subject Name: Calculus and Linear Algebra

Subject Code: BS-MA101

L-T-P-C: 3-1-0-4

Course Objectives : The purpose of this course is to make students to

1	Master the basic tools of differential and integral calculus.
2	Study the differential equations and its applications.
3	Study the infinite series.
4	Study the elementary linear algebra and become skilled for solving problems arising in science and Engineering.

Course Outcomes

CO1	Understand the concepts of calculus, differential equations, infinite series and linear algebra.
CO2	Analyze the first order linear differential equations and infinite series using standard methods.
CO3	Apply the concepts of calculus, differential equations and matrix method to Engineering problems.
CO4	Demonstrate the matrix method and Jacobians using alternative tools.

UNIT	Description	Hours
I	Differential Calculus : Review of elementary calculus, polar curves- angle between the radius vector and tangent, angle between two curves, Length of the perpendicular from pole to the tangent. Curvature and radius of curvature-Cartesian and polar forms (without proof)-problems.	10
II	Linear Algebra: Rank of the matrix, Echelon form. Solution of system of linear equations by Gauss-Elimination method, Gauss-Jordan method and Gauss-Seidel method. Eigen values and Eigen vectors, Rayleigh's Power method. Diagonalization of a square matrix of order two.	12
III	Partial differentiation: Definition of Partial differentiation, Total derivatives - differentiation of composite functions. Jacobians, Maxima and Minima for a function of two variables, Method of Lagrange's multipliers with one subsidiary condition.	10
IV	Infinite Series- Convergence and divergence of positive infinite series- P-series test, Comparison test, Cauchy's root test and D'Alembert's ratio test, Raabe's test(without proof)- problems. Series: Taylor's and Maclaurin's series expansions for one variable(Statement only)-problems.	10
V	Ordinary Differential Equations (ODE): Review of Differential equation, Bernoulli's differential equation. Exact differential equation and reducible to Exact differential equation of the Types: $(i) \frac{M_y - N_x}{N} = g(x) (ii) \frac{N_x - M_y}{M} = h(y)$. Application of ODE's-Orthogonal trajectories, Newton's law of cooling, flow of electricity, law of decay and growth.	10



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Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers, 43 rd Edition Khanna Publications, 2015.ISBN:9788174091956
2	Advanced Engineering Mathematics	E. Kreyszig	, John Wiley & Sons, 10 th Edition JonWiley&Sons,2015. ISBN:9780470913611

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett	McGraw-Hill Book Co., New York, 6 th Edition. 1995, ISBN:9780071135436.
2	A Text Book of Engineering Mathematics	N.P.Bali and Manish Goyal	Laxmi Publishers 7 th Edition Lakshmi Publishers, 2010, ISBN:9788131808030.
3	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw-Hill, 1st Edition, TataMcGraw- Hill, 2006, ISBN:9780070634190
4	Calculus and Analytical Geometry	Thomas G. B and Finney R. L	Pearson, 9 th Ed. 2012.ISBN:0201400154.



Syllabus for the Academic Year – 2021 - 2022

Department: Physics

Semester: I/II

Subject Name: Engineering Physics

Subject Code: BS-PH104/204

L-T-P-C: 3-0-0-3

Course Objectives:

1	Impart the physical principals, laws and hypothesis of the Universe
2	To develop critical thinking and quantitative reasoning skill, scientific problems and experiments
3	Emphasize the role of Physics in life and other disciplines.
4	Understand the knowledge about the strength of materials

Course Outcomes

CO1	Analyze the behavior of vibrating and elastic bodies.
CO2	Understand the concepts of superconductors and shock waves.
CO3	Able to understand the difference between wave mechanics and Quantum mechanics.
CO4	Able to understand basic concepts of Fiber optics, Lasers, Dielectrics and Nano materials

UNIT	Description	Hours
I	Elasticity: Introduction- Stress and Strain, Hooke's law, Expression for Young's modulus (y), Bulk modulus (k) and Rigidity modulus (n), Poisson's ratio (μ) and relation between the Elastic constants (y , k , n & σ). Bending of beams – Expression for bending moment of a beam and Single cantilever (derivation). Vibrations: Introduction, Damped vibrations (Theory): cases of under damping, over damping and critical damping, Forced vibrations (Theory), Resonance-amplitude and sharpness of resonance. Numerical problems.	8
II	Superconductors: Introduction, Temperature dependence of resistivity in superconducting metals. Effect of magnetic field (Meissner effect). Type I & Type II superconductors, Temperature dependence of critical field, BCS theory and High temperature superconductors. Applications of superconductors. Shock waves: Definition of Mach number. Distinctions between acoustic, ultrasonic, subsonic, transonic, supersonic and hypersonic waves. Description of a shock wave & its applications. Basics of conservation of mass, momentum & energy. Derivation of normal shock relations (Rankine – Hugonit equations).	8
III	Wave mechanics: Introduction, wave-particle dualism, de-Broglie wavelength, phase velocity and group velocity, theory of group velocity, Expression for de-Broglie wavelength by the concept of group velocity. Quantum mechanics: Heisenberg's Uncertainty principle (no derivation), Applications-Non-existence of electrons in the nucleus, Wave function, Physical significance of wave function, Schrodinger wave equation in one dimension (derivation), Eigen values, Eigen functions and Applications: For a free particle and particle in one dimensional potential well of infinite height. Numerical problems.	7



IV	Fiber optics: Introduction. Propagation mechanism in optical fibers, Numerical aperture (derivation). V-number, Types of optical fibers and mode of propagation. Attenuation and mechanism radiation loss (micro and macroscopic bends). Applications-Point to point communication system with block diagram. Advantages and disadvantages of optical communication systems. Numerical problems. Lasers: Introduction, Review of principles-three types of interaction with matter, Einstein's coefficients (Expression for energy density at thermal equilibrium). Semiconductor Laser (Construction, Working and Energy level diagram). Holography, applications of laser in Science, Engineering and Medicine. Numerical problems	8
V	Dielectric properties of materials: Introduction to Dielectric materials, Determination of static dielectric constant, Polarization and its mechanisms, Clausius-Mossotti equation, Dielectric loss, Expression for dielectric loss. Numerical problems. Nanomaterials: Introduction, Principles, Nanocomposite materials, Nano scale systems. Physics of Smart materials, MEMS and Carbon nanotubes	8

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Detailed text book of Engineering Physics	S. P. Basavaraju	2018.
2	Engineering Physics	R. K. Gaur & S. L. Gupta	Danpath Rai Publications, 2012.

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Molecular machinery, manufacturing and computation,	K. Eric Drexler	Nanosystems –Wiley, ISBN-13: 978-0471575184, 1992
2	Shock waves made simple	Chintoo S. Kumar, K Takayama and K.P.J. Reddy	Wiley, 2014
3	Theory and applications	K. Thyagarajan and A. K. Ghatak	Lasers Plenum Press, New York, 1981



Syllabus for the Academic Year – 2021 - 2022

Department: Electrical & Electronics Engineering

Semester: I /

II

Subject Name: BASIC ELECTRICAL ENGINEERING

Subject Code: ES-EEI102 / 202

L-T-P-C:3-0-

2-4

Course Objectives:

1	To understand the fundamentals of Electrical Engineering
2	To analyze electrical circuits & operating principle of Electrical machines
3	To understand the role & importance of electrical wiring, protective devices & earthing in electrical system
4	To evaluate Electrical quantities with respect to performance of Electrical machines

Course Outcomes: At the end of the course, the student will be able to:

1	Use the fundamental principle of Electrical Engineering for preliminary applications.
2	Can analyze electrical circuits (single Phase & Three Phase) involving different electric machines.
3	Can apply the knowledge of electrical wiring, protective devices & earthing for safety of the systems.
4	Evaluate Electrical quantities and performance of Electrical machines.

UNIT	Description	Hours
I	A.C Fundamentals: Generation of sinusoidal voltage, definition of instantaneous value, maximum value, frequency, time period, cycle, average value, RMS value, form factor, peak factor of sinusoidally varying quantity, phase, phase difference and phasor representation of alternating quantities. A.C Circuits: Analysis with phasor diagram of circuits with R, L, C, R-L, R-C, R-L-C combination in series, parallel & series-parallel circuits, real power, reactive power, apparent power and power factor, illustrative examples.	8
II	Three Phase Balanced Circuits: Introduction to three-phase generation, Voltage and current relations in star and delta connected system, Measurement of three phase power by using two wattmeter method, Illustrative examples. Domestic wiring: Two way and three way control of lamp, elementary discussion on fuse, Miniature Circuit Breaker(MCB), Earth Leakage Circuit Breaker(ELCB), Electric shock, precautions against shock, earthing, plate and pipe earthing.	8
III	Single Phase Transformers: Faraday's Laws, Statically & dynamically induced EMFs, self and mutually induced emf, coefficient of coupling, Fleming's rules, construction, types, principle of operation, emf equation, losses, efficiency, Illustrative examples on emf equation and efficiency.	8



IV	D.C Machines: Construction, basic parts of D.C machines, types of D.C machines D.C Generator- Principle of operation, emf equation, Illustrative examples. D.C Motor- Principle of operation, back emf, torque equation, Illustrative examples.	8
V	Three Phase Induction Motors: Construction, working, types, concept of rotating magnetic field, slip, Illustrative examples on slip calculation. Alternators: Principle of operation, types, emf equation, concept of pitch factor and distribution factor (derivation excluded), Illustrative examples on emf equation.	7

List of Experiments:

Expt. No.	Description	Hours
I	i) Demonstration on different types of measuring instruments. ii) Demonstration on different protective devices in electrical circuit.	2
II	Verification of truth table for two way and three way control of lamp.	2
III	Determine the relationship between line and phase quantities of voltage and current in a three phase system.	2
IV	Determination of Power factor for different lighting systems.	2
V	Determine the Efficiency of transformer at different loading conditions.	2

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Basic Electrical Engineering	Kulshreshtha D. C	TMH Publications, New Delhi (Revised 1 st edition 2017)

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Basic Electrical Engineering	M.V.Rao	Subhash Publications, Bangalore
2	Electrical Technology	E. Hughes International Students	9 th Edition, Pearson 2005
3	Fundamentals of Electrical Engineering	B.L.Theraja	Volume I, S Chand Publications, New Delhi
4	Electrical Technology	B.L.Theraja	Volume II, S Chand Publications, New Delhi



Syllabus for the Academic Year – 2021 - 2022

Department: Civil Engineering

Semester: I/II

Subject Name: Elements of Civil Engineering

Subject Code: ES-CV103/203
0-0-3

L-T-P-C: 3-

Course Objectives:

Sl.No	Course Objectives
1	This Course Provides a Exposure to the students to know about the various fields of Civil Engineering, roads, dams and bridges.
2	This course will develop a student in gaining knowledge about various components of building.
3	This Course Provides a Exposure to basic concepts of mechanics, analysis of coplanar
4	This Course Provides a Exposure to concepts of centroid and Moment of inertia

Course outcome

Course outcome	Descriptions
CO1	Students will be able to gain the knowledge of various fields of Civil Engineering roads, dams and bridges.
CO2	Students will be able to apply the knowledge of components of building and its usage in construction practices.
CO3	Students will be able to analyze coplanar force systems.
CO4	Students will be able to compute the centroid and the moment of inertia of plane

UNIT	Description	Hours
I	Introduction to Civil Engineering: Scope of major fields of civil engineering-Surveying, Geotechnical Engineering, Structural Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering. Roads: Types of roads and functions Dams: Different types of dams Foundation: Classification of foundations and their functions.	08
II	Components of building: Introduction to different components of building, plinth, wall, arch, lintel, column, beam, chejja, slab, canopy and balcony. Doors, windows, ventilators and their functions. Roofs-types, roofing materials, flooring- types, Stairs, requirements of ideal stairs and types. Plastering, painting and formwork(Definitions only)	08
III	Building materials: Introduction, Bricks, composition, classification, properties of good bricks, Common building stones, classification, properties and uses. Cement and uses. Steel, types and properties. Timber, properties, defects and uses. Masonry: Introduction, classification, definition and terms used in masonry. Brick masonry. Bonds in brick work- English bond, Flemish bond. Stone	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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	masonry, classification, joints in stonework.	
IV	Force and Force system: Basic idealizations - Particle, Continuum and Rigid body, Force, couple- Definition and characteristics, classification of force systems, composition and resolution of forces. Simple Numerical problems	08
V	Centroid: Definition of Centroid & Centre of Gravity, Location of Centroid of Rectangle, Triangle, Semicircle and Quadrant by method of integration. Simple Numerical problems.	07

Text books:

Sl No	Text Book Title	Author	Volume and Year of Edition
1	Elements of Civil Engineering and Engg. Mechanics	M.N Shesha Prakash, Ganesh B. Mogaveer	3rd edition, 2014
2	Engineering Materials	Rangwala	43rd edition, 2017

Reference Book:

Sl No	Text Book Title	Author	Volume and Year of Edition
1	‘Elements of Civil Engineering & Mechanics’	H.J. Sawant & S.P. Nitsure	2016
2	Elements of Civil Engineering and Engg. Mechanics	B.K Kolhapure	3rd edition, 2018
3	Alternative Building Materials Technology	Jagadish.k.s	2007
4	Building Materials, products, properties and system	Gambhir.M.L & Neha Jamwal	2012



Syllabus for the Academic Year – 2020 - 2021

Department: Mechanical Engineering

Semester: I / II

Subject Name: COMPUTER AIDED ENGINEERING DRAWING

Subject Code: ES-ME105

L-T-P-C2-0-4-4

Course Objectives: The students will be able to

1	Familiarize with the free hand sketching of basic geometrical constructions in Engineering Drawing for visualization of three dimensional objects
2	Apply the principles of scales, orthographic projections to draw elevation, plan and profile views of lines, planes and solids
3	Apply the principles of projection of lines to find solutions to practical problems involving distances and inclinations
4	Apply the fundamentals of solid geometry and develop lateral surfaces of solids

Course Outcomes: At the end of the course, the student will be able to:

1	Demonstrate competence in the basics of Scales, Orthographic Projections of points, lines, planes and Solids for their presentation in the three Principal Views (L1, L2)
2	Apply the principles of orthographic projections to find solutions to real life problems involving distances and inclinations of geometrical objects (L3)
3	Analyze Orthographic projections of solids for drawing Isometric Projections (L4).
4	Develop lateral surfaces of solids and create isometric projections of solids of combination (L4).

UNIT	Description	Hours
I	Introduction to Computer Aided Sketching Introduction, Drawing Instruments and their uses, BIS conventions, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, square, rectangle, polygons, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity.	2L+4P
II	Introduction to Scales, Types of scales and problems on scales. Orthographic Projections of points, straight lines and planes. Introduction, Definitions - Planes of projection, reference line and conventions employed, introduction to four quadrants. Projections of points (problems are only from First quadrant), Including Front View, Top View, Left View, Right view. Projections of straight lines (located in First quadrant/first angle projection only), True and apparent lengths, True and apparent inclinations to reference planes. Introduction, Projections of plane surfaces triangle, square, rectangle, pentagon, hexagon and circle planes in different positions by change of position method only (First Angle Projection Only)	10L+20P



III	Introduction to projections of Solids, projections of right regular tetrahedron, hexahedron (cube), Prisms, Pyramids of square, pentagon and Hexagon, cylinders and cones in different positions (First angle Projection only)	6L+12P
IV	Introduction to Isometric Projection, Isometric scale, Isometric projection of plane surfaces, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids.	4L+8P
V	Development of Lateral Surfaces of Solids, Introduction to Section planes and Sectional views, Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only.	4L+8P

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Graphics	K.R. Gopalakrishna	Subhash Publishers 32 nd edition, 2005
2	A Primer on Computer Aided Engineering Drawing-2006		Published by VTU

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Drawing	N.D. Bhatt & V.M. Panchal	Charotar Publishing House, Gujarat 48th edition, 2005
2	Engineering Drawing	K.Venu Gopal & V.Prabu Raja	New Age Publications, New Delhi 4 th Edition, 2005

Conducting classes may be conducted in two slots/ week of 3 hours each
(Instruction 1 hr. + Sketching & Practice 2 hr.)

Scheme of Examination

- Unit 1 is only for practice and Internal Assessment and not for examination.
- A maximum of THREE questions must be set as per the following pattern (No mixing of questions from different Units).

Q. No	From Units	Marks Allotted
1	UNIT 2	15
2	UNIT 3	20
3	UNIT 4 and UNIT 5	15

Scheme of Evaluation for Continuous Internal Evaluation (50 Marks)

- 30 Marks for Class work (Sketching & Computer Aided Engineering drawing printouts in A4 size sheets).
- Two tests of 10 Marks each.

Scheme for Semester End Examination

Q. No.	Solutions and sketching in the sketch book	Computer display and print out	Total Marks
1	6	9	15



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2	8	12	20
3	6	9	15
Total Marks	20	30	50



Syllabus for the Academic Year – 2020 - 2021

Syllabus for the Academic Year – 2020 - 2021

Department: Physics

Semester: I/II

Subject Name: Engineering Physics Lab

Subject Code: BS-PH106/206

L-T-P-C: 0-0-2-1

Course Objectives:

Sl.No	Course Objectives
1	Acquiring the knowledge of measuring instruments.
2	Verify the laws of Blackbody radiations.
3	To study the characteristics of resonance circuits, dielectric constant and semiconducting materials and devices.
4	To evaluate the strength of materials.

Course Outcomes

Course outcome	Descriptions
CO1	Understands the measuring instruments and their working.
CO2	Acquires the knowledge of Blackbody radiations.
CO3	Knows to measure the strength of materials.
CO4	Able to design electrical and electronic circuits.

Sl.No	List of experiments
1	I-f characteristics of Series & Parallel LCR circuits.
2	Verification of Stefan's law.
3	Y- Single cantilever.
4	Sonometer - Determination of AC frequency.
5	Energy gap of semiconductor.
6	Laser diffraction grating- Determination of wavelength.
7	Moment of inertia of irregular body & Rigidity modules (n).
8	Dielectric constant by charging and discharging.
9	Determination of Planck's constant.
10	Fermi energy of copper.



Syllabus for the Academic Year – 2020 - 2021

Department: ENGLISH

Semester: I/II

Subject Name: Professional English

Subject Code: BS-PH108/208

L-T-P-C: 0-0-2-1

Course Objectives:

Sl.No	Course Objectives
1	To understand the vocabulary and structure of the English language as it is used in academic writing.
2	To practice rhetorical methods of writing development that are common in business writing and correspondence.
3	To improve the listening, reading, writing, and critical thinking skills needed for academic success.
4	To perform discipline-appropriate exercises and activities to develop the interpersonal, academic, and language skills necessary to succeed in a university or college environment.
5	To practice learning strategies that will enable you to become an independent, confident, and successful learner.

Course Outcomes

Course outcome	Descriptions
CO1	The ability to analyze, interpret and understand the complex interrelationships between authors, texts and specific social contexts.
CO2	A demonstrable ability to use the terms, categories, and concepts of critical or “close reading”.
CO3	The ability to write well- critically, creatively, or both, mature in its voice and cogency.
CO4	To strengthen their ability to write academic papers, essays and summaries using the process approach

UNIT	Description	Hours
I	<u>Introduction to communication</u> :Communication as sharing; context of communication; the speaker/writer and the listener/reader; medium of communication; barriers to communication; accuracy, brevity, clarity and appropriateness in communication.	4
II	<u>Technical English</u> : Grammar -Parts of speech, Tenses, Articles, Active-Passive voices, Subject Verb Agreement, Degree of comparison <u>Sentences</u> : Simple ,Complex, Declarative, Assertive, Negative ,Interrogative, Exclamatory	12
III	<u>Vocabulary building</u> : One word Substitution Synonym, Antonym, Homophones, Idioms and Phrases, Common mistakes, Confusable words and Expressions	8
IV	<u>Writing skill</u> : Drafting Resume and Curriculum Vitae. Letter writing-informal letter of enquiry, letters of complaint and enquiries, Self exploration through description, e-mail writing.	8



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Sr.No.	Communicative situations	category
1	Reading newspaper	READING
2	Reading written instructions/advice	
3	Navigating speed breakers	
4	Understanding author	
5	Reading business documents	
6	Skimming ,scanning, searching	
7	Communicating through E- mails	WRITING
8	Writing minutes of the meetings	
9	Writing business letters	
10	Writing cover letter	LISTENING
11	Listening v/s Hearing	
12	Process of listening	
13	Obstacles to effective listening	SPEAKING
14	Introducing oneself	
15	Asking and answering rational question	
16	Talking about daily life situations	
17	Telephonic conversation	

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	high school grammar composition	Wren Pc and martin H	S chand and co.
2	interpersonal communication: The whole story(2009)	K .Floyd	McGraw hill
3	An introduction to English grammar	Greenbaum Sydney and nelson Gerald	Pearson
4	practical English usage	Swan Michael	OUP 2005
5	intermediate English grammar	Raymond Murphy	Cambridge university press



Syllabus for the Academic Year-2020-2021

Department: Humanity Science

Semester: I/II

Subject Name: Environmental Studies

Subject Code: HS-EV102/202

L-T-P-C: 2-0-0-0

Course Objectives:

Sl.No	Course Objectives
1	Imparting basic knowledge about the environment
2	Developing an attitude of concern for the environment
3	Creating the awareness about environmental problems

Course Outcomes: After completion of this course students are able to,

CO1	Recognize the physical, chemical and biological components of earth's system
CO2	Know the different types of energy sources available in nature
CO3	Analysis of different types of pollution and their effects
CO4	Critically examine all sides of current environmental issues

UNIT	Description	Hours
I	Environment -Definition, Components of environment, Ecosystem- Types of ecosystem, Human activities-Food, Shelter, Economic and Social security. Effects of human activities on environment-Agriculture, Housing, Industry, Mining and Transportation, Environmental Impact Assessment (EIA), Sustainable development.	6
II	Natural resources -Introduction, Types of resources, Water resources-Availability and Quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral resources, Forest wealth, Materials cycles-Carbon, Nitrogen and Sulphur cycles.	5
III	Energy – Introduction, Different types of energy: Hydroelectric, Solar, Nuclear energy sources (Production, merits and demerits). Hydrogen as an alternative future source of energy	5
IV	Environmental pollution and their effects: Introduction, Pollutants, Classification of pollutants based on the form they exist, biological degradability and their existence. Types of environmental pollution: Air pollution, Water pollution, Land pollution, Noise pollution. Public health aspects	5
V	Current environmental issues of importance: Population growth, Climate change and Global warming effects, Urbanization, Acid rain, Ozone layer depletion, Environmental protection - Role of Government, Legal aspects, Initiatives by Non - Governmental Organizations (NGO), Environmental Education, Women Education	5



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books

Sl No	Text Book title	Author	Volume and Year of Edition
1	Environmental Studies	Dr.R.Geetha Balakrishna	Sunstar Publishers, 7 th Edition, 2016
2	Environmental Studies	Dr. S.M. Prakash	Elite Publishers, 2007

Reference Books

Sl No	Text Book title	Author	Volume and Year of Edition
1	Principles of Environmental Science and Engineering	P.Venugopala Rao	Prentice Hall of India
2	Environmental Science and Engineering	Meenakshi	Prentice Hall, India



Syllabus for the Academic Year:2021 – 2022

Common to: CV, EC, EE, ET, IM, ME, ML

Department: Mathematics

Semester: III

Subject Name: Integral Transforms and Numerical Techniques

L-T-P-C: 4-0-0-4

Subject Code: MA3TH1

Total Contact Hours: 52

Course Objectives:

	Course Objectives
1	Introduce the concept of Laplace Transform and problems on periodic function.
2	Introduce the concept of Fourier series and problems arising up in engineering problems.
3	Introduce the concept of Fourier transform and Z-transform.
4	To develop the proficiency in Numerical techniques and solving Ordinary Differential Equations arising in engineering applications.

Course Outcomes

Course outcome	Description
CO1	Understand the basic concepts of Laplace transforms, Inverse Laplace transform, Fourier series, Integral transforms and Numerical methods.
CO2	Apply the concepts of Laplace transform, inverse Laplace transform, Fourier series to solve problems in network analysis.
CO3	Demonstrate Fourier series and Integral transforms to study behavior of periodic functions arising problems in engineering.
CO4	Analyze and apply Z- transforms and Numerical methods in engineering fields.

UNIT	Description	Hours
I	Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's and Adams-Bashforth Predictor and Corrector methods (No derivation of formulae) problems. Numerical Integration: Simpson's $1/3^{rd}$, $3/8^{th}$ rule, Weddle's rule, (without proof), problems.	10
II	Laplace Transforms: Definition, Laplace transforms of elementary functions.(Statement only). Derivations: Laplace transform of t^n , Laplace transform of division by t , Laplace transform of $\int_0^t f(t) dt$. Laplace transforms of Periodic function (Statement only) and problems on square wave, saw-tooth wave, triangular wave, full and half wave rectified form, Unit step functions -problems.	10
III	Inverse Laplace transforms: Definition, properties, evaluation using different methods. Convolution theorem (without proof), evaluation of $L^{-1}\{F(s)\}$ using convolution theorem. Application to solve ordinary linear differential equations by Laplace transforms method.	10

IV	Fourier Series: Periodic function, Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with period 2π and with arbitrary period $2l$. Applications to Engineering problems: Fourier series for Periodic square wave, Half wave rectified form, Full wave rectified form, Saw-tooth wave with graphical representation. Half range Fourier series, Practical harmonic analysis.	12
V	Fourier Transforms: Infinite Fourier transforms. Fourier Sine and Cosine transforms. Inverse Fourier transforms, and simple problems. Z-Transforms: Basic definitions of Z-transform, Standard Z-transforms, Damping rule, Shifting rule, Initial value and Final value theorems(without proof), problems, Inverse Z-transform, problems. Applications-solutions of difference equations using Z-transforms.	10

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications, 2015. ISBN:9788174091956
2	Higher Engineering Mathematics	B.V.Ramana	1 st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Advanced Engineering Mathematics	E.Kreyszig	10 th EditionJonWiley&Sons, 2015. ISBN:9780470913611
2	Higher Engineering Mathematics	H.K.Das and Er.RajnishVerma	1 st Edition,Chandpublishing, 2011. ISBN:9788121938907

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Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: III

Subject Name: Applied Mechanics

Subject Code: CE3TH2

L-T-P-C: 3-0-0-3

Course Objectives

Sl No	Course Objectives
1	The Course Provides a Exposure to basic concepts of Non-Concurrent Force System and analysis of Coplanar Non Concurrent systems
2	The Course Provides a Exposure to Equilibrium of concurrent force system and Equilibrium of non-concurrent force system
3	The Course Provides a Exposure to concepts of Centroid and Moment of Inertia
4	The Course Provides an Exposure to friction and their applications in Engineering field.

UNIT	Description	Hours
I	Non-Concurrent Force System: Couple and its Characteristics, Introduction to coplanar non concurrent system, Varignon's theorem, Numerical problems.	08
II	Equilibrium of Concurrent Force System: Equilibrium of coplanar concurrent system of forces, free body diagram, Conditions of equilibrium. Definition of Equilibrant, Numerical problems on equilibrium of coplanar concurrent force systems.	07
III	Equilibrium of Non-concurrent Force System: Equilibrium of non-concurrent system of forces, Types of loads, supports for beam, statically determinate and indeterminate beams, Numerical problems on statically determinate beams subjected to concentrated load, Uniformly distributed load, Uniformly Varying Load and their combinations Problems on equilibrium of different force systems.	08
IV	Moment of Inertia: Concept of Moment of inertia, perpendicular axis theorem, parallel axis theorem, and moment of inertia of Rectangular, Circular, Semicircular, Quadrant of circle Triangular sections by method of integration. Numerical Problems on moment of inertia of composite section.	08
V	Friction: Definition of Friction and its applications, angle of friction, angle of repose, coefficient of friction. Types of Friction, laws of static friction, Description and application of friction on blocks on horizontal and inclined planes. Ladder friction and problems.	08



Course Outcomes

Course outcome	Descriptions
CO1	Students will be able to analyze coplanar non-concurrent force systems.
CO2	To analyze equilibrium of concurrent force system and equilibrium of non-concurrent force system.
CO3	To compute the moment of inertia of plane figures.
CO4	To apply friction laws to analyze the problems on friction.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	'Elements of Civil Engineering and Engg. Mechanics'	M.N SheshaPrakash, Ganesh B. Mogaveer	3rd edition, 2014
2	'Elements of Civil Engineering and Engineering Mechanics'	B.K Kolhapure	3rd edition, 2018

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	'Engineering Mechanics'	Stephen Timoshenko & D H Young, J.V.Rao	5th edition, 2017.
2	'Engineering Mechanics-Statics and Dynamics'	A Nelson	1st edition, 2009



Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: III

Subject Name: Engineering Geology

Subject Code: CE3TH3

L-T-P-C: 3-0-0-3

Course objectives:

Sl no	Course objectives
1.	To understand the internal structure and composition of earth.
2.	To comprehend the engineering properties, occurrence and uses of minerals in various industries.
3.	To focus on geomorphological agents and their processes in land forms along with the concept of ground water including the effects on civil engineering projects.
4.	To gain the knowledge of structural features of rocks underneath and their consideration in the selection of sites for civil engineering projects.

UNITs	Description	Hours
I	Introduction: Application of Earth Science in Civil Engineering Practices, Understanding the earth, internal structure and composition. Mineralogy: Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group (Glass); Feldspar Group (Ceramic wares and Flooring tiles); Kaolin (Paper, paint and textile); Asbestos (AC sheets); Carbonate Group: Calcite, Dolomite (Cement); Gypsum (POP, gypsum sheets, cement); Mica Group (Electrical industries); Ore minerals - Iron ores (Steel); Chromites (Alloy); Bauxite (aluminum); Chalcopyrite (copper), Iron Pyrite.	08
II	Petrology: Formation, Classification and Mineral composition and Engineering Properties of rocks. Igneous Rocks - Granite, Diorite, Gabbro, Dunite, Dolerite, Porphyries, Basalt, Pegmatite, Sedimentary rocks – Conglomerates, Breccias, Sandstone, Shale, Limestone, Laterite; Metamorphic rocks - Gneiss, Schists, Quartzite, Marble, Slate, Charnockite: Rock as a material in construction of foundations, Concrete Aggregate, Road metal, Railway ballast with reference to Engineering properties.	08
III	Structural and Engineering Geology:- Outcrops, Dip and Strike, Compass Clinometer and its uses; Description of folds, Faults, Joints and Unconformities and their types; Recognition of folds, faults in the field and its consideration in Civil Engineering projects; Geological site investigation: Surface and subsurface explorations by Geo-Physical investigations; Selection of site for Dams and reservoirs, Tunneling, Bridges, Road and Highway sites;	08



IV	Geomorphology and Geodynamics: Geological agents and their processes in Land forms, Rock weathering and its types, Geological work of rivers, Formation of Soil, classification, profile, erosion and conservation methods. Geological hazards such as earthquakes and landslides- Causes, Effects, Slope stabilization. Tsunami – causes and effects. Concept of Plate tectonics,	07
V	Hydrogeology and Geoinformatics: Hydrological cycle, Occurrence of Groundwater in different terrains- Weathered, Hard and Stratified rocks, Groundwater Exploration by Electrical Resistivity method, Resistivity curves, Water Bearing Formations, Aquifer types and parameters, Artificial Recharging of Groundwater by different methods, Effect of ground water on various Civil Engineering structures. Study of Topographic maps and Contour maps; Remote Sensing – Concept, Application and its Limitations; Geographic Information System (GIS) and Global Positioning System (GPS).	08

Course Outcomes:

Course outcome	Descriptions
CO1	After successful completion this course students will be able to: Describe index properties of earth dynamics and justify geological hazards.
CO2	Determine minerals and rock mass properties and its suitability in engineering projects.
CO3	Estimate and evaluate the ground behaviour and conditions of rocks.
CO4	Delineate the interactions between groundwater systems and change detection of thematic layers through geo-informatics techniques.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Text book of Engineering and General Geology.	Parbin Singh.	Katson publishing house, Ludhiana, 2009.
2	Text book of Geology	Mukerjee, P. K	World Press Pvt. Ltd., Kolkatta



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Textbook of Engineering Geology	Kesavulu, C	Macmillan India Ltd, 1993, NewDelhi
2	Structural Geology	Billings, M.P	Prentice-Hall India, 1974, New Delhi
3	Geology for Engineers	Blyth, F.G.H and de Freitas, M.H	ELBS, 1974 London
4	Experiments in Engineering Geology	Gokhale, KVG.K and Rao, D.M	Tata-McGrawHill, 1981, New Delhi
5	Remote sensing and Image Interpretation	Lilesand, T.M. and Ralph W. Keifer	John Wiley & Sons, 1987, New York.
6	Groundwater Hydrology	Todd, D.K	John Wiley & Sons, 1980, New York
7	Text book of Remote Sensing and Geographical Information System	M Anji Reddy,	BS Publications, Hyderabad
8	Ground water Assessment, development and Management	K.R. Karanth,	Tata McGraw Hills



Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: III

Subject Name: Fluid mechanics

Subject Code: CE3TH4

L-T-P-C: 3-0-0-3

Course objectives :

Sl no	Course objectives
1	To introduce the concepts of fluid mechanics useful in civil engineering applications
2	To provide basic exposure to fluid statics and kinematics
3	To provide an exposure to dynamics and measurement of pressure
4	To provides exposure to computations of hydrostatic forces on structural components

UNIT	Description	Hours
I	INTRODUCTION AND FLUID PROPERTIES Definition of Fluid, Distinction between solids & fluids, fluid continuum. Mass density, specific volume, Specific Weight, Relative density or Specific Gravity Viscosity, Newton's law of viscosity, Newtonian and Non-Newtonian Fluids, Ideal and Real fluids, Surface tension, Capilarity Problems, Newton's law of viscosity, surface tension, hollow and solid bubble	8
II	FLUID PRESSURE AND ITS MEASUREMENT Definition of pressure, Pascal's law, Hydrostatic pressure law, Absolute and Gauge pressure, Simple and Differential Manometer theory and problems, HYDROSTATICS Definition of total pressure, derivation of center of pressure, Equation for hydrostatic force, Problems on hydrostatic force on vertically submerged surfaces, Description of fluid flow, Ideal, Rotational and irrotational flow	8
III	KINEMATICS OF FLUIDS Derivation of continuity equation in three dimensions in differential form, Definition of velocity potential, stream functions, stream line, equipotential line, Relation between velocity potential and stream function, Laplace equation. Problems on stream function and velocity potential	8
IV	DYNAMICS OF FLUID FLOW Derivation of Euler's equation and Bernoulli's equation (2 dimensional) with assumption and limitation, Modification of Bernoulli's equation, Venturimeter, Momentum equation(no problem) FLOW THROUGH PIPES Flow through pipes, Major loss equation for head loss due to friction (Darcy-Weishbach equation), Minor losses equation for head loss due to sudden	8



	expansion and contraction. Problems on Bernoullis Equation	
V	FLOW MEASUREMENTS Flow through Orifices; classification, Hydraulic co-efficients of an Orifice and relation between them, Equation for co-efficient of velocity. Flow over notches, classification, Equation for discharge over rectangular and V-notches (Velocity of approach and end contractions not included) Types of Nappe, Ventilation of weirs, Broad crested weirs, Problems on weirs and notches	8

Course Outcomes

Course outcome	Descriptions
CO1	The student will possess knowledge of fundamental properties of fluids, fluid pressure, flow kinematics and flow dynamics, pipe flow and open channel flow.
CO2	be able to compute and solve problems on fluid properties, fluid pressure measurement fluid statics and kinematics
CO3	be able to compute and solve problems on fluid dynamics and flow measurement
CO4	be able to compute discharge through pipes and over notches and weirs

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Hydraulics and Fluid Mechanics Including Hydraulic Machines	P.N. Modi and S.M. Seth	20th Edition- 2015
2	A textbook of Fluid Mechanics and Hydraulic Machines	R K Bansal	9th Edition -2017

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Fluid mechanics and Hydraulic Machines	K A Subramanya,	3rd Edition -2008
2	Elementary Hydraulics	Cruise, J.F., Singh, V.P. and Sherif, M.M.	1st Edition -2007
3	Fluid Mechanics	Douglas, J.F., Gasoriek, J.M., Swaffield, J. and Jack L.	5 th Edition -2006
4	Fluid Mechanics	Streeter V.L., and Wylie,E.B.	8th Edition 1985



Syllabus for the Academic Year – 2020 - 2021

Department: CIVIL ENGINEERING

Semester: III

Subject Name: BUILDING PLANNING AND DRAWING

Subject Code: CE3TH5

L-T-P-C: 1-0-2-3

Sl. No	Course Objectives
1	Introduction to bye-laws of different town, city and metropolitan cities.
2	To provide the concepts of planning of different types of buildings.
3	To provide the concepts of water supply, sanitary and electrical layout details of residential and public buildings.
4	To Provide the concepts of Layout plan of Rainwater recharging and harvesting system

Description	Hours
PART-A Introduction: Importance of drawing, Drawing tools & Scale. Building planning as per local building bye laws. Symbols used in Civil Engineering Drawing. Development of plan, elevation, section and schedule of openings from the given line diagram of 1) Residential buildings (G, G+1) 2) Office building 3) Health care centre 4) School building	25
PART-B For a given single line diagram, Preparation of water supply, sanitary and Electrical layouts. Layout plan of Rainwater recharging and harvesting system in Residential building.	14

Course Outcomes

Sl. No	Course outcomes
CO1	Students will have the knowledge of bye-laws and other details of building construction through the drawings.
CO2	Students will have the knowledge of planning, designing of residential and public buildings.
CO3	Students will be able to draw water supply, sanitary and electrical layout details of residential and public buildings .
CO4	Students will be able to draw Layout plan of Rainwater recharging and harvesting system in Residential building.



Question paper Pattern:

1. Two questions to be answered compulsorily in PART –A for 90 Marks
Plan with Schedule of opening- 25 Marks
Elevation- 10 Marks
Section- 10 M
Each question will carry 45 marks (2 x 45) = 90 Marks.
2. One question to be answered from part B for 10 Marks
3. CIE -50 Marks
CIE conduction of Test -20 Marks
Submission of Manual Drawing - 30 Marks

Note: No theory questions shall be asked from any chapter

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Building Drawing, Tata McGraw Hill Publishers , New Delhi	Shah M.H and Kale C.M,	4 th Edition, 2017
2	Civil Engineering Drawing And Design, C B S Publishers, New Delhi	D N Ghose	2 nd Edition, 2017

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Reference book on Computer Aided Design Laboratory, Laxmi Publications, New delhi	M N SheshaPrakash, Dr. G S Suresh	1 ST Edition, 2006
2	Building Planning And Drawing, I K International publishing house, New Delhi	S SBhavikatti and M V Chitawadgi	1 st Edition, 2019
3	Civil Engineering Drawing And Design, Charotar Publishers, New Delhi	B C Rangawala	3 rd Edition 2017
4	National Building Code (IS 1962:1989)	BIS	New Delhi



Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: III

Subject Name: Surveying

Subject Code: CE3TH06

L-T-P-C: 3-0-0-3

Course objectives:

Sl No	Course objectives
1	To understand the fundamentals of surveying and the usage of basic surveying instruments.
2	To determine the reduced levels and elevation of objects by different levelling instruments.
3	To know the usage of plane table in developing maps and to compute the capacity of reservoirs by contouring.
4	To know the usage of modern surveying instruments in various field applications.

UNIT	Description	Hours
I	Introduction to chain and compass surveying: Definition of Surveying, Classification of Surveying, Basic Principles of Surveying, types of Chains and Tapes, Ranging of lines and its types, Measurement of distances over sloping ground. Introduction to compass surveying- Accessories used, Principle involved Meridians, bearings and their types. Numerical problems on computations of bearings and included angles for a closed traverse.	8
II	Levelling: Principles and basic definitions of levelling, parts of Dumpy level, Temporary adjustments, Methods of Levelling- simple, differential, fly, fly-back, profile and cross sectioning. Booking of levels- height of instrument method and rise and fall method. Arithmetic checks. Numerical problems on above.	8
III	Theodolite survey: Theodolite and its types, Temporary adjustments of theodolite. Measurement of horizontal angles by Method of repetitions and reiterations. Measurement of vertical angles. Trigonometric levelling: Determination of elevation of objects when the base is accessible and inaccessible by single plane method.	7



IV	Plane table survey: Introduction, accessories, advantages and limitations, Orientations and methods of orientation. Methodology of plotting-radiation, intersection, traversing and resection methods. Contouring: Introduction to contouring, characteristics, methods of contouring- direct and indirect methods. Capacity of contours and Uses of contours. Simple problems on above.	8
V	Modern surveying instruments: Introduction to EDM, fundamental principles of measurement-Pulse method, phase difference method, classification of EDM instruments. Total station and its accessories, fundamental measurements, types of total station instruments, advantages and disadvantages.	8

Course Outcomes

Course outcome	Descriptions
CO1	Knowledge of using basic surveying instruments in obtaining the field measurements.
CO2	To measure the elevation of ground and angular measurements by different levelling instruments.
CO3	To prepare maps by plane table and to arrive the storage capacity of reservoir by different methods.
CO4	To utilize the modern instruments in assessing the field data required for preparing drawings of engineering importance.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“Surveying”, Laxmi Publications, New Delhi	B C Punmia, Ashok kumar Jain and Arunkumar Jain	Volume 1, 16 th Edition, 2016
2	“Surveying”, Laxmi Publications, New Delhi	B C Punmia, Ashok kumar Jain and Arunkumar Jain	Volume 2, 17 th Edition, 2016



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Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“Surveying and levelling”, Standard Book House, New Delhi	K R Arora	Volume 1, 11 th Edition, 2015
2	“Engineering Surveying”, Tata McGraw-Hill publications, New Delhi	S K Duggal	Volume 1, 3 rd Edition, 2009
3	“Surveying and levelling”, Tata McGraw-Hill publications, New Delhi	N N Basak	2 nd Edition, 2014
4	“Elementary surveying-An introduction to Geoinformatics”, Prentice Hall publications, USA.	Charles D Ghilani and Paul R Wolf	13 th Edition, 2012



Syllabus for the Academic Year : 2021-22

Common to all (Lateral entry students)

Department: Mathematics

Semester: III

Subject Name: Fundamental Mathematics

Total Hours: 40

Subject Code: MA3DP6

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No	Course Objectives
1	To develop mathematical skill so that student are able to apply mathematical method and principals in solving problem from engineering field.
2	Introduce the concept of differential calculus.
3	Introduce concept of Integral Calculus.
4	Study the concept of probability.

Course outcomes	Descriptions
CO1	To understand concept of probability, polar curves, differential equations and Vectors calculus.
CO2	Apply analytical techniques to compute solutions of first and higher order ordinary differential equations.
CO3	Apply concepts of double and triple integrals in engineering field.
CO4	Use partial differentiation and multiple integral to solve the problems in engineering.

UNIT	Description	Hours
I	Probability: Introduction, Sample space and events. Axioms of probability. Addition and multiplication theorems, Conditional probability-illustrative examples. Baye's theorem-problems.	8
II	Differential Calculus: List of standard derivatives including hyperbolic functions, rules of differentiation. Polar curves: Polar coordinates, angle between radius vector and tangent, angle between two polar curves – Problems.	8
III	Series: Taylor's and Maclaurin's series expansions of one variable. Integral Calculus: List of standard integrals, integration by parts. Definite integrals – problems. Statement of reduction formulae for $\int_0^{\frac{\pi}{2}} \sin^n x dx$, $\int_0^{\frac{\pi}{2}} \cos^n x dx$ and $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$, simple problems. Multiple integrals-Simple problems.	7



IV	Differential equations: Introduction to first order ordinary differential equations. Variables separable, Linear equation. Exact differential equation - Problems. Ordinary differential equations with constant coefficients: Homogeneous differential equations, non-homogeneous differential equations – Particular integral for functions of the type $f(x) = e^{ax}$, $\sin(ax)$, $\cos(ax)$, x^n and simple problems.	8
V	Vector calculus and Partial differentiation: Del operator, gradient-directional derivative, divergence, curl - problems. Introduction to Partial differentiation - Illustrative examples. Differentiation of composite functions. Jacobians (without proof) – Simple Problems.	9

Question paper Pattern:

From each unit, two questions of 20 marks each have to be prepared, the student has to answer one full question of his/her choice.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications, 2015. ISBN:9788174091956

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
2	Advanced Engineering Mathematics	E.Kreyszig	10 th Edition Jon Wiley & Sons, 2015. ISBN:9780470913611
2	Higher Engineering Mathematics	B.V.Ramana	1st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190



Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: III

Subject Name: HYDRAULICS AND HYDRAULIC MACHINESLABORATORY

Subject Code: CE3LB1

L-T-P-C: 0-0-3-1.5

Course objectives :

Sl no	Course objectives
1	To calibrate Flow Measuring Devices
2	To calibrate the different types of vanes
3	To determine the performance characteristics of Rotodynamic machines
4	To determine the performance characteristics of centrifugal pumps

UNIT	Description	Hours
I	1. Experiments on Free Surface Flow a. Calibration of V-notch. b. Calibration of Rectangular Notch c. Calibration of Ogee Weir. d. Calibration of Broad Crested Weir.	15
II	2. Experiments on Closed Conduit Flow a. Calibration of Venturimeter. b. Determination of Darcy's Friction Factor for a Straight Pipe. c. Determination of Minor Loss Constants (Bend, Sudden Contraction, Sudden Expansion) d. Determination of Hydraulic Coefficient of a Vertical Orifice. e. Determination of Vane Coefficient for Flat, Inclined and Hemispherical vanes	15
III	3. Experiments on Performance of Rotodynamic Machines a. Performance Tests on a Single Stage/ Multi Stage Centrifugal Pump b. Performance Tests on Pelton Wheel. c. Performance Tests on Francis Turbine. d. Demonstration of Kaplan Turbine.	10



Course Outcomes

Course outcome	Descriptions
CO1	Able to use the various instruments for fluid flow measurement
CO2	Able to determine performance characteristics of hydraulic turbines
CO3	Able to determine performance characteristics of centrifugal pumps
CO4	Able to use the notches and weirs for fluid flow measurements



Syllabus for the Academic Year – 2021 - 2022

Department: Civil Engineering

Semester: III

Subject Name: SURVEYING PRACTICE - I

Subject Code: CE3LB2

L-T-P-C: 0-0-3-1.5

Sl. No	Course Objectives
1	To use basic survey instruments.
2	To set out regular geometrical figures using chain and compass.
3	To use plane table to locate points in the horizontal plane.
4	To use the dumpy level to find the difference between two points and plotting the longitudinal and cross-sections.

Expt no.	Experiments
	Survey by using Chain/Tape/Compass
1	Measurements of distances using tape along with horizontal planes and slopes, direct ranging.
2	Setting of geometrical figures using prismatic compass.
	Survey by using Plane table
3	To locate points using radiation of plane table
4	To locate points using intersection method of plane table
5	To locate plane table station by using 2 point and 3 point problem.
	Survey by using Dumpy level/auto level
6	Determination of reduced levels of points using dumpy level/auto level by simple levelling (HI and Rise-Fall method)
7	Determination of reduced levels of points using dumpy level/auto level (differential levelling).
8	To determine the difference in elevation between two points using Reciprocal leveling and to determine the collimation error.
9	To conduct profile leveling, cross sectioning. Plotting profile and cross sectioning in excel.
10	Contouring- direct and indirect methods.

Course Outcomes: Students will be capable of

Course outcome	Descriptions
CO1	The student will be capable of marking the geometric shapes on the ground using chain and prismatic compass.
CO2	To prepare maps of an area using plane table.
CO3	To know the difference in elevation between any two points of reference.
CO4	To create l/s and c/s profile of the ground.



Question paper Pattern:

1. All experiments are to be included in the examination except demonstration exercises.
2. Candidate to perform experiment assigned to the students.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Surveying	B CPunmia, Ashok kumar Jain and Arunkumar Jain	Volume 1, 17th Edition, 2016
2	Engineering Surveying	S K Duggal	Volume 1, 3rd Edition, 2009
3	Surveying	B CPunmia, Ashok kumar Jain and Arunkumar Jain	Volume 2, 17th Edition, 2016

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Basics of Remote Sensing and GIS	S Kumar	3 rd Edition, 2019
2	Remote Sensing and Geographical Information Systems	M Anji Reddy	Volume 1, 4 th Edition, 2019
3	Surveying and levelling	K R Arora	Volume 1, 11 th Edition, 2015
4	Plane Surveying	A M Chandra	Volume 1, 2 nd Edition, 2016



Syllabus for the Academic Year – 2020 - 2021

Department: CIVIL ENGINEERING

Semester: III

Subject Name: Auto CAD LABORATORY

Subject Code: CE3LB3

L-T-P-C: 0-0-3-1.5

Course Objectives:

SL No	Course Objectives
1	This course aims to teach students the basic commands and tools necessary for professional 2D drafting using Auto CAD.
2	Creating the plan, section, and elevation of residential buildings and public buildings.
3	Creating the plan and elevation of a staircase.
4	Creating the draw layouts of water supply, sanitary and electrical works

Course Outcomes

Course outcome	Descriptions
CO1	Able to understand Drawing tools of Auto CAD.
CO2	To draw the plan, section, and elevation of residential buildings and public buildings.
CO3	students will be able to draw a plan and elevation of a staircase.
CO4	students will be able to draw layouts of water supply, sanitary and electrical works.

UNIT	Description	Hours
1	Basic tools of Auto CAD.	6
2	Single storey residential building plan, elevation, and section.	6
3	Two storey residential building in cross site plan, elevation and section.	6
4	Public health centre, plan elevation and section.	3
5	Dog legged stair case plan and elevation.	3
6	Preparation of water supply and sanitation layout.	3
7	Preparation of electrical layout.	3



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Question paper Pattern:

Examination will be conducted for 50 marks

1. Problem identification and procedure writing :15 marks
2. Drawing Execution:25 marks
3. Viva voce :10 marks

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Working with AUTOCAD	Singh Ajit	2002
2	Building Drawing	Shah, M.G Kale	2002

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Civil Engineering Drawing	Malik & Mayo	2009
2	A to Z Building Constructions	Mantri, Sandip	2015
3	Building Planning and Drawing	Swamy, Rao	2015
4	Building Construction	Bhavikatti S S	2005



Syllabus for the Academic Year: 2021 – 2022

Common to: CV, ME and IEM

Department: Mathematics

Semester: IV

Subject Name: Probability and Calculus of Variations

L-T-P-C: 3-0-0-3

Subject Code: MA4TH1

Total Contact Hours:40 Course Objectives:

Sl.No	Course Objectives
1	Understand the least square method to fit a curve for the given data and evaluate the correlation coefficient and regression lines for the data.
2	To develop probability distribution of discrete and continuous random variables.
3	Study the concept of joint probability distribution and Calculus of Variations.
4	To learn the concept on complex analysis.

Course Outcomes

Course outcome	Descriptions
CO1	Understand the concept of statistics, probability distributions and calculus of variations.
CO2	Use the concept of analytic function and variational problems in Engineering field.
CO3	Apply probability distributions and its generating functions in Engineering fields.
CO4	Make use of Correlation, regression analysis and complex analysis to solve the problems in real life and in Engineering fields.

UNIT	Description	Hours
I	Statistics: Correlation and regression- Karl Pearson's coefficient of Correlation, problems. Regression analysis- lines of regression (without proof) problems. Curve Fitting: Curve fitting by the method of least square- Fitting of the curves: Linear, polynomial, exponential function of the form $y=ab^x$.	8
II	Probability Distributions: Review of basic probability theory. Random variables (Discrete and Continuous), Probability of mass/density functions. Binomial distribution, Poisson's distribution, exponential distribution and Normal distribution (without derivations) and problems.	7
III	Moments: Moments, central moments, characteristic functions, probability generating and moment generating functions-illustrations. Joint probability distribution: Joint probability distribution for two discrete random variables, Marginal distributions, Expectation, Co-variance, Correlation coefficient.	7

IV	Complex Analysis: Review of function of a complex variables, limits, continuity, and differentiability. Analytic functions, Cauchy-Riemann equations in Cartesian and polar forms (without proof). Construction of analytic functions by Milne-Thompson Method-problems. Bilinear Transformations.	9
V	Calculus of Variations: Functional, Euler's Equation (Without derivations) standard variation problems, Minimal surface of revolution, Hanging chain problem, Brachistochrone problem	8

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications, 2015. ISBN: 9788174091956
2	An Introduction to Probability Theory and its Applications	W. Feller	3 rd Edition, John Wiley & Sons, Inc, 2008, ISBN 9788126518050

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	A First Course in Probability	S.Ross	8 th Edition, Pearson, 2010, ISBN:9780136033134
2	Higher Engineering Mathematics	B.V.Ramana	1st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190

Mapping Course Outcomes with Program Outcomes

[illegible]



Syllabus for the Academic Year – 2021 - 2022

Department: CIVIL ENGINEERING

Se

semester: IV Subject Name: STRENGTH OF MATERIALS

Subject Code: CE4TH2
3

L-T-P-C: 3-0-0-

Sl. No	Course Objectives
1	To determine the Mechanical behavior of the body by determining the stresses, strains produced by the application of load.
2	To apply the fundamentals of simple stresses and strains principal stresses and strains.
3	To facilitate the concept of bending and its theoretical analysis.
4	To apply fundamental concepts related to deformation, moment of inertia, load carrying capacity, shear forces, bending moments, torsional moments, column and struts, principal stresses and strains.

UNIT	Description	Hours
I	Simple Stresses and Strain: Introduction, Definition and concept of stress and strain. Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self-weight. Saint Venant's principle, Compound bars, Temperature stresses, Compound sections subjected to temperature stresses, state of simple shear, Elastic constants and their relationship.	08
II	Compound Stresses: Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses. Analysis of Trusses: Introduction, assumptions, analysis of pin jointed plane determinate trusses using method of joints and sections.	08



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III	Shear Force and Bending Moment in Beams: Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to point load, uniformly distributed loads, uniformly varying loads, couple and their combinations.	08
IV	Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, I and T sections.	07
V	Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus. Power transmitted by shaft, combined bending and torsion. Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.	08

Course outcome	Students will be able to
CO1	To understand the strength of various structural elements, internal forces such as compression, tension, shear, bending and torsion.
CO2	To understand the basic concept of analysis of various structural elements.
CO3	To apply the knowledge to select suitable material for the construction.
CO4	To analyze various structural elements subjected to various kinds of loads.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



TextBooks:

Sl No	TextBooktitle	Author	VolumeandYear ofEdition
1	StrengthofMaterials	B.S. Basavarajaiah,P.M ahadevappa	University Press (India)Pvt.Ltd.,3rdEdition, 2010
2	MechanicsofMaterials	FerdinandP.Beer,E.RussellJohnston andJr.John T. DeWolf	Tata McGraw-Hill,Third Edition, SI Units

ReferenceBook:

Sl No	TextBooktitle	Author	VolumeandYearofEdition
1	ElementsofStrengthof Materials	D.H.Young,S.P. Timoshenko	EastWestPressPvt.Ltd.,5th Edition(Reprint2014)
2	StrengthofMaterials	RKBansal	4th Edition, Laxmi Publications,2010
3	StrengthofMaterials	S.S.Rattan	McGrawHillEducation(India) Pvt. Ltd., 2nd Edition(Sixthreprint 2013)
4	AnalysisofStructures	Vazirani, V N,RatwaniMM.andS KDuggal	Vol.I,17thEdition,KhannaPublishers,NewDelhi.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2021 - 2022

Department: Civil Engineering

Semester: IV

Subject Name: Concrete Technology

Subject Code:CE4TH3

L-T-P-C: 3-0-0-3

Sl.No	Course Objectives
1	Outline the manufacturing and types of cements and concrete and its application.
2	Assess the methods of measuring properties of concrete
3	Describe various strength of concretes and enhancing the properties of concrete using admixtures
4	Analyze the methods of mix proportion and importance of ready mix concrete

UNIT	Description	Hours
I	Concrete Ingredients: Cement – Cement manufacturing process(Wet & Dry Process), chemical composition and their importance, hydration of cement, types of cement. Testing of cement. Fine aggregate: Functions, application, Alternatives to River sand, Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, application. Qualities of water.	8
II	Concrete: Workability, Factors affecting workability, Measurement by various tests, Manufacturing Concrete: Mixing, Transporting, Placing, Compaction and Curing, Importance of Curing and Methods of Curing, Segregation, Bleeding. Special Concrete: Properties and applications on High Strength concrete, High Performance Concrete, Self-Compacting Concrete, Fibre Reinforced Concrete and Geo-polymer Concrete.	8
III	Admixtures: Chemical admixtures–plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures – Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice huskash. Durability- definition, significance, permeability, sulphate attack, chloride attack, carbonation, freezing and thawing.	7
IV	Hardened concrete: Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept, Testing of hardened concrete – Compressive strength test , Split tensile test, Flexural Strength Test, Creep –factors affecting creep. Shrinkage of concrete – plastic shrinking and drying shrinkage, Factors affecting shrinkage.	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



V	Mix design: Introduction, variables in proportioning exposure conditions, Procedure of mix design as per IS 10262-2009. Numerical examples of mix design. Non Destructive testing of concrete: Importance of Non-destructive tests, Rebound hammer test, Ultra sonic pulse velocity test. Procedure to conduct tests – Penetration and pull out test.	8

Course outcome	Descriptions
CO1	Understand the various ingredients of concrete and their properties, types of cement and their uses.
CO2	Able to understand the various tests on fresh concrete and Hardened concrete
CO3	Able to do the mix design as per IS code specification
CO4	Gain knowledge of non-destructive tests on concrete.

Question paper Pattern:

1. The question paper will have 5 units comprising of ten questions. Each full question carrying 20 marks.
2. The students shall answer five full questions, selecting one full question from each unit.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Concrete Technology	Neville A M	Volume 1,2 nd Edition,2019
2	Concrete Technology,	Gambhir M L	Volume 1,5 th Edition,2017

Reference Books:



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



S1 No	Text Book title	Author	Volume and Year of Edition
1	Concrete Technology	M S Shetty	Jan 2018
2	Concrete technology,	Shanthakumar.A.R	Apr 2018, Oxford University Press, New Delhi, ISBN-13: 978- 0199458523
3	Concrete Mix Design	N. Krishna Raju	Volume 1,3 rd Edition 2010
4	Concrete Mix proportioning guidelines	IS 10262	2009



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: IV

Subject Name: Hydraulics And Hydraulic Machines

Subject Code: CE4TH4

L-T-P-C: 3-0-0-3

Course objectives :

Sl no	Course objectives
1	To introduce the students to the principles of fluid flow problems associated with pipe flows, open channel flows and to solve practical fluid flow problems.
2	To provide an exposure to the principles of dimensional analysis
3	To provides an exposure to the impact of jet on different types of vanes
4	To provides an exposure to the working principles and performance characteristics of hydraulic machines.

UNIT	Description	Hours
I	Flow In Open Channels: Definition Of Open Channels, Classification, Difference Between Pipe Flow & Open Channel Flow, Types Of Flow, Geometric Properties Of Open Channels, Uniform Flow In Open Channels, Chezy's And Manning's Formulae, Problems On Uniform Flow. Specific Energy, Definitions, Specific Energy Curve, Conditions For Minimum Specific Energy And Maximum Discharge, Critical Flow In Rectangular Channels, Problems, Hydraulic Jump In Rectangular Channels, Froude Number Concept, Problems On Hydraulic Jump.	10
II	Dimensional Analysis & Model Similitude: Introduction To Dimensional Analysis, Units & Dimensions, Table Of Dimensions, Dimensional Homogeneity, Methods Of Analysis(Rayleigh's & Buckingham's Method), Problems On Rayleigh's & Buckingham's Methods, Model Studies, Introduction, Comparison With Dimensional Analysis, Similitude, Dimensionless Parameters.	07
III	Impact Of Jet On Flat And Curved Vanes: Introduction To Impulse Momentum Equation And Its Applications, Force Exerted By A Jet On A Fixed vane, Derivations, Force Exerted By A Jet On A Moving Target, Derivations. Force Exerted By A Jet On A Curved Vane, Concept Of Velocity Triangles (no problems).	07



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



IV	Turbines: Hydropower generation, Turbines- classification, description of Pelton wheel turbine and Francis turbine. Unit quantities, specific speed, problems, characteristic curves of turbine. General layout of hydroelectric plant.	07
V	Centrifugal Pumps: Definition Of Pump, Classification, Description & General Principle Of Working, Priming & Methods, Work Done & Efficiencies Of A Centrifugal Pump, Minimum Starting Speed, Cavitation In Centrifugal Pumps, Multistage Pumps, Problems On Centrifugal Pumps.	08

Course Outcomes

Course outcome	Descriptions
CO1	Able to explain open channel flow and energy concepts in open channel flow.
CO2	Able to solve practical fluid flow problems, to apply dimensional analysis.
CO3	Able to apply the principles of impulse momentum equation to study impact of jet on different types of vanes.
CO4	To design the sections of open channels and to choose turbine and pumps for various conditions by performance characteristics

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Hydraulics and Fluid Mechanics Including Hydraulic Machines	P.N. Modi and S.M. Seth	20th Edition- 2015
2	A textbook of Fluid Mechanics and Hydraulic Machines	R K Bansal	9th Edition -2017

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Fluid Mechanics and Hydraulics	J.B. Evett, and C.Liu	3rd Edition- 2009
2	Elementary Hydraulics	Cruise, J.F., Singh, V.P. and Sherif,M.M.	1st Edition -2007
3	Fluid mechanics and Hydraulic Machines	K Subramanya	3rd Edition -2009



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: IV

Subject Name: Building materials and construction management

Subject Code: CE4TH05

L-T-P-C: 3-0-0-3

Course objectives:

Sl No	Description
1	To comprehend the properties of masonry walls and its behaviour under different conditions of loading.
2	To be familiar with the different types of alternative building materials.
3	To gain the knowledge of alternatives to conventional masonry walls and roofs.
4	To understand the role of management in entrepreneurship and the concept of scheduling in construction projects.

UNIT	Description	Hours
I	Masonry and its properties: Introduction, Types of walls-load bearing and non- load bearing walls, types of loading on walls, Strength of masonry in compression and tension, factors affecting the compressive strength, Stress-strain properties of masonry. Design of footing for masonry wall for axial loading only.	7
II	Alternative Building Materials: Types of structural units, characteristics of building blocks-bricks, laterite blocks, concrete blocks, Fal-G blocks, stabilized mud blocks, steam cured blocks. Selection of good building blocks for construction. Fibre reinforced cement composites- materials, fibres, filler materials and additives, applications.	7
III	Alternative Building Technologies: Alternatives for wall constructions-composite masonry, confined masonry, cavity walls, rammed earth. Ferro cement and ferroconcrete building components- construction methods, properties and applications. Top down construction, Mivan Construction Technique. Alternative Roofing Systems-Concepts, Filler slabs, Composite beam panel roofs.	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



IV	Construction management and scheduling process: Introduction to management, Meaning, Characteristics, Scope, Functional Areas, Roles and Levels of Management. Introduction to Scheduling, Net Work Analysis-Types of Networks, CPM, PERT, Differences between CPM and PERT. CPM Network (A-O-A Network)- Terms and Definition, Calculation of Floats, Related Problems.	9
V	Construction equipment and entrepreneurship: Introduction to construction equipments –Earth Moving Equipments, Hoisting Equipments, Equipments For Highway Construction, Factors For Selecting Equipments. Meaning of Entrepreneur, Types of Entrepreneur, Concept, Evolution and Development of Entrepreneurship, Stages in Entrepreneurial Process, Role of Entrepreneurs in Economic Development.	8

Course Outcomes

Course outcome	Descriptions
CO1	To describe the different types of loading and its effect on masonry walls.
CO2	To characterize the building blocks by their properties to use in construction.
CO3	To differentiate the alternative construction techniques with the conventional methods.
CO4	To utilize the concept of network analysis in scheduling a construction project and to develop managerial skills in entrepreneurship.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“Building Materials”, New Age International publishers, New Delhi	S K Duggal	Volume 1, 3 rd Edition,
2	“Alternative Building Material and Technologies”, Laxmi Publications, New Age International publishers, New Delhi	K S Jagadish, B V Venkataramana Reddy and K S NanjundaRao	2 nd Edition, 2017

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“Brick and Reinforced Brick Structures”, Medtech Scientific publishers, New Delhi	P Dayaratnam	2 nd Edition, 2018
2	“Construction Planning and Management”, Galgotia publications, New Delhi	U K Srivastava	1 st Edition, 2016
3	“Construction Engineering and Management”, Umesh publications, New Delhi	S Seetharaman	5 th Edition, 2015
4	“Project Planning and Control with PERT and CPM”, Galgotia publications, New Delhi	B C Punmia and K K Khandelwal	4 th Edition, 2006



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: IV

Subject Name: Basic Geotechnical Engineering

Subject Code: CE4TH06

L-T-P-C: 3-0-0-3

Course objectives:

Sl no	Description
1	To understand basic concepts of soil mechanics as an integral part in the knowledge of civil engineering.
2	To comprehend the engineering properties of different types of soil and to be familiar with the mechanical behaviour of soils.
3	To be broadly familiar with geotechnical engineering problems such as flow of water and terminologies associated with soil mechanics.
4	To assess the strength-deformation and consolidation characteristics of soils

UNIT	Description	Hours
I	Index properties: History of soil mechanics, Definition, origin and formation of soil, Phase Diagram with inter relationships between index properties, Laboratory determination of Moisture content, Specific gravity, Relative Density, Consistency limits and indices, in-situ density, Particle size distribution by sieve analysis and IS Plasticity chart, Soil structure, Common clay minerals- Montmorillonite, kaolinite, halloysite and illite, Soil-Water system- Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution.	8
II	Flow of water: Darcy's law with assumptions, coefficient of permeability and its determination, factors affecting permeability, seepage velocity, superficial velocity, permeability of stratified soils, concept of total stress, effective stress and pore stress, Quick sand phenomena and capillary phenomena. Numerical problems on permeability.	7



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



III	Compaction: Definition, Principle and factors affecting compaction, Problems on compaction. Field compaction control - compactive effort & method of compaction, lift thickness and number of passes, Proctor needle, Compacting equipments and their suitability.	7
IV	Consolidation: Definition, Terzaghi's one dimensional consolidation theory-assumption, types of consolidation, Determination of Consolidation characteristics (C_c , a_v , m_v , C_v) by square root of time fitting and logarithmic time fitting and Numerical problems on consolidation. Determination of Pre-consolidation pressure by Casagrande's method.	9
V	Shear Strength: Mohr-coulomb theory, factors affecting shear strength, Determination of Shear Strength by Direct shear test, Unconfined compression test and Triaxial compression test. Numerical problems on above. Thixotropy and sensitivity. Test under different drainage conditions.	8

Course Outcomes

Course outcome	Descriptions
CO1	To determine the index properties in classifying the soils based on index properties and plasticity chart.
CO2	To determine compaction characteristics and permeability property of soils in acquiring the knowledge of stresses due to seepage and effective stress.
CO3	To solve practical problems related to estimation of consolidation settlement of soil.
CO4	To estimate shear strength parameters of different types of soils using the data of different shear tests using Mohr-Coulomb failure theory.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“Basic and Applied Soil mechanics”, New Age Publishers and Distributors, New Delhi.	GopalRanjan and A S R Rao	2 nd Edition, 2009
2	“Soil Mechanics And Foundation Engineering”, UBS Publishers And Distributors, New Delhi.	V N S Murthy	2 nd Edition, 2009

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“Soil Mechanics and Foundation Engineering”, Laxmi Publications, New Delhi.	B C Punmia	18 th Edition, 2017
2	“Geotechnical Engineering”, New Age Publications, New Delhi	Venkatramaiah C	3 rd Edition, 2009
3	“Foundation Analysis and Design”, McGraw Hill Publishers, New York.	Joseph E Bowles	8 th Edition, 2010
4	“Soil Mechanics Fundamentals”, John Wiley And Sons Publications, New York.	Muni Budhu And Wiley Blackwell	2 nd Edition, 2009



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year 2020 - 2021

Department: CIVIL ENGINEERING

Semester: IV Subject Name: BASIC MATERIAL TESTING LABORATORY

Subject Code: CE4LB1

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl.No	Course Objectives
1	Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
2	Ability to function on multi-disciplinary teams in the area of materials testing
3	Ability to function on multi-disciplinary teams in the area of materials testing
4	Understanding of professional and ethical responsibility in the areas of material testing.

UNIT	Description	Hours
1	Tension test on Mild steel and HYSD bars.	3
2	Compression test of Mild Steel, & Cast iron	3
3	Torsion test on Mild Steel circular sections	3
4	Shear Test on Mild steel.	3
5	Impact test on Mild Steel (Charpy & Izod)	3
6	Bending and Rebending test on steel (for demonstration)	3
7	Hardness test on ferrous and non-ferrous metals 1. Brinell's, 2. Rockwell 3. Vicker's	6
8	Bending Test on RCC beam under two point loading	3



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



9	TestsonCoarseaggregates: 1. WaterAbsorption 2. SpecificGravity 3. BulkDensity 4. SieveAnalysis	12

CourseOutcomes

Courseo utcome	Descriptions
CO1	Studentswillbeabletounderstandthebehaviorofengineeringmaterialsby conductingtension and compressiontests
CO2	Studentswill be ableto understand thebehaviorofengineeringmaterialsby
CO3	Studentswill beable tounderstandthe behaviorof engineeringmaterials by
CO4	Studentswillbeabletofindcertainpropertiescourseaggregates,likewater

TextBooks:

Sl	TextBooktitle	Author	VolumeandYear
1	TestingofEngineeringMaterials	Davis,H.E.,Troxell,	McGraw Hill Publications, New
2	ConcreteManual	M.L.Gambhir	DhanpatRai&Sons

ReferenceBook:

Sl	TextBooktitle	Author	VolumeandYear
1	MechanicalTestingofMaterials	Fenner,	GeorgeNewnesLtd.
2	ExperimentalStrengthofMaterials	HolesKA,	EnglishUniversities
3	TestingofMetallicMaterials	SuryanarayanaAK	
4	MaterialTestingLaboratoryManual	KukrejaCB,Kishore	StandardPublishers



Syllabus for the Academic Year - 2021 - 2022

Department: Civil Engineering Semester: IV

Subject Name: SURVEYING PRACTICE - II

Subject Code: CE4LB2

L-T-P-C: 0-0-3-1.5

Sl.No	Course Objectives
1	To facilitate the students to develop their intellectual and motor skills to conduct the surveying works based on objectives.
2	To train the students of civil engineering in using various surveying Instruments - care and adjustments.
3	To train the students to collect the field data, field notes and to apply corrections required using suitable methods before plotting or setting-out.
4	To use the various techniques necessary for engineering practices.

Expt no.	Experiments
1	To determine distance using tachometric surveying with horizontal and inclined line of sight.
2	To determine tachometric constants using tachometric surveying with horizontal and inclined line of sight.
	Total station
3	Introduction to the total station and to study the parts of Total station.
4	To make the temporary adjustments of Total station and to measure Horizontal and sloping distance.
5	Orientation with reference to north, measurement of horizontal distances, sloping distances, horizontal angles in angular measuring mode.
6	To compute the coordinates ie., Northing, Easting and reduced levels for various points given on the ground from one instrument station.
7	To conduct open traverse using Total station and to measure the coordinates of intermediate points like electrical poles, trees etc., and to orient the instrument with respect previous station points.
8	To conduct closed traverse using Total station and to measure the coordinates NEZ values.
9	To conduct profile leveling to existing ground profile and Plot LS & CS.



Course Outcomes

Course outcome	Descriptions
CO1	To Perform tachemetric survey to avail field data
CO2	To perform basic operations of total station
CO3	To utilize the total station for various type of field survey like standard traverse, profile leveling to exiting ground etc.
CO4	To Work effectively as a member in a team & contribute to the team's goal

Question paper Pattern:

Examination will be conducted for 50 marks

1. Experiment identification and procedure writing :15 marks
2. Experiment conduction:25 marks
3. Viva voce :10 marks

Text Books:

S/No	Text Book title	Author	Volume and Year of Edition
1	Surveying	B.C. Punmia,	Volume-I, Laxmi Publications, New Delhi..
2	Plane Surveying	A.M Chandra,	Volume-I, New Age International ® Ltd.,

Reference Book:

S/No	Text Book title	Author	Volume and Year of Edition
1	Fundamentals of Surveying	S.K. Roy	Prentice Hall of India
2	Fundamentals of Surveying	Milton O. Schimidt Wong	Thomson Learning.
3	Surveying	S.K. Duggal	Volume I
4	Plane Surveying	ALAK, S. Chand	Company Ltd., New Delhi.



Syllabus for the Academic Year 2020 - 2021

Department: Civil Engineering

Semester: IV

Subject Name: Engineering Geology Laboratory

Subject Code: CE4LB3

L-T-P-C: 0-0-3-1.5

Course objectives:

Sl no	Course objectives
1	To expose the students to identify the minerals and rocks based on their physical properties and uses in civil engineering.
2	Students will learn the thickness of strata, dip and strike, bore hole problems related to geological formations for foundation, tunnels, reservoirs and mining
3	To educate the students in the interpretation of the geological maps related to civil engineering projects
4	Students will understand the field knowledge by visiting the site structural features of the earth like faults, folds, joints, unconformity etc.

Experi ments	Description of experiment	Hour s
1	Study of physical properties of minerals and identification of different group of minerals and their uses. Rock Forming minerals - Quartz group, Feldspar group, Garnet, Corundum, Mica group, Hornblende, Talc, Chlorite, Olivine, Asbestos, Calcite, Gypsum, etc	3 hours
2	Study of physical properties of minerals and identification of different group of minerals and their uses. Ore forming minerals - Magnetite, Hematite, Limonite, Pyrite, Chalcopryite, Galena, Pyralusite, Chromite, Bauxite etc.	3 hours
3	Study of physical properties and Engineering Properties of rocks and their identification and uses. Igneous rocks - Granites and related rocks, Dolerite, Porphyries of Granite, Syenite, Diorite, Basalt, and Pegmatite etc.	3 hours
4	Study of physical properties and Engineering Properties of rocks and their identification and uses. Sedimentary rocks - Conglomerate, Breccia, Sandstone, Shale, Lime stone, Laterite, etc. Metamorphic rocks - Gneiss, Schist, Marble, Quartzite, Slate, Charnockite, etc.	3 hours
5	Calculation of Thickness of strata - Vertical, True thickness and width of the outcrops. (3 methods)	3 hours



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



6	Dip and Strike problems- Determine Apparent dip and True dip and amount of inclinations (3 methods)	3 hours
7	Borehole problems- Determination of subsurface behavior of rocks, their attitude related to foundation, tunnels, reservoirs and mining. Triangular methods.	3 hours
8	Borehole problems- Determination of subsurface behavior of rocks, their attitude related to foundation, tunnels, reservoirs and mining. Square methods.	3 hours
9	Interpretation and drawing of sections for geological maps showing formation of rock bodies, tilted beds, faults, unconformities etc. (10 Maps)	9 hours
10	Study of Rock Forms & Structural features by using Wooden Models.	3hours

Course Outcomes

Course outcome	Descriptions
CO1	The students able to identify the minerals, rocks and utilize them effectively in civil engineering practices.
CO2	The students will interpret subsurface information such as thickness of soil, weathered zone, depth of hard rock
CO3	The students will interpret and understand the geological conditions of the area for implementation of civil engineering projects.
CO4	The students will be able to identify the different structural features in the field.

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Geology Laboratory Manual	B.S. SatyanarayanaSwamy	DhanpatRai Sons, New Delhi.
2	Structural Geology	MP Billings	CBS Publishers and Distributors, New Delhi.
3	Textbook of Geology	P.K.MUKERJEE,	WorldPress Pvt. Ltd., Kolkatta



III SEMESTER B.E.

III Semester B.E. (Common to ECE and ETE) (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)							Examination			
SI No	Course Code		Course Title	Teaching dept.	Board of Exam.	Credits	CIE	SEE	Total Marks	Exam Hours
01	BS	MA3TH1	Integral Transform and Numerical Methods	MA	MA	4.0	50	50	100	3
02	PC	ES3TH2	Signals and Systems	EC	EC	3.0	50	50	100	3
03	PC	ES3TH3	Network Theory	EC	EC	3.0	50	50	100	3
04	PC	ES3TH4	Analog Electronics Circuits	EC	EC	3.0	50	50	100	3
05	PC	EC3TH5	Digital Electronics Circuits	EC	EC	3.0	50	50	100	3
06	ES/MA	ES3TH6/M A3DP6	Electronic Instrumentation/ DIP Mathematics	EC/MA	EC/MA	3.0	50	50	100	3
07	PC	ES3LB1	Signals and Systems Lab	EC	EC	1.5	50	50	100	3
08	PC	ES3LB2	Analog Electronics Circuits Lab	EC	EC	1.5	50	50	100	3
09	PC	EC3LB3	Digital Electronics Circuits Lab	EC	EC	1.5	50	50	100	3
10	HS	SK3DP1	Skill Development-I	HS	HS	1.0	50	-	50	-
Total						24.5	500	450	950	-
CIE-Continuous Internal Evaluation, SEE-Semester End Examination										

Note: MA3DP6: DIP Mathematics for Lateral Entry students only.

There is no SEE for Skill Development-I course.

However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.

IV SEMESTER B.E.

IV Semester B.E. (Common to ECE and ETE) (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)							Examination			
SI No	Course and Course Code		Course Title	Teaching dept.	Board of Exam.	Credits	CIE	SEE	Total Marks	Exam Hrs.
01	BS	MA4ES1	Probability and Complex Analysis	MA	MA	3.0	50	50	100	3
02	PC	EC4TH2	Digital System Design using Verilog	EC	EC	3.0	50	50	100	3
03	PC	ES4TH3	Fields and waves	EC	EC	3.0	50	50	100	3
04	PC	EC4TH4	Analog Communication	EC	EC	3.0	50	50	100	3
05	PC	ES4TH5	Microcontroller and Its Applications	EC	EC	3.0	50	50	100	3
06	PC	ES4TH6	Control Systems	EC	EC	3.0	50	50	100	3
07	PC	EC4LB1	Verilog Lab	EC	EC	1.5	50	50	100	3
08	PC	EC4LB2	Analog Communication Lab	EC	EC	1.5	50	50	100	3
09	PC	ES4LB3	Microcontroller Lab	EC	EC	1.5	50	50	100	3
10	HS	SK4DP2	Skill Development-II	HS	HS	1.0	50	-	50	-
Total						23.5	500	450	950	-
CIE-Continuous Internal Evaluation, SEE-Semester End Examination										

Note: MA4**1: Engineering mathematics-IV is not common for all Branches (Syllabus is based on Department request).

There is no SEE for Skill Development-II course. However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mathematics

Semester: III

Subject Name: Integral Transforms and Numerical Techniques

Common to: All BE

Courses

Subject Code: MA3TH1

L-T-P-C: 4-

0-0-4

Course Objectives:

	Course Objectives
1	Introduce the concept of Laplace Transform and problems on periodic function.
2	Introduce the concept of solving Linear Differential Equations by the method of Laplace Transform.
3	Represent a periodic function as a Fourier Series and Compute the Fourier coefficients numerically.
4	To develop the proficiency in Numerical techniques and solving Ordinary Differential Equations arising in engineering applications.

UNIT	Description	Hours
I	Laplace Transforms: Definition, Laplace transforms of elementary functions.(Statements only).Derivations: Laplace transform of t^n , Laplace transform of division by t , Laplace transform of $\int_0^t f(t)dt$.Laplace transforms of Periodic function (Statement only) and problems on square wave, saw-tooth wave, triangular wave, full and half wave rectifier,Unit step functions - problems.	10
II	Inverse Laplace transforms: Definition, properties, evaluation using different methods. Convolution theorem (without proof), evaluation of $L^{-1}\{F(s)\}$ using convolution theorem. Application to solve ordinary linear differential equations by Laplace transforms method.	10
III	Fourier Series: Periodic function, Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with period 2π and with arbitrary period $2l$.Applications to Engineering problems: Fourier series for Periodic square wave, Half wave rectifier, Full wave rectifier, Saw-tooth wave with graphical representation. Half range Fourier series, Practical harmonic analysis.	10
IV	Fourier Transforms: Infinite Fourier transforms. Fourier Sine and Cosine transforms. Inverse Fourier transforms, and simple problems. Z-Transforms: Basic definitions of Z-transform, Standard Z-transforms, Damping rule, Shifting rule, Initial value and Final value theorems(without proofs), problems, Inverse Z-transform, problems. Applications-solutions of difference equations using Z-transforms.	11
V	Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge- Kutta method of fourth order, Milne's and Adams-Bashforth Predictor and Corrector methods (No derivation of formulae) problems. Numerical Integration: Simpson's $1/3^{rd}$, $3/8^{th}$ rule, Weddle's rule, (without proof), problems.	11



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Text Books:

SN	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition KhannaPublications,2015.ISBN:9788174091956
2	Advanced Engineering Mathematics	E.Kreyszig	10 th Edition JonWiley&Sons,2015. ISBN:9780470913611

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	A text book of Engineering Mathematics	N.P.Bali and Manish Goyal	7 th Edition Lakshmi Publishers, 2010ISBN:9788131808030
2	Higher Engineering Mathematics	B.V.Ramana	1st Edition, TataMcGraw-Hill,2006. ISBN:9780070634190
3	Higher Engineering Mathematics	H.K.Das and Er.RajnishVerma	1 st Edition, Chand publishing, 2011. ISBN:9788121938907

Course outcome	Descriptions
CO1	Understand the basic concepts of Laplace transforms, Fourier series, Integral transforms and Numerical methods.
CO2	Apply Laplace transform, inverse Laplace transform, Fourier series to solve problems in network analysis, control system and others fields of engineering.
CO3	Demonstrate Fourier series and Integral transforms to study behavior of periodic functions, discrete/continuous functions arising in single and system, field theory and system communication.
CO4	Analyze and apply Z- transforms and Numerical methods in engineering problems.

Department: ECE
Subject Name: Signals and Systems
Subject Code: ES3TH2

Semester: III
L-T-P-C: 3-0-0-3
Total Contact Hours 39 Hours

Course Objectives:

No.	Description
1	Knowledge about basic signal and system modeling concept and definitions
2	Learn about representations of Linear Time Invariant system using Differential and Difference equations
3	Knowledge about the application and use of mathematical transforms to solve electrical engineering problems
4	Understand the different transform techniques to solve the continuous and discrete Linear Time Invariant Systems

UNIT	Description	Hours



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I	Introduction to Signals: Definition of signal and system, Classification of signals, Basic Operations on signals, Elementary signals.	7
II	Introduction to Systems: Definitions of a system, properties of systems, systems viewed as Interconnections of operations, Differential and difference equation representations and block diagram representations of LTI systems.	8
III	Representation of LTI Systems: Introduction to impulse response representation, Convolution sum, Convolution Integral. Fourier representations of Aperiodic Signals: Introduction, Fourier representation of Continuous time signals (FT), Fourier representation of Discrete time signals (DTFT), Properties and Significance of FT and DTFT.	8
IV	Sampling: Sampling of Continuous time signals and reconstruction of Continuous time signals from samples. Applications of Fourier Transform Representations: Introduction, Frequency Response of LTI systems, Fourier Transform Representation for discrete time signals, frequency domain analysis of simple circuit. (Section 4.1 to 4.4)	8
V	Z-Transform and its applications: Introduction, Z-transform, properties of ROC, Properties of Z-transforms, Inverse of Z-transforms. Transform function, Unilateral Z-transform and its application to solve difference equations. (Section 7.1 to 7.6, 7.9 to 7.10)	8

Text Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	Simon Haykin and Barry Van Veen,	Signals and Systems	Wiley India Edition.	13 978-81-265-1257-7	2nd Edition, 2007 (Reprint),

Reference Books:

Sl No	Author	Text Book title	Publisher	Volume / Issue	Year /Edition
1	Michael Roberts,	Fundamentals of Signals & Systems	Tata McGraw-Hill,	6	2nd edition 2010
2	Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab	Signals and Systems	PHI	4	1997, Indian reprint 2002
3	B. P. Lathi, 2005.	“Linear Systems and Signals”,	Oxford University Press,	2	2005
4	Ganesh Rao and Satish Tunga	Signals and Systems	Pearson Technical Publishers,	10	2004

Course Outcomes:



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Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze the fundamental concepts of both continuous and discrete signals and systems.
CO2	Apply the properties of signals and analyze both continuous and discrete systems commonly used in signal processing applications.
CO3	Analyze Non Periodic signals in Frequency domain.
CO4	Analysis of Discrete time systems using Z-Transform.



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Department: ECE/ETE

Semester: III

Subject Name: NETWORK ANALYSIS

L-T-P-C: 3-0-0-3

Subject Code: ES3TH3

Total Contact Hours: 39 Hours

Course Objectives: after studying this Course, students will be able to:		
1	Study the Basic Laws of electric circuits and Network Theorems.	
2	Learn the network reduction techniques and Laplace transforms.	
3	Understand the concepts of Resonance and Network Topology applied to circuits.	
4	Study the two port network parameters.	
UNIT	Description	Hours
I	FUNDAMENTAL CONCEPTS OF NETWORKS Introduction to Voltage and current sources, Kirchhoff's Laws, source Transformation and shifting, Loop Variable Analysis, Node Variable Analysis, Network reduction using star to delta conversion.Text1: 3.1 to 3.6.	09
II	NETWORK THEOREMS Introduction,Superposition theorem, Reciprocity theorem,Thevenin's theorem, Norton's theorem,Millman's Theorem, Maximum power transfer theorem.Text2: 7.1 to 7.7	08
III	NETWORK TOPOLOGY AND RESONANCE IN CIRCUITS Introduction, Graph of a network, Concept of tree and links, Incidence matrix, tie-set and cut set schedules, Duality, Series resonance - Variation of Current and Voltage with Frequency, Selectivity and Bandwidth-factor, Circuit magnificationfactor, Parallel resonance -Selectivity and Bandwidth, Maximum Impedance Conditions with C,L and f variable, Current in Anti-Resonant Circuit, The General Case-Resistance present in both branches. Text2: 3.1 to 3.6,3.10,8.1 to 8.3	08
IV	INITIAL CONDITIONS AND LAPLACE TRANSFORMATION Introduction to initial conditions in elements, Transients, Initial value and final value theorem, Wave form synthesis of periodic & non periodic signals. Text1: 5.2,7.3,7.4	07
V	TWO PORT NETWORK Introduction to single & two port Networks, Relationship between Two-port variables, open circuit impedance parameters, Short circuit admittance parameters, Hybrid parameters and Transmission parameters, Relationships between parameter sets.Text1:11.0 to 11.6	07

Text Books

Sl No	Author	Text Book title	Publisher	ISBN	Edition/ Year
1	M. E. Van Valkenburg	Network Analysis	PHI	978-81-203-0156-6	Third edition, 2007
2	Roy Choudhury	Networks and systems	New Age International Publishers	81-224-0002-7	2nd edition, 2006



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Edition / Year
1	Hayt, Kemmerly and Durbin	Engineering Circuit Analysis	TMH	13-978-007-1122276	6 th Edition, 2002
2	Franklin F. Kuo	Network Analysis and Synthesis	Wiley	10: 9788126510016	Second edition (2006)
3	Ravish R singh	Electrical Networks	McGraw Hill	978-0-07-026096-2	Tenth reprint 2013
4	Smarajit Ghosh	Network Theory Analysis and Synthesis	PHI Learning Pvt. Ltd	978-81-203-2638-5	Sixth printing, June 2010.

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply network reduction for Solving the currents and voltages using basic laws (L2)
CO2	Identify the resonance and two port network parameters.(L2)
CO3	Synthesize the Periodic and non-Periodic waveforms using Laplace transform.(L3)
CO4	Apply the initial conditions and Network theorems for the given network.(L3)



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Department: ECE

Semester: III

Subject Name: Analog Electronic Circuits

L-T-P-C: 3-0-0-3

Subject Code: ES3TH4

Total Contact Hours: 39

Course Learning Objectives: This course will enable students to

1	Understand the basics of semiconductor physics and electronic devices.
2	Study the mathematical models of BJTs, MOSFETs.
3	Learn the design concepts and demonstrate the diode circuits and amplifiers.
4	Communicate and discuss effectively the applications of analog electronic circuits.

	Description	Hours
I	Design of Diode Applications: Introduction, applications of diode, Full wave rectifier with C Filter, Clippers and Clampers. Problems and Solutions MOS Field-Effect Transistor (MOSFETs): Introduction, Device Structure & Physical Operation, Derivation of i_D - V_{DS} Relationship, Symbol, i_D - V_{DS} characteristics, Operation as a switch, Operation as a Linear Amplifier. Problems and Solutions. (Text1: 2.5.2, 2.6.1, 2.6.2, 4.1.1 to 4.1.3, 4.1.6, 4.2.1 to 4.4.4)	8
II	MOS Field-Effect Transistor (MOSFETs) amplifier: Small-Signal Operation and Models and MOSFET Amplifiers: MOSFETs- Small Signal Analysis, Trans-conductance g_m , The T-equivalent Circuit model. Common Source amplifier, Common Source amplifier with Source Resistance, Common Drain Amplifier. Problems and Solutions Frequency response of CS amplifier MOS Differential Pair: Operation with a Common-Mode Input Voltage and Differential Input voltage. Small-Signal Operation of the MOS Differential Pair: Differential Gain and Common Mode Rejection Ratio. (CMRR). (Text1:4.6.4 to 4.6.6, 4.7.3,4.7.4,4.7.6,8.1.1,8.1.2,8.2.1,8.2.2)	8
III	Feedback Amplifier and oscillators: Introduction, Feedback Amplifiers: General feedback structure, Properties of Negative feedback. Basic four feedback topologies. Concept of Positive feedback, LC Oscillators, and Crystal Oscillator (Qualitative). (Text1:7.1.1, 7.2.1 to 7.2.4, 7.3.1 to 7.3.4, 7.3.8) Operational Amplifier: Introduction, Op-amp parameters, common mode and supply rejection ratio, offset voltages and currents, Input and output impedances, Slew rate. (Text2: 3.2)	9
IV	Operational Amplifier applications: Comparator, zero crossing detectors, Inverting Schmitt trigger, Non inverting Schmitt trigger circuit. ,small signal rectifiers(Precision half wave rectifiers, precision full wave rectifiers), Active filters First and Second order Low Pass Filters, High Pass Filters, Band Pass Filters. Problems and Solutions (Text 2: 9.1,to9.4,9.12.2,8.2 to 8.4,8.5,8.6,8.8,8.8.1,8.8.2, 8.9, 8.9.1,8.9.2, 8.10)	7
V	Waveform generators and power amplifier: RC-phase shift oscillator, Wien bridge oscillator, Basic 555 timers, timer used as A stable and Monostable Multi vibrator circuits. Classification of power amplifiers, Transformer coupled Class A amplifier & Class B Push-pull amplifier, Class C Amplifier (Text -2:8.12, 8.13, 10.4, 10.4.1, 10.4.3, 10.4.4, 12.1, 12.2.5,12.2.6)	7

Text Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	ADEL S. SEDRA KENNETH C. SMITH	Microelectronic Circuits, Theory and Applications	Oxford	978-81-265-0932-4	5th Edition,
2	Ramakanth A Gayakawad	Op-Amp and linear integrated circuits.	Pearson Education	738-265-0632-4	3 rd Edition. 1998

Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition



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1	BEHZAD RAZAVI	Fundamentals of Microelectronics	Wiley	978-0-07-064-811-1	2nd Edition 2006

Course Outcomes : after studying this Course, students will be able to:

CO1	Outline the principles associated in designing rectifiers, amplifiers, oscillators (L2)
CO2	Analyze the discrete analog circuits based on BJT, MOSFET and OP-Amp (L3)
CO3	Evaluate the performance parameters of discrete analog circuits based on standard specifications (L4)
CO4	Develop discrete analog circuits based on BJT, MOSFET and OP-Amp (L3)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: ECE

Semester: III

Subject Name: Digital Electronics Circuits

L-T-P-C: 3-0-0-3

Subject Code: EC3TH5

Total Contact hours: 39 Hours

Course Learning Objectives: This course will enable students to	
1	Introduce the concepts of digital logic and binary systems.
2	Understand the concepts of analysing the combinational and sequential logic circuits.
3	Learn the various techniques in designing the digital circuits.
4	Gain the knowledge of programmable logic devices and logic families.

UNIT	Description	Hours
I	UNIT– I: Principles of Combinational Logic: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3 and 4 Variables, incompletely specified functions (Don't Care terms), Simplifying Max term equations, Map entered variables. (Text1:3.1 to 3.4, 3.6, 3.8)	8
II	UNIT-II: Analysis and Design Of Combinational Logic circuits: Introduction, General approach, Decoders-BCD decoders, Encoders. Digital multiplexers- Using multiplexers as Boolean function generators. Adders and Subtractors-Cascading full adders, Look ahead carry, MSI adders, Using MSI Adders as Subtractors, BCD adder, Binary comparators. (Text 1:Section:4.1 to 4.6-4.6.1,4.6.2,4.6.3,4.6.4,4.6.6,4.7)	8
III	UNIT-III: Sequential Logic Circuits : Introduction, Basic Bi-stable Element, Latches, SR Latch, application of SR Latch, A Switch Debouncer, The Latch, The gated SR Latch, The gated D Latch, J-K Flip-Flop, Race around condition, <i>The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops)</i> : The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Characteristic Equations, Excitation tables, Flip Flop conversions. (Text2:section:6.1 to 6.6)	8
IV	UNIT-IV:Analysis and Design Of Sequential Logic Circuits: Introduction, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-n Counter (up to Mod-8): using clocked JK Flip-Flops and using clocked D, T or SR Flip-Flops. (Text2:section:6.1 to 6.6)	8
V	UNIT-V: Programmable Logic and Logic Families: Introduction, Memory-ROM, PROM and EPROM, Programmable logic devices(PLD's) PLD Notation, PLA and PAL. PLD realization of combinational logic. (Text 1: section: 9.1 to 9.5) Introduction to Logic Families: Gate performance considerations, Noise margin, Fan out, speed of operation and Propagation delay time, Power dissipation, DTL, TTL, ECL and CMOS	7



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books :

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	John M Yarbrough	Digital Logic Applications and Design	Thomson Learning	978-8131500583	2006
2	Donald D Givone	Digital Principles and Design	Tata McGraw Hill	978-0072549379	2007

Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	Charles H Roth	Fundamentals of logic design	Thomson Learning	978-1133-628-477	2013
2	Mono and Kim	Logic and computer design Fundamentals	Pearson, 2 nd edition	978-0133-760-637	2015
3	R.P Jain	Modern Digital Electronics	TMI Edition	978-0070-66-9116	2010
4	SenthilSivakumar	Fundamentals of Digital Design	S Chand2	978-93-84319-12-0	2014

Course Outcomes: After completing the course, the students will be able to

CO1	Realize the fundamental logic functions and basic building blocks of digital logic(L1)
CO2	Interpret different logic families(L2)
CO3	Analyze the characteristics of PLDs, Basic Combinational and Sequential Blocks for implementation of Boolean functions (L4)
CO4	Design the logic circuits by using various combinational and sequential building blocks (L3)



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Department: ECE/TCE/ML

Subject Name: Electronic Instrumentation

Subject Code: ES3TH6

Course Objectives:

Semester: III

L-T-P-C: 3-0-0-3

Total Contact Hours: 39Hours

No.	Description
1	Understand the principle concepts of electronic instruments.
2	Study the performance parameters of measuring instruments.
3	Understand the concept of analog to digital conversion
4	Learn the concept of data acquisition

UNIT	Description	Hours
I	Measurement and Error: Introduction, Definitions, Accuracy, precision, resolution and significant figures, types of errors, measurement error combinations, basics of statistical analysis. Ammeters: DC Ammeter, multirange ammeter, ayrton shunt or universal shunt, requirements of shunt, extending ammeter ranges, RF ammeter (thermocouple), limitation of thermocouple. Digital voltmeters: Introduction, RAMP technique, Dual Slope integrating type DVM, integrating type DVM, principles of ADC, successive approximations ADC, resolution and sensitivity of digital meters, general specifications of DVM. DAC: Binary Weighted, R-2R Ladder Converter:Text1(1.1 to 1.8, 3.1 to 3.7,5.1 to 5.6,5.8 to 5.10)	9
II	Digital Instruments: Introduction, digital multimeters, digital frequency meter, digital measurement of time, universal counter, digital pH meter, digital phase meter, digital capacitance meter. Oscilloscopes: Introduction, basic principles, CRT features, block diagram of oscilloscope, simple CRO, vertical amplifier, horizontal deflecting system, sweep or time base generator, triggered sweep CRO, measurement of frequency by lissajous method, sampling oscilloscope, storage oscilloscope (for VLF signals only). Text1(6.1 to 6.5,6.10,6.12,6.13,7.1 to 7.8,7.17,7.18,7.20)	8
III	Signal Generators: Introduction, standard signal generator, function generator, square and pulse generator. Bridges: Introduction, wheatstone's bridge, kelvin's bridge, AC bridges, capacitance comparison bridge. Maxwell's bridge, Wein's bridge, Wagner's earth connection.Text 1(8.1,8.5,8.8,8.9,11.1 to 11.3,11.8,11.9,11.11,11.14,11.15)	8
IV	Transducers: Introduction, characteristics of transducer, requirement of transducer, classification of transducer, selection of transducer. Displacement: potentiometer, LVDT, piezoelectric transducer. Temperature: RTD, thermistors, thermocouple- their ranges. Text 1(13.1to 13.4, 13.11,13.15,13.20.2,13.8, 13.20.6)	8
V	Sensors: Principles, classification, parameters, characterization, applications – automobile sensors, home appliance sensors. Data Acquisition System (DAS): Introduction, objective of DAS, signal conditioning of inputs, single channel DAS, multi-channel DAS, computer based DAS.Text 2(1.1 to 1.4,9.2.1 to 9.2.5,9.3), Text 1(17.1 to 7.6)	6

Text Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year / Edition
1	H. S.Kalsi	Electronic Instrumentation	McGraw Hill	13:9780070583702.	2010 2 nd Edition
2	D Patranabis	Sensors and Tranducers	PHI Sons	9788120321984.	2018, 2 nd Edition

Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	H. S.Kalsi	Modern Electronic Instrumenta tion and Measuring Techniques	Pearson 1 st Edition	97893325560 65.	2015
2	A. K. Sawhn ey	Electrical and Electronic Meas urements	Dhanpat Rai & Sons	97881770010 06	2013



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Course Outcomes: After completing the course, the students will be able to	
CO1	Compare electrical parameters with accuracy, precision, resolution.(L1)
CO2	Interpret various types of analog and digital instruments.(L2)
CO3	Build AC and DC bridges for relevant parameter measurement.(L3)
CO4	Apply appropriate passive or active transducers for measurement of physical phenomenon.(L3)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: Mathematics

Semester: III

Subject Name: Fundamental Mathematics

Subject Code: MA3DP6

L-T-P-C: 4-0-0-3

Course Objectives:

Sl. No	Course Objectives
1	Introduce concept of nth derivative and Multiple integrals..
2	Introduce the concept of differential equations.
3	Introduce concept of probability.
4	Study the concept of partial differential equations.
Course outcome	Descriptions
CO1	To understand the basic concept of differentiation and integration
CO2	To understand the concepts of partial differentiation and differential equations arising in a variety of engineering applications.
CO3	To understand the double and triple integrals.
CO4	To understand concept of Vectors and probability.

UNIT	Description	Hours
I	Differential Calculus: List of standard derivatives including hyperbolic functions, rules of differentiation. Polar curves: Polar coordinates, angle between radius vector and tangent, angle between two polar curves, Problems. Taylor's and Maclaurin's series expansions of one variable.	9
II	Integral Calculus: List of standard integrals, integration by parts. Definite integrals – problems. Statement of reduction formulae for $\sin^n x$, $\cos^n x$, and $\sin^m x \cos^n x$ and evaluation of these with standard limits-Examples. Double and triple integrals-Simple examples.	9
III	Differential equations: Introduction to first order differential equations. Variables separable, Linear equation. Exact differential equation, Problems. Ordinary differential equations with constant coefficients: Homogeneous differential equations, non-homogeneous differential equations – Particular integral for functions of the type $f(x) = e^{ax}$, $\sin(ax)$, $\cos(ax)$, x^n .	9
IV	Vector calculus and Partial differentiation: Del operator, gradient-directional derivative, divergence, curl, problems. Introduction to Partial differentiation. Illustrative examples. Differentiation of composite functions. Jacobians (without proof) – Simple Problems.	9



V	Probability: Introduction, Sample space and events. Axioms of probability. Addition and multiplication theorems, Conditional probability-illustrative examples. Baye's theorem-problems.	9

Question paper Pattern:

From each unit, two questions of 20 marks each have to be prepared, the student has to answer one full question of his/her choice.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications, 2015. ISBN:9788174091956
2	Advanced Engineering Mathematics	E.Kreyszig	10 th Edition Jon Wiley & Sons, 2015. ISBN:9780470913611

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	A text book of Engineering Mathematics	N.P.Bali and Manish Goyal	7 th Edition Lakshmi Publishers, 2010. ISBN:9788131808030
2	Higher Engineering Mathematics	B.V.Ramana	1st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190
3	Higher Engineering Mathematics	H.K.Das and Er.Rajnish Verma	1 st Edition, Chand publishing, 2011. ISBN:9788121938907
4	A First Course in Probability	S. Ross	8 th Edition, Pearson, 2010, ISBN:9780136033134
5	An Introduction to Probability Theory and its Applications	W. Feller	3 rd Edition, John Wiley & Sons, Inc, 2008, ISBN9788126518050



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Common to ECE/ETC

Semester: III

Subject Name: Signals and System Lab

Subject Code: ES3LB1

L-T-P-C:0-0-3-1.5

Course Objectives:

Sl.No.	Course Objectives Student will be able to learn:
1	Understand the basic usage of MATLAB/SCI Lab
2	Study the basic classification and operations of signals.
3	Understand the properties of systems.
4	Implement convolution, Fourier Transform and Z-Transform on signals.

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate the knowledge on signals, filters and their experimental implementation.
CO2	Analyze and relate the experimental observations and measurements for validation.
CO3	Apply the conceptual knowledge of signals and filters in relevance to industry and society.
CO4	Communicate effectively in verbal and written form in signals and system domain.

Sl. No.	List of Experiments
1.	Basic Operations on Matrices.
2.	Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3.	Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding,
4.	Computation of Energy and Average Power.
5.	Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
6.	Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
7.	Solution to difference equation.
8.	Convolution between Signals and sequences.
9.	Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum
10.	Sampling Theorem Verification.
11.	Locating the Zeros and Poles and plotting the Pole-Zero maps in Z-Plane for the given transfer function.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE/ETC
Subject Name: Analog Electronics Circuits Lab
Subject Code: ES3LB2

Semester: III
L-T-P-C: 0-0-3-1.5

Course Learning Objectives: This course will enable students to	
1	Study the design concept of diode Circuits and Op-Amp applications
2	Understand the Simulation of various Oscillators
3	Learn the design details of Schmitt Trigger using 555 IC

List of Experiments	
1.	Design and Verify the Input and Output waveforms of Clipping Circuits
2.	Design and Verify the Input and Output waveforms of Clamper Circuits
3.	Design C-Filter for Full wave rectifier and Plot the waveforms
4.	To plot the Input and Output characteristics of MOSFET
5.	Implement the single stage RC coupled amplifier using MOSFET
6.	Design and implementation of half wave and full wave Precision Rectifiers using Operational amplifier
7.	Design of analog circuits using multisim: a) Hartley oscillator b) Colpitts oscillator c) RC phase shift oscillator
8.	Design and verify the Performance parameters of Astable and Mono stable Multivibrator using 555timer.
9.	Tabulate the Simulated results of UTP and LTP of Schmitt Trigger Circuit.
10.	Design the First order HPF and LPF and Tabulate the Parameters of Filters

Text Book:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	ADEL S. SEDRA KENNETH C. SMITH	Microelectronic Circuits, Theory and Applications	Oxford	978-81-265-0932-4	5th Edition,

Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	Ramakanth A Gayakawad	3	Oxfordpress	9780-1994-76282	2010, 4 th Edition

Course Outcomes : At the end of the course, students will be able to:	
CO1	Interpret the various parameters, characteristics and specifications of diode circuits, Filters and op-amp application (L2)
CO2	Generate Sinusoidal wave forms for given specifications (L2)
CO3	Design multi vibrators using 555 Timer (L3)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: III

Subject Name: Digital Electronics Circuits lab

Subject Code: EC3LB3

L-T-P-C: 0-0-3-1.5

Course Learning Objectives: This course will enable students to

1	Understand the realization of Boolean expression using logic gates.
2	To impart knowledge on assessing performance of combinational circuits and sequential circuits.
3	Study and use the simulation tools to analyze the performance of digital circuits.

Sl. NO.	List of Experiments
1	Simplification, Realization of Boolean Expression Using Logic Gates/Universal Gates
2.	Design and implement Half/Full Adder and Subtractors using i) Basic and EX-OR gates ii) NAND gates
3.	Realize Parallel Adder/Subtractor using IC 7483.
4. a. b.	Design and implement the Code Converters BCD To Excess-3 And Excess-3 To BCD code converter Binary-to-Gray And Gray-to-Binary code converter
5.	Realize adder and subtractor using multiplexer IC 74153.
6.	Realize half and Full adder using De-multiplexer Using IC 74139.
7.a. b.	Design and implement 1 bit , 2 bit Comparator. Realize 4 bit comparator using IC 7485.
8.	Realize Encoder and Decoder using IC 74148 and IC 7447.
9.	Realize master slave Flip-Flops using NAND gate.
10. a. b.	Design and implement a. Asynchronous Counters b. Synchronous Counters using IC 7476
11.	Realize the following Shift Registers using IC 7495. i) SIPO ii) SISO iii) PISO iv) PIPO
12.	Realize Johnson Counter/Ring Counter using the IC 7495.

Text Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	John M Yarbrough	Digital Logic Applications and Design	Thomson Learning	978-8131500583	2001
2	Donald D Givone	Digital Principles and Design	Tata McGraw Hill	978-0072549379	2003



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Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	Charles H Roth	Fundamentals of logic design	Thomson Learning	978-1133-628-477	2004
2	R.P Jain	Modern Digital Electronics	TMI Edition	978-0070-66-9116	2010

Course Outcomes: after studying this course, students will be able to:

CO1	Demonstrate the realization of Boolean expressions using suitable logic gates (L2)
CO2	Develop the testing and experimental set up for designing optimal combinational circuit and sequential circuits (L3)
CO3	Verify, interpret and record the experimental data, analyze the results and prepare a formal laboratory report. (L2)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: Mathematics

Semester: IV

Subject Name: Probability and Complex Analysis

Subject Code: MA4ES1

L-T-P-C: 4-0-0-3

Sl.No	Course Objectives
1	Apply least square method to fit a curve for the given data and evaluate the correlation coefficient and regression lines for the data.
2	To develop probability distribution of discrete and continuous random variables.
3	Develop the joint probability distribution occurring in digital signal processing and design engineering.
4	To develop the proficiency in Numerical techniques and solving Ordinary Differential Equations arising in engineering applications.
SN	Course Outcomes
CO1	Make use of correlation and regression analysis to fit a suitable mathematical model for the statistical data.
CO2	Apply discrete and continuous probability distributions for one and two variable in analyzing the probability models arising in engineering field.
CO3	To understand the concepts of the stochastic process in engineering field.
CO4	Use the concept of analytic function and complex integrals to solve the problems arising in engineering field.

UNIT	Description	Hours
I	Statistics: Correlation and regression- Karl Pearson's coefficient of Correlation, problems. Regression analysis- lines of regression (without proof) problems. Curve Fitting: Curve fitting by the method of least square- Fitting of the curves: Linear, polynomial, exponential function of the form $y=ab^x$.	9
II	Probability Distributions: Review of basic probability theory. Random variables (Discrete and Continuous), Probability of mass/density functions. Binomial distribution, Poisson's distribution, exponential distribution and Normal distribution (without derivations) and problems.	9
III	Joint probability distribution: Joint probability distribution for two discrete random variables, Marginal distributions, Expectation, covariance, problems. Markov Chain: Probability Vector, Stochastic Matrix, Regular Stochastic Matrix, Transition Probabilities and Transition probability Matrix, Higher Transition Probabilities, stationary distribution of regular Markov chains, problems.	9
IV	Calculus of Complex function: Review of function of a complex variables, limits, continuity and differentiability. Analytic functions, Cauchy-Reimann equations in Cartesian and polar forms (without proof). Properties and construction of analytic functions by Milne-Thompson Method. Bilinear Transformations.	9
V	Complex Integration: Line integral of complex function, Cauchy's theorem and Cauchy's integral formula (without proof) and problems. Taylor's theorem and Laurent's theorem (Statements only), Singular points: poles, Residues and Residue theorem (Without proof), problems.	9



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Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition KhannaPublications,2015. ISBN:9788174091956
2	Advanced Engineering Mathematics	E.Kreyszig	10 th EditionJonWiley&Sons,2015. ISBN:9780470913611

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	A text book ofEngineering Mathematics	N.P.Bali and Manish Goyal	7 th EditionLakshmiPublishers,2010. ISBN:9788131808030
2	Higher Engineering Mathematics	B.V.Ramana	1st Edition, TataMcGraw-Hill,2006. ISBN:9780070634190
3	Higher Engineering Mathematics	H.K.Das and Er.RajnishVerm a	1 st Edition,Chandpublishing, 2011. ISBN:9788121938907
4	A First Course in Probability	S.Ross	8 th Edition,Pearson,2010,ISBN:9780 136033134
5	An Introduction to Probability Theory and its Applications	W.Feller	3 rd Edition,JohnWiley&Sons,Inc,200 8, ISBN9788126518050



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Department: ECE
Subject Name: Verilog HDL
Subject Code: EC4TH2

Semester: IV
L-T-P-C: 3-0-0-3
Total Contact hours: 39

Course Learning Objectives: This course will enable students to

1	To know the basic language features of Verilog HDL and the role of HDL in digital logic design.
2	To develop Verilog models representing structure, behavior or data flow concepts describing the internal structure or external behavior of the circuit.
3	Understand the Verilog tasks, functions, timing and delays.
4	To know the concept of logic synthesis of combinational and sequential descriptions.

UNIT	Description	Hours
I	Introduction: Evolution of computer-aided digital design, Emergence of HDLs, VLSI design flow, importance of HDLs, Popularity of Verilog HDL ,Trends in HDLs, Design Methodologies, components of simulation. Modules and Ports: modules, ports, port connection rules. Basic Concepts: Lexical conventions, data types, system tasks and compiler directives. (Text1: 1.1 to 1.6, 2.1, 2.3, 2.5, 3.1 to 3.4,4.1,4.2)	8
II	Gate level Modeling: Gate types, gate delays, examples Data flow Modeling: Continuous assignments, Delays, Expressions, Operators and Operands, Operator types, Examples (Text1: 5.1 to 5.3 ,6.1- 6.6))	8
III	Behavioral Modeling: Structured procedures, procedural assignments, timing controls, conditional statements, multiway branching, Loops, generate blocks, Examples. (Text1: 7.1 to 7.6, 7.8 to 7.10)	8
IV	Tasks and Functions: Difference between tasks and functions, Tasks and Functions. Timing and delays : Types of delay models, path delay modeling (Text1: 8.1 to 8.4,10.1 to 10.2)	7
V	Logic Synthesis with Verilog HDL: Logic synthesis, Impact of Logic synthesis, Verilog HDL Synthesis, verification of the gate level netlist. Synchronous sequential circuits: Moore and Mealy FSM, Design and implementation of serial adder,Design of a Counter using sequential approach, sequential multiplier circuit. (Text1: 14.1 to 14.3, 14.5)(Text 2: 8.5,8.7)	8

Text Books

Sl No	Author	Text Book title	Publisher/ Edition	Volume /ISBN	Year
1	Samir Palnitkar	Verilog HDL , A Guide to Digital Design and Synthesis	Pearson Education ,Second edition	ISBN 81-7758-918-0	2017
2	Stephen Brown and Zvonko Vranesic	Fundamentals Of Digital Logic with Verilog Design	McGraw-Hill Higher Education	ISBN 0-07-282315-1 ISBN 0-07-121322-8 (ISE)	2003



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Books:

Sl No	Author	Text Book title	Publisher/ Edition	Volume /ISBN	Year
1	Nazein M. Botros	HDL programming(VHDL and Verilog)	Dreamtech press,	ISBN-10: 8177226975 ISBN-13: 978-8177226973	2009
2	J Bhasker	A Verilog HDL Primer	BS publications, Second edition	ISBN 81-7800-012-1	2007
3	Joseph cavanagh	Verilog HDL(Digital design and modelling)	CRC press	ISBN 1-4200-5154-7	2007
4	Viveksagdeo	The complete verilog book	Springer	ISBN 0-306-47658-4	1998

Course Outcomes :after studying this Course, students will be able to:

CO1	Apply the knowledge of HDL for modeling and functional verification of digital circuits.(L2)
CO2	Design combinational and sequential digital circuits in dataflow, behavioral and structural modeling (L3)
CO3	Develop programs using Verilog tasks ,function and directives with timing and delay Specification.(L3)
CO4	Interpret the various constructs in logic synthesis.(L2)



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Department: ECE

Subject Name: FIELDS AND WAVES

Subject Code: ES4TH3

Semester: IV

L-T-P-C: 3-0-0-3

Total Contact Hours: 39 Hours

Course Learning Objectives: This course will enable students to		
1	Understand the concepts of Electrostatic and Magneto static fields.	
2	Study the applications of Coulombs law, Gauss law for different charge distributions and Laplace equation.	
3	Acquire the knowledge of characteristics of transmission lines.	
4	Learn the wave equation and wave propagation in free space.	
UNIT	Description	Hours
I	UNIT – I: Electrostatics I: Coulomb’s Law and Electric Field Intensity: Introduction to vector algebra, Coulomb’s law , Electric field Intensity, Different types of charge distributions, Electric field due to line charge, Field due to Sheet of charge, Field due to Surface charge distribution, Electric flux density, Relationship between Force, Electric field and Displacement flux density, Numerical problems. (Text1: 1.2, 2.1 to 2.5, 3.1)	08
II	UNIT-II: Electrostatics II: Gauss law, Divergence and Potential: Introduction, Gauss law, Application of Gauss law to point charge, Line charge & Surface charge, Differential form of Gauss law, Work done in moving a point charge in an electric field, Relation between E and V. Poisson’s and Laplace’s Equations: Poisson’s & Laplace’s Equations, Applications of Laplace equation (Cartesian Cylindrical and Spherical Coordinate system), Boundary conditions between two different dielectrics, Conductor and Dielectric, Numerical problems. (Text 1: 3.2 to 3.4, 3.7, 4.1, 4.6, 6.2, 7.1, 7.3)	08
III	UNIT-III: Magneto statics: Steady magnetic Field: Introduction, Ampere’s circuital law, Differential form of amperes circuital law, Stoke’s theorem, Biot-savart Law, Magnetic field intensity due to Solenoid & on the axis of Solenoid, due to infinite straight conductor, due to center of a circular coil & on the axis of circular coil, Numerical problems. Magnetic Forces: Force on a moving charge, Force acting on differential current element and Force acting on current carrying wires. (Text 1: 8.1 to 8.4, 9.1 to 9.3)	08
IV	UNIT-IV: Time varying Fields & Wave propagation: Time varying Fields: Faraday’s Law, Maxwell’s Equations in Point form and Integral form. Uniform Plane Wave: Wave equation of E & H in free space and its solution, Relation between E & H, Wave propagation in free space, in good dielectric and in good conductor, Numerical problems. (Text 1: 10.1, 10.3, 10.4, 12.1, 12.2, 12.4)	08
V	UNIT-V: Transmission Lines: Introduction, A line of cascaded T sections, Transmission line- general solutions, Waveform distortion, Distortion-less line, Reflection coefficient, Open and short circuited lines, Numerical problems. (Text 2: 6.1, 6.2, 6.6, 6.7, 6.11, 6.14)	07



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Course Outcomes: After completing the course, the students will be able to

CO1	Understand the Basic Laws and Concepts related to Electrostatic Fields and Magneto static Fields(L2)
CO2	Evaluate the electric fields and Magnetic due to different charge distribution by applying various laws and Analytical methods(L3)
CO3	Analyze the transmission line equations and Interpret the Poisson's and Laplace equation (L3)
CO4	Apply Maxwell's equation for time varying field, EM Wave and propagation in different mediums (L2)

Text Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	W.H. Hayt and Jr John. A. Buck	Engineering Electromagnetics	Tata McGraw- Hill	978-0-07- 061223-5	2012, 7 th Edition
2	John Ryder	Networks, Lines and Fields	Prentice-Hall India	81-23-0299-6	2005, 2 nd Edition

Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	Matthew N.O., Sadiku,	Element of Electromagnetics	Oxford university press	9780190698614	2018, 7 th Edition
2	E.C. Jordan and K.G. Balman,	Electromagnetic Waves and Radiating systems	Prentice-Hall India	978-81-2003-0054-5	2008, 2 nd Edition
3	Joseph Edminster	Electromagnetics	Tata MC Graw -Hill	978-0070681958	4 th Edition, (Schaum's outline series)
4.	Simon Ramo and John R Whinnery	Fields and Waves in Communication Electronics	John Wiley & Sons, Inc	978-0471-58551-0	3 rd Edition



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Department: ECE

Semester: IV

Subject Name: ANALOG COMMUNICATION

L-T-P-C: 3-0-0-3

Subject Code: EC4TH4 Total Contact Hours: 39

Course Learning Objectives: This course will enable students to	
1	Study the basic principles of amplitude modulation and angle modulation.
2	Understand the significance of SNR in analog communication systems.
3	Study the concepts of random process and probability theory in communication systems.
4	Learn the concepts of different applications of analog communication.

UNIT	Description	Hours
I	Amplitude modulation: Introduction, Amplitude Modulation, Time-Domain description, Frequency Domain description, Single tone modulation, Power relations in single tone AM, Modulation by several sine waves, Generation of AM wave: Square law modulator, Switching modulator, Detection of AM waves: Square law detector, Envelope detector. Double Side Band Suppressed Carrier (DSBSC): Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: Balanced modulator, Ring modulator, Coherent detection of DSBSC modulated waves, Costas loop, Quadrature carrier multiplexing. Text: s/c: 7.1 to 7.3.	10
II	Single Side-Band Modulation (SSB): Hilbert transform, Properties of Hilbert transform, Canonical representation of bandpass signals, Frequency domain description of SSB, Time domain description, Generation of SSB : Frequency discrimination method, Phase discrimination method, Demodulation of SSB. Vestigial Side Band Modulation (VSB): Vestigial side band modulation : Frequency domain description, Time domain description, Generation of VSB waves using filtering method, Detection of VSB waves using coherent detection, Comparison of Amplitude modulation techniques, Frequency translation, Frequency division multiplexing, Application: AM radio. Text: s/c: 7.4 to 7.9	8
III	Angle Modulation: Basic definitions, FM, Narrowband FM, Wideband FM, Transmission bandwidth of FM, Generation of FM waves : Direct method , Indirect method, Demodulation of FM waves, Phase locked loop, FM Stereo multiplexing, FM radio. Text: s/c: 7.10 to 7.14 except 7.13	7
IV	Random variables and process: Random variables, Several random variables, Function of a random variable, Gaussian distribution, Transformation of random variables, Properties of autocorrelation function, Random process, Stationarity, Mean, Correlation and covariance function Properties of Gaussian process. Text: s/c: 8.2 to 8.7 and 8.12	7
V	Noise: Introduction to Noise: shot noise, thermal noise, white noise, Noise equivalent bandwidth, Narrow bandwidth, Noise figure, Equivalent noise temperature, Friis transmission formula. Noise in Analog modulation systems: Introduction, Signal-to-Noise ratios, Receiver model, Noise in DSB-SC receivers, Noise in SSB receivers, Noise in AM receivers using envelope detection, Noise in FM receivers, Pre-emphasis and de-emphasis in FM system (Qualitative analysis), PAM, PWM, PPM (Qualitative analysis). Text: s/c: 4.7, 4.8, 9.1 to 9.5 and 9.8, 5.1	7

Text Book

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	Simon Haykin	An Introduction to Analog and Digital Communication	John Wiley	978-81-265-0932-4	2010

Reference Books

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	B.P. Lathi and Zhding	Modern Digital and Analog communication systems	Oxford press	9780-1994-76282	2010, 4 th Edition
2	Taub and Schilling	Principles of communication systems	TMH	978-0-07-064-811-1	2011, 3 rd Edition
3	Harold P.E., Stern, Samy A. Mahmond	Communication Systems: Analysis and Design	Pearson Education	978-0130-402-684	2004, 1 st Edition



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Course Outcomes :after studying this Course, students will be able to:	
CO1	Outline the modulation and demodulation techniques of analog modulation.(L2).
CO2	Interpret the various noises, receiver models and SNR of analogcommunication systems.(L2).
CO3	Apply Fourier analysis and characterizethe analog and digital signals.(L3).
CO4	Make use of random variables and random process for noise modeling of analog signals.(L3).



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: ECE/ETC

Subject Name: Microcontroller and Embedded Systems

Subject Code: ES4TH5

Semester: IV

L-T-P-C: 3-0-0-3

Total Contact Hours: 39

Course Learning Objectives: This course will enable students to	
1	Understand the difference between Microprocessor, Microcontroller and Embedded Microcontroller
2	Familiarize the basic Architectural Features of 8051 Microcontroller and Interface 8051 to External memory and I/O devices
3	Learn the ALP techniques using 8051 microcontroller instruction set
4	Understand the operation and use of inbuilt timers/counters and Serial port of 8051

UNIT	Description	Hours
I	Microprocessor, Microcontroller and Embedded Micro Controllers: Introduction, Difference between Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, The 8051 Microcontroller: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, Stacks, Addressing Modes. Text 1: Section: 1.1, 2.4 to 2.7, 5.1 to 5.3	7 Hours
II	8051 Instruction set: Instruction set of 8051: Data transfer instructions, Arithmetic Instructions, Logical Instructions, Branch control instructions, Bit oriented instructions. Application Programs: Incrementing, Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, sorting programs. Text 1: Section: 3.1 to 3.3, 4.1 to 4.2, 6.1 to 6.5, Text2: Section 5.6.	8 Hours
III	8051 I/O Ports, Timer/counter programming: 8051 Peripherals: I/O Ports: Input/output port structures of 8051, Programming of ports. Timer/Counter: Programming 8051 Timers, Counter Programming (Programming using Assembly language) Text1: Section: 9.1 to 9.2	8 Hours
IV	8051 Serial communication and Interrupts Programming: Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial Communication Programming in assembly. Basics of interrupts, 8051 interrupt structure, Priority of interrupts and Programming External Hardware Interrupts. Text 1: Section: 10.1 to 10.3, 11.1 to 11.5, Text2: Section: 3.6	8 Hours
V	8051 Interfacing to External memory, I/O Devices and RTC: Introduction to external memory, External Memory interfacing (Programming memory only), DAC, Stepper motor interfacing, and programming in Assembly language, DS12887 RTC Interfacing and programming in assembly language (Setting the Time and Date). Text1: Section: 13.2, 14.1 to 14.4, 16.1, 17.2 to 17.3	8 Hours

Text Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	MuhammadAliMazidi and Janice Gillespie MazidiandRollinD.	“The 8051 Microcontroller and Embedded Systems – using assembly and C”.	McKinlay PHI, Pearson,	978-81-317-1026-5	2008
2	Kenneth J Ayala	The 8051 Microcontroller Architecture, Programming and Applications	Penram International /Thomson Learning	13:978-81-315-1105-3	3 rd Edition



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year/ Edition
1	Raj Kamal	Microcontrollers Architecture, programming, Interfacing and System Design	Dorling Kindersley (India)	978-81-317-5990-5	2011
2	Davies J H	MSP 430 Microcontroller Basics	Elsiever	978-00-0558-554	2008
3	Smpath K Venkatesh	Micronrollers	S K Kataria and sons	9789350141281	2008

Course Outcomes: After completing the course, the students will be able to	
CO1	Interpret the architectural features of 8051 and design memory interfacing. (L2)
CO2	Outline Interrupt systems, operation of Timers/Counters and Serial Port of 8051 (L2)
CO3	Apply knowledge of addressing modes and instructions for writing assembly language programming. (L3)
CO4	Develop assembly language program to interface I/O devices and RTC with 8051 microcontrollers. (L3)



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Department: ECE
Subject Name: Control Systems
Subject Code: ES4TH6

Semester: IV
L-T-P-C: 3-0-0-3

Total Contact Hours: 39 Hours

Course Learning Objectives: This course will enable students to

1	Study the Mathematical Modelling of Electrical and Mechanical Systems.
2	Understand the system Transfer Function using Block diagram and Signal Flow Graph representations
3	Learn the concept of Transient response and Steady state response of the system
4	Acquire the knowledge of frequency domain analysis of a system using graphical method

UNIT	Description	Hours
I	INTRODUCTION AND MODELING OF CONTROL SYSTEM Introduction, Basic elements of control system, Open loop and closed loop systems, advantages & disadvantages with examples, Transfer Function, System Modeling, differential equations of physical systems- Electrical and Mechanical, Problems Analogous systems – representing electrical system in mechanical form and vice versa using force voltage and force current method. <i>Text 1</i>	08
II	BLOCK DIAGRAM AND SIGNAL FLOW GRAPH Introduction to block diagram representation, basic terminologies used, block diagram reduction rules, Problems. Introduction to Signal Flow Graph, basic terminologies used, masons gain formula, problems.	08
III	TIME RESPONSE ANALYSIS Introduction to time domain analysis, time domain specifications (delay time, rise time, peak overshoot, settling time), transient response and steady state response. Standard test signals, unit step response of first order systems and second order systems, Steady state errors, problems. <i>Text 1</i>	08
IV	STABILITY ANALYSIS Introduction, Methods of Stability Analysis, necessity condition for Stability, Routh-Hurwitz criterion, Construction of Routh Array, Special cases for stability Analysis, relative stability Analysis, Root Locus Technique, concepts and theory of Root Locus sketch, Construction of Root locus, Stability analysis. Problems.	08
V	FREQUENCY RESPONSE ANALYSIS Introduction of Frequency domain response, Bode plots and Stability analysis, Gain margin and Phase Margin for different value of Gain Constant (K), conditions, Frequency domain specifications. Problems.	07

Text Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	J Nagrath and Gopal, M	Control System Engineering	New Age International Publishers	81-224-2008-7	2008, 5th Edition



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Reference Books:

Sl No	Author	Text Book title	Publisher	Edition	Year
1	Benjamin C. Kuo	Automatic Control Systems	john wiley & sons	9 th Edition	2009
2	Schaum's Outline Series	Feedback and Control Systems	TMH	2nd Edition	2007
3	Ogata K	Modern Control Engineering	Pearson Education Asia/PHI	5th Edition	2009
4	Richard C Drof , Robert H Bishop	Modern Control Systems	Pearson Education	12 th Edition	2010

Course Outcomes: After completing the course, the students will be able to	
CO1	Illustrate the closed and open loop systems (L2)
CO2	Develop mathematical model of a given Mechanical system/Electrical System (L3)
CO3	Apply the concepts of Frequency domain and Time domain analysis for determining the Stability of a given System (L3)
CO4	Analyse the Stability of a given system using Transfer function (L4)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: ECE

Semester: IV

Subject Name: HDL Programming Lab

Subject Code:

L-T-P-C: 0-0-3-1.5

Sl.No	Course Objectives
1	To get practical experience on concept of verilog design for digital circuits
2	To give the students the opportunity to build and test the digital systems.
3	To make use of the Xilinx 9.1 ISE tool for designing and implementing digital systems on FGPA..
4	To know the concept of logic synthesis of combinational and sequential descriptions.

Course Outcomes

Course Outcome	Descriptions
CO1	Develop a Verilog model for combinational and sequential circuits.(L3)
CO2	Design,Simulate and synthesize using different Verilog descriptions for Combinational and Sequential circuits using xilinx software.(L3)
CO3	Implementation of combinational and Sequential circuits on FPGA kit.(L3)
CO4	Interface the hardware to the programmable chips and obtain the required output.(L4)

Sl.No	List of Programs																		
1	Write a Verilog program for the following combinational designs in data flow, behavioral and structural modelings,simulate using modelsim simulator and implement on FPGA kit: a) Full Adder b) 4: 2 Encoder without priority c) 2 : 4 Decoder d) 4 : 1 Multiplexer e) 1 : 4 Demultiplexer f) 4 bit binary to gray converter																		
2	Write a Verilog code for 8:3 encoder with priority using casex or casezstatement,simulate using modelsim simulator and implement on FPGA kit.																		
3	Write a Verilog code of full adder using half adders in structural modelling, simulate using modelsim simulator and implement on FPGA kit.																		
4	Develop Verilog code for 4 bit ALU using the following descriptions. ALU should use combinational logic to calculate output based on the four bit op-code. ALU is enabled, when enable line is high and tri state the out bus when the enable line is low. ALU should decode the 4 bit op-code as shown in the below table,simulate using modelsim simulator and implement on FPGA kit: <table border="1"> <thead> <tr> <th>Opcode</th><th>Operation</th></tr> </thead> <tbody> <tr> <td>0001</td><td>A + B</td></tr> <tr> <td>0010</td><td>A – B</td></tr> <tr> <td>0011</td><td>A * B</td></tr> <tr> <td>0100</td><td>A / B</td></tr> <tr> <td>0101</td><td>A and B</td></tr> <tr> <td>0110</td><td>A or B</td></tr> <tr> <td>0111</td><td>A xor B</td></tr> <tr> <td>1000</td><td>not A</td></tr> </tbody> </table>	Opcode	Operation	0001	A + B	0010	A – B	0011	A * B	0100	A / B	0101	A and B	0110	A or B	0111	A xor B	1000	not A
Opcode	Operation																		
0001	A + B																		
0010	A – B																		
0011	A * B																		
0100	A / B																		
0101	A and B																		
0110	A or B																		
0111	A xor B																		
1000	not A																		
5	Write a Verilog code for the following flip – flops SR, D, JK and T using case and if statements, simulate using modelsim simulator and implement on FPGA kit.																		



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6	Write a Verilog programs for 4 bit Binary and BCD counters, simulate using modelsim simulator and implement on FPGA kit.
7	Write a Verilog code for 4-bit parallel adder, 4-bit Ripple carry adder and 4-bit carry lookaheadadder. Write test bench with appropriate input patterns to verify the modelledbehaviour and implement on FPGA kit.
8	Write a Verilog code for universal shift register, simulate using modelsim simulator and implement on FPGA kit:
9	Write a Verilog code for detecting the given sequence using mealy and moore model, simulate using modelsim simulator and implement on FPGA kit:
Interfacing Programs	
10	Write a Verilog code to display counters using seven segment display. Implement it on FPGA kit:
11	Interface a DC motor and Stepper motor to FPGA and write a Verilog code to control speed and direction.
12	Interface a DAC to FPGA and write a Verilog code to generate different waveforms (sine, square, triangle, ramp etc).

Text Books

Sl No	Author	Text Book title	Publisher/ Edition	Volume /ISBN	Year
1	Samir Palnitkar	Verilog HDL , A Guide to Digital Design and Synthesis	Pearson Education ,Second edition	ISBN 81-7758-918-0	2017
2	Stephen Brown and Zvonko Vranesic	Fundamentals Of Digital Logic with Verilog Design	McGraw-Hill Higher Education	ISBN 0-07-282315-1 ISBN 0-07-121322-8 (ISE)	2003

Reference Books:

Sl No	Author	Text Book title	Publisher/ Edition	Volume /ISBN	Year
1	Nazein M. Botros	HDL programming(VHDL and Verilog)	Dreamtech press,	ISBN-10: 8177226975 ISBN-13: 978-8177226973	2009
2	J Bhasker	A Verilog HDL Primer	BS publications, Second edition	ISBN 81-7800-012-1	2007
3	Joseph cavanagh	Verilog HDL(Digital design and modelling)	CRC press	ISBN 1-4200-5154-7	2007
4	Viveksagdeo	The complete verilog book	Springer	ISBN 0-306-47658-4	1998



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: ECE

Subject Name: Analog Communication Lab

Subject Code: EC4LB2

Semester: IV

L-T-P-C: 0-0-3-1.5

Course Learning Objectives: This course will enable students to

1	Study the experiments on active filters.
2	Learn basic analog modulation and demodulation experiments.
3	Demonstrate different pulse modulation experiments.

List of Experiments

11.	Design and generate an Amplitude modulation signal using AFT, IFT and Transistor. Demodulate the AM signal using envelope detector.
12.	Design and generate an DSBSC signal using Ring Modulator.
13.	Design and generate an Frequency modulation using IC 8038 and also find the modulation index and transmission bandwidth of generated FM signal.
14.	Design and verify the working of Pre-Emphasis & De-Emphasis circuits and find the normalized gain.
15.	Design and verify the Phase Lock Loop (PLL) and its capture range, lock range and free running VCO Frequency.
16.	Design and Implement second order band pass and band elimination Filters using Op-Amp and Plot the characteristics of Frequency response.
17.	Design and generate a Pulse amplitude modulation signal and also demodulate the generated Pulse amplitude modulation signal.
18.	Design and generate a Pulse width modulation signal and also demodulate the generated Pulse width modulation signal.
19.	Design and generate a Pulse position modulation signal and also demodulate the generated Pulse position modulation signal.
20.	Design and verify the working of a Class C tuned amplifier at center frequency and its maximum efficiency. Plot a graph of load resistance versus efficiency.

Text Book:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	Simon Haykin	An Introduction to Analog and Digital Communication	John Wiley	978-81-265-0932-4	2010

Reference Books:

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	B.P. Lathi and Zhding	Modern Digital and Analog communication systems	Oxfordpress	9780-1994-76282	2010, 4 th Edition
2	Taub and Schilling	Principles of communication systems	TMH	978-0-07-064-811-1	2011, 3 rd Edition
3	Harold P.E., Stern, Samy A. Mahmond	Communication Systems: Analysis and Design	Pearson Education	978-0130-402-684	2004, 1 st Edition

Course Outcomes : after studying this Course, students will be able to:



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



CO1	Illustrate the active filter configurations, Pre-Emphasis & De-Emphasis circuits and Class-C tuned Amplifiers (L2).
CO2	Realize the analog modulation and demodulation techniques. (L3).
CO3	Verify, interpret and record the experimental data, analyze the results and prepare a formal laboratory report. (L3).



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: ECE
Subject Name: Microcontroller Lab
Subject Code: EC4LB3

Semester: IV

Course Objectives:

Course Learning Objectives: This course will enable students to	
1	Study the assembly language programs using Kiel micro vision software
2	Provide foundation on interfacing the external devices with Processor as per user requirements.
3	Understand the tools for the development and debugging of programs

SI No	Description
I	Data transfer Instructions (a) Write an Assembly language program to Transfer A Block Of Data from Source to Destination (b) Write an Assembly language program to Interchange Block Of Data from Source to Destination
II	Arithmetic Instructions (a) Write an Assembly language program for Addition of Two Multi Byte Numbers (b) Write an Assembly language program for Subtraction of Two Multi Byte Numbers (c) Write an Assembly language program for Multiplication of 16 Bit Number By 8 Bit Number (d) Write an assembly language program to find cube of a number (e) Write an Assembly language program to find Average Of 'N' Numbers
III	Sorting of Numbers (a) Write an Assembly language program to Sort 'N' Hexadecimal Numbers in Ascending/ Descending Order (b) Write an Assembly language program to find Largest / Smallest Number in A Given Array
IV	Code Conversions (a) Write an Assembly language program for Conversion of Decimal to Hexadecimal and vice versa (b) Write an Assembly language program for Conversion of ASCII To BCD and vice versa
V	Counters Write an Assembly language program for Implementation of Decimal Up/Down Counter
VI	Bit Handling Instructions (a) Write an Assembly language program for Realization of Boolean Expression (b) Write an Assembly language program for identifying valid Two Out Of Five Code
VII	Bit Manipulation Instructions (a) Write an Assembly language program for Finding Positive and Negative Numbers in A Given Array (b) Write an Assembly language program for Finding Odd And Even Numbers In A Given Array (c) Write an Assembly language program for Finding Ones And Zeros In A Given Byte
VIII	DAC Interfacing (a) Write a C Program for Generation of Ramp Wave Using DAC Interface. (b) Write a C Program for Generation of Square Wave Using DAC Interface (c) Write a C Program for Generation of Triangular Wave Using DAC Interface (d) Write a C Program for Generation of Sine Wave Using DAC Interface
IX	Stepper Motor Control (a) Write a C Program for Stepper Motor Interface



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



X	DC Motor Control (a) Write a C Program for DC Motor Interface

Sl No	Author	Text Book title	Publisher	ISBN	Year /Edition
1	MuhammadAliMazidi and Janice Gillespie Mazidi and Rollin D.	“The 8051 Microcontroller and Embedded Systems – using assembly and C”.	McKinlay PHI,	978-81-317-1026-5	2008
2	Kenneth J Ayala ,	The 8051 Microcontroller Architecture, Programming and Applications	Penram International ,Thomson Learning	13:978-81-315-1105-3	2010

CourseOutcomes:Aftercompleting thecourse,thestudentswillbeable to	
CO1	Develop ALP, compile, debug and test ASM files using KEIL simulators (L2)
CO2	Demonstrate C programs for various interfacing devices with 8051 microcontrollers (L3)
CO3	Verify, Interpret and Record the experimental data, analyze the results and prepare a formal laboratory report (L3)



CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION FOR B.E. DEGREE COURSE
(Effective from the academic year 2020-21)

III Semester B.E. Information Science and Engineering (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.- Jan. 2018)							Teaching Hours /Week		Examination			
Sl No.	Course Code		Course Title	Teaching Department	Board of Exam	Credits	L	P	CIE	SEE	Total Marks	Exam Hours
01	BS	MA3CS1/MA3IS1	Statistics and Probability	MA	MA	4	4	-	50	50	100	3
02	PC	IS3TH2	Discrete Mathematical Structures	ISE	ISE	3	3	-	50	50	100	3
03	PC	IS3TH3	UNIX and SHELL Programming	ISE	ISE	3	3	-	50	50	100	3
04	PC	IS3TH4	Data Structures and its Applications	ISE	ISE	3	3	-	50	50	100	3
05	PC	IS3TH5	Object Oriented Programming	ISE	ISE	3	3	-	50	50	100	3
06	PC/MA	IS3TH6/MA3DP6	Digital Design and Computer Organization/ Fundamental Mathematics	ISE/MA	ISE/MA	3	3	-	50	50	100	3
07	PC	IS3LB1	UNIX and SHELL Programming Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
08	PC	IS3LB2	Data Structures Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
09	PC	IS3LB3	Object Oriented Programming Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
10	HS	SK3DP1	Skill Development-I	HS	HS	1	-	2	50	-	50	-
Total						24.5	19	11	500	450	950	-
L-Lecture Hours, P-Practical Hours, CIE-Continuous Internal Evaluation, SEE-Semester End Examination												

Note:

- DM3TH6: Fundamental Mathematics - for Lateral Entry students only.
- There is no SEE for Skill Development-I course. However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.



Syllabus for the Academic Year: 2021 – 2022

Department: Mathematics

Semester: 3

Subject Name: Statistics and Probability

Subject Code: MA3CS1/ MA3IS1

L-P-C: 4-0-4

Course Objectives:

Sl. No.	Descriptions
1	Make use of correlation and regression analysis to fit a suitable mathematical model for the statistical data.
2	Apply discrete and continuous probability distributions for single and two variable in analyzing the probability models arising in engineering field.
3	Understand the concepts of the stochastic process of a statistic and estimation of parameters arising in engineering field.
4	Study the queuing models and sampling distributions.

UNIT	Description	Hours
I	Statistical Methods: Correlation and regression- Karl Pearson's coefficient of Correlation, problems. Regression analysis- lines of regression (without proof) problems. Curve Fitting: Curve fitting by the method of least square- Fitting of the curves of Linear, Polynomial and exponential function of the form $y=abx$.	10
II	Probability Distributions: Review of basic probability theory. Random variables (Discrete and Continuous), Probability of mass/density functions. Uniform distribution, Binomial distribution, Poisson's distribution, Exponential distribution and Normal distribution (without derivations) and problems.	10
III	Sampling and Statistical Inference: Sampling distributions, Concepts of hypothesis, standard error and confidence interval, Type-1 and Type-2 errors, Level of significance, One tailed and two tailed tests. Problems on sampling distribution of means, test of significance of sample mean, Student's t – distribution, Chi-square test for goodness of fit.	12
IV	Markov Chain: Probability Vector, Stochastic Matrix, Regular Stochastic Matrix, definition of Markov Chain, Transition Probabilities and Transition probability Matrix, Higher Transition Probabilities, state transition diagram, stationary distribution of regular Markov chains, problems. Queuing theory: Introduction, Concepts and M/G/1 and M/M/1 queuing systems, problems.	10



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 3

Subject Name: Discrete Mathematical Structures

Subject Code: IS3TH2

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Introduce the fundamental discrete mathematics concepts.
2	Provide theoretical foundations of computer science to perceive other courses in the programme.
3	Illustrate the applications of discrete structures: logic, relations, functions, counting and graph theory.
4	Apply different mathematical proof techniques to solve the problems.

UNIT	Description	Hours
I	Fundamentals of Logic: Basic connectivity and truth tables, Logical Equivalence: The Laws of Logic, Logical implication: Rule of Inference. Coding Theory: Elements of coding theory, Hamming Matric, The parity check and generator matrices.	08
II	Relations: Properties of Relations, Zero-one matrices and directed graphs, Partial orders and Hasse Diagrams, Equivalence relations and partitions. (No proof of theorems) Functions: Function definition, Types of Functions- One to One, On to and one to one correspondence. Sterling number of second kind. Function composition and inverse functions. The Pigeonhole principle (No proof of theorems).	08
III	Fundamental Principles of Counting: The rules of Sum and product- Permutations and Combinations, Binomial Theorem, Combinations with repetitions. (No proof of theorems). Properties of Integers: The well ordering principle: Mathematical Induction, Recursive definitions (No proof of theorems).	08
IV	The principles of Inclusion and Exclusion: The principles of Inclusion and Exclusion, Generalization of Principle. Derangements, Rook Polynomials, Arrangements with forbidden positions. Recurrence Relations: First order linear recurrence relations. Formulation and Examples. Second order linear Homogeneous Recurrence Relations with constant coefficients-Distinct real roots, Repeated real roots.	08
V	Introduction to Graph Theory: Definitions and Examples: Directed and undirected graphs, Walk, Trail, Path. Subgraphs, Complements, and Graph Isomorphism, Vertex Degree: Euler Trails and Circuits, Planar Graphs, Hamilton Paths and Cycles, Graph Coloring and Chromatic Polynomials. (No proof of theorems) Trees: Definitions, Properties and Examples: Tree, Spanning Tree, Rooted Tree, Binary Tree. (No proof of theorems)	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Book:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Discrete and Combinatorial Mathematics	Ralph P. Grimaldi and B V Ramana	5th Edition – 2017, Pearson Education, Asia, ISBN 978-0321385024.

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Discrete Mathematics and its applications	Kenneth H Rosen	8th Edition, McGraw Hill 2007. ISBN-978-1259676512
2	Discrete Mathematical Structures with Applications to Computer Science	J.P. Tremblay and R. Manohar	1st Edition, McGraw Hill Education, 2017, ISBN: 978-0074631133

Course Outcomes:

Sl. No.	Description
1	Understand the basic concepts of Discrete Mathematical structures.
2	Formulate and solve abstract mathematical problems.
3	Apply the knowledge of mathematics in the field of computer science.
4	Design solutions for complex problem using different concepts of discrete mathematical structure.



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 3

Subject Name: UNIX and SHELL PROGRAMMING

Subject Code: IS3TH3

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Provide introduction to UNIX Operating System and its File System.
2	Gain an understanding of important aspects related to the Shell and the process.
3	Develop the ability to formulate regular expressions and use them for pattern matching.
4	Learn a comprehensive introduction to Shell Programming, Services and utilities.

UNIT	Description	Hours
I	Getting Started and the UNIX Architecture & Command Usage and Basic File Attributes. The UNIX Operating System, The UNIX Architecture, Features of UNIX, Locating Commands, Internal and External Commands, The File System: The File, The Parent – Child Relationship, The HOME variable, Absolute Pathnames and Relative Pathnames, The UNIX File System, ls -l: Listing File Attributes, The -d Option, Listing Directory Attributes, File Ownership, File Permissions, chmod: Changing File Permissions, Directory Permissions, Changing File Ownership.	08
II	More File Attributes continued and Shell File Systems and Inodes, Hard Links, Symbolic Links and ln, the Directory, umask: Default File and Directory Permission, Modification and Access Times, find: Locating Files, The Shell's Interpretive Cycle, Pattern Matching –The Wild-cards, Escaping and Quoting , Redirection :The Three Standard Files, /dev/null and /dev/tty: Two Special Files, Pipes, tee : Creating a Tree, Command Substitution , Shell Variables,	08
III	Process and Simple Filters Process Basics, ps: Process Status, System Processes (-e or -a), Mechanism of Process Creation, Internal and External Commands , Running Jobs in Background, nice : Job Execution with Low Priority, Killing Processes with Signals, Job Control, at and batch: Execute Later , cron :Running Jobs Periodically ,time :Timing Processes. The Sample Database, pr: Paginating Files, head: Displaying the Beginning of a File, tail: Displaying the End of a File, cut: Slitting a File Vertically paste: Pasting Files, sort: Ordering a File, uniq: Locate Repeated and Non repeated Lines, tr: Translating Characters,	08
IV	Filters using Regular Expression and Essential Shell Programming grep: Searching for a pattern, Basic Regular Expression (BRE) – Introduction, Extended Regular Expression (ERE) and egrep, Shell Scripts, read: Making Scripts Interactive, Using Command Line Arguments, exit and Exit Status of Command, The Logical operators && and - Conditional Execution, The if , case Conditional, Using test to evaluate expression, The case Conditional, expr: Computation	08



	and string Handling, \$0: Calling a Script by Different Names, While: Looping, for : Looping within a List, set and Shift: Manipulating the Positional Parameters, The HERE Document(<<), trap, Debugging Shell Scripts with set -x.	
V	Advanced SHELL Programming: Shells and Sub-Shells, () and { } : sub-shell or Current Shell?, export: Exporting shell variables, Running a script in the Current Shell: the . Command, let: Computation – A second Look (Korn and Bash), Arrays (Korn and Bash), String Handling (Korn and Bash), Conditional parameter substitution, Merging Streams, Shell Functions, eval: Evaluating Twice, The exec statement	08

Text Book:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Unix Concepts and Applications	Sumitabha Das	4th Edition, Tata McGraw Hill, 2012.

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	UNIX and Shell Programming	Behrouz A. Forouzan, Richard F. Gilberg	Cengage Learning – India Edition, 2009.
2	Linux Command Line and Shell Scripting Bible	Richard Blum , Christine Bresnahan	2nd Edition, Wiley, 2014.

Course Outcomes:

Sl. No.	Description
1	Classify and use the various Unix commands.
2	Use simple filters and regular expressions for file processing
3	Demonstrate the importance of shell in programming via shell scripts.
4	Write advanced shell scripts to solve the problems



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 3

Subject Name: Data Structures and its Applications

Subject Code: IS3TH4

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Understand record structure and representation in memory.
2	Learn linked representation of data structures.
3	Understand stacks and queues and its applications.
4	Understand non-linear data structures.

UNIT	Description	Hours
I	Introduction: Basic terminology; Elementary Data Organization, Data structures, Data Structures Operations, Arrays, Records and Pointers: Introduction, Linear arrays, Representation of linear arrays in memory, Traversing linear arrays, Inserting and deleting, Multidimensional arrays, Pointers: pointer arrays, Records: Record Structures, Representation of records in memory; parallel arrays, Unions.	08
II	Linked Lists: Introduction, Linked lists, Representation of linked list in memory, Traversing a linked list, Searching a linked list, Memory allocation; Garbage collection, Insertion into a linked list, Deletion from a linked list, Header linked lists, Two-way lists.	08
III	Stacks, Queues, Recursion: Introduction, Stacks, Array representation of stacks, Linked representation of stacks, Arithmetic expressions: Polish notation, Recursion, Towers of Hanoi, Implementation of recursive procedures by stacks, Queues, Linked representation of queues, Dequeues, Priority queues.	08
IV	Trees: Introduction, Binary trees, Representing binary trees in memory, Traversing binary trees, Traversal algorithms using stacks, Header nodes: Threads, Binary search trees, Searching and inserting in binary search trees, Deleting in a binary search trees, General trees.	08
V	Sorting and searching: Introduction, Bubble sort, Insertion sort, Selection sort, Linear search, Binary search, Graphs and their applications: Graph theory terminology, Sequential representation of graphs; adjacency matrix; path matrix, Warshall's algorithm; Shortest paths, Traversing a graph.	08

Text Book:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Data Structures (Revised First Edition) Schaum's Outline Series Paperback – 1 February 2014	Seymour Lipschutz	McGraw Hill Education, 2014, ISBN-13: 978-1259029967



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Data Structure using C	Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein	1st Edition, Pearson publication, 2019, ISBN-13: 9789332543546.
2	Data Structures: A Pseudocode Approach with C	Richard F. Gilbert and Behrouz A. Forouzan	Cengage Publication, 2007, ISBN-13: 9788131503140

Course Outcomes:

Sl. No.	Description
1	Define the basic concepts of data structures and their operations.
2	Explain the working principle of linear and non-linear data structures.
3	Develop the code snippet for the implementation of data structures.
4	Apply concepts of linear and non-linear data structures to solve a problem.



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 3

Subject Name: Object Oriented Programming

Subject Code: IS3TH5

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Understand the fundamentals of object-oriented programming in Java, which includes defining classes, Objects, invoking methods.
2	Understand the principles of inheritance, packages and interfaces.
3	Understand fundamentals of exception handling mechanisms and Enumerated Data Types.
4	Write Object oriented programs to solve real world problems.

UNIT	Description	Hours
I	Introduction to Object oriented programming: Fundamentals of Object Oriented Programming -Introduction, Object-Oriented Paradigm, Basic Concepts of Object-Oriented Programming, Benefits of OOP, Applications of OOP. An Overview of Java -First Simple Java program: Entering the Program, Compiling the Program, A Closer Look at the First Sample Program, A Second short program, Java is a Strongly Typed Language. Introducing Classes: Class Fundamentals: The General Form of a Class, A Simple Class, Declaring Objects: A Closer Look at new, Assigning Object Reference Variables, Introducing Methods: Adding a Method to the Box Class, Returning a Value, Adding a Method That Takes Parameters: Parameterized Constructors, Constructors, The this Keyword: Instance Variable Hiding, Garbage Collection, The finalize() Method; A Stack Class.	08
II	Classes and Methods: A Closer Look at Methods and Classes: Overloading Methods: Overloading Constructors, Using Object as parameter, A Closer Look at Argument Passing, Returning Object, Introducing Access Control, Understanding Static, Introducing Final, Arrays Revisited, Introducing Nested and Inner Classes. Exploring the String Class, Using Command-Line Arguments.	08
III	Inheritance: Inheritance: Inheritance Basics: Member Access and Inheritance, A More Practical Example, A Superclass Variable Can Reference a Subclass Object, Using Super: Using super to Call Superclass Constructors, A Second Use for super, Creating Multi-Level Hierarchy, when Constructors are Executed, Method Overriding, Dynamic Method Dispatch: Why Overridden Methods?, Applying Method Overriding, Using Abstract Classes, Using Final with Inheritance: Using final to Prevent Overriding, Using final to Prevent Inheritance, The Object Class.	08



IV	Packages and Interface: Packages: Defining a Package, Finding Packages and CLASSPATH, A Short Package Example, Access protection: An Access Example, Importing Packages, Interfaces: Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces Can Be Extended, Default Interface Methods: Default Interface Methods, A More Practical Example, Multiple Inheritance Issues, Use Static Methods in an Interface.	08
V	Exception Handling and Enumerations: Exception Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch: Displaying a Description of an Exception, Multiple Catch Clauses, Nested try Statements, throw, throws, finally, Java's built-in Exceptions, Creating your own Exception Subclasses. Chained Exceptions. Three Recently Added Exception Features. Enumerations: Enumeration Fundamentals, The values() and valueOf() Methods ,Java Enumerations Are Class Types, Enumerations Inherit Enum, Another Enumeration Example	08

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Java - The Complete Reference	Herbert Schildt	11th Edition, Tata McGraw Hill, 2019, ISBN: 978-1-26-044024-9
2	Programming With Java	E Balagurusamy	6th Edition, Tata McGraw Hill, 2019, ISBN: 978-93-5316-234-4

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to JAVA Programming	Y. Daniel Liang	10th Edition, Pearson Education, 2015, ISBN-13:9780133761313

Course Outcomes:

Sl. No.	Description
1	Describe the fundamentals of object oriented programming.
2	Identify classes, objects, members of a class and relationships among them needed for a specific problem.
3	Design and implement object oriented solutions involving multiple objects, packages & Interfaces.
4	Develop reliable programs by using exception handling mechanisms and create own data types using Enumeration.



Syllabus for the Academic Year – 2021 – 2022

Department: Information Science and Engineering

Semester: 3

Subject Name: Digital Design and Computer Organization

Subject Code: IS3TH6

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Learn and analyze basic Digital design principles, logic circuit design.
2	Simulate digital circuits using Verilog coding.
3	Understand various data transfer techniques in digital computer.
4	Analyze processor performance improvement using instruction level parallelism.

UNIT	Description	Hours
I	Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Product-of-sums Method, Product-of-sums Simplification. HDL Implementation Models. Multiplexers, Demultiplexers, 1-of-16 Decoder, BCD-to-decimal Decoders, Seven-Segment Decoders, Encoders, Parity Generators and Checkers, Magnitude Comparator, HDL Implementation of Data Processing Circuits.	08
II	Flip-Flops and RS,D,JK,T Flip-Flop, Master-Slave Flip-Flops, Edge-Triggered Flip-Flops, Various Representations of Flip-Flops, Registers, Counters, Design of Synchronous Counters. HDL Implementation of Flip-Flops, Registers, Counters.	08
III	A Top-Level View of Computer Function and Interconnection : Computer Components, Computer Function, Interconnection Structures, Bus Interconnection, PCI Cache Memory: Computer Memory System Overview, Cache Memory Principles, Elements of Cache Design Pentium 4 Cache Organization ARM Cache Organization Internal and External Memory: Semiconductor Main Memory ,Error Correction, Advanced DRAM Organization, Magnetic Disk, RAID, Optical Memory, Magnetic Tape	08
IV	Computer Arithmetic: The Arithmetic and Logic Unit (ALU), Integer Representation, Integer Arithmetic, Floating-Point Representation, Floating-Point Arithmetic. Input/Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels and Processors, The External Interface: FireWire and InfiniBand	08
V	Instruction Sets Characteristics and Functions: Machine Instruction Characteristics, Types of Operands, Intel x86 and ARM Data Types, Types of Operations Intel x86 and ARM Operation Types. Instruction Sets Addressing Modes and Formats: Addressing, x86 and ARM Addressing Modes, Instruction Formats,x86 and ARM Instruction Formats, Assembly Language Processor Structure and Function: Processor Organization, Register Organization, The Instruction Cycle Instruction Pipelining, The x86 Processor Family, The ARM Processor	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Digital Principles and Applications	Malvino and Leach	8th Edition, McGraw Hill Education, 2014 ISBN-13 : 978-9339203405
2	Computer Organization And Architecture Designing For Performance	William Stallings	11th Edition, Pearson, 2019, ISBN 9780134997193.

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Logic and Computer Design Fundamentals	M. Morris Mano Charles Kime	4th Edition, Pearson, 2014 ISBN 13: 978-1-292-02468-4.
2	Digital Principles and Design	Donald D. Givone	1st Edition, McGraw-Hill Publishers, 2017, ISBN-13: 9780070529069.

Course Outcomes:

Sl. No.	Description
1	Design digital circuits using basic gates and combinatorial logic.
2	Evaluate flip flops, counters and registers and Simulate simple digital circuits using Verilog code.
3	Design memory organization, Arithmetic and Logical unit and understand I/O unit.
4	Apply and Implement fundamental coding schemes.



Syllabus for the Academic Year – 2021 – 2022

Department: Mathematics

Semester: 3

Subject Name: Fundamental Mathematics

Subject Code: MA3DP6

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Develop mathematical skill so that student are able to apply mathematical method and principals in solving problem from engineering field.
2	Introduce the concept of differential calculus.
3	Introduce concept of Integral Calculus.
4	Study the concept of probability.

UNIT	Description	Hours
I	Probability: Introduction, Sample space and events. Axioms of probability. Addition and multiplication theorems, Conditional probability-illustrative examples. Baye's theorem-problems.	08
II	Differential Calculus: List of standard derivatives including hyperbolic functions, rules of differentiation. Polar curves: Polar coordinates, angle between radius vector and tangent, angle between two polar curves – Problems.	08
III	Series: Taylor's and Maclaurin's series expansions of one variable. Integral Calculus: List of standard integrals, integration by parts. Definite integrals – problems. Statement of reduction formulae for $\int_0^{\frac{\pi}{2}} \sin x dx$, $\int_0^{\frac{\pi}{2}} \cos x dx$ and $\int_0^{\frac{\pi}{2}} \sin x \cos x dx$, simple problems. Multiple integrals-Simple problems.	07
IV	Differential equations: Introduction to first order ordinary differential equations. Variables separable, Linear equation. Exact differential equation - Problems. Ordinary differential equations with constant coefficients: Homogeneous differential equations, non-homogeneous differential equations – Particular integral for functions of the type $f(x) = e^{ax}$, $\sin(ax)$, $\cos(ax)$, x^n and simple problems.	08
V	Vector calculus and Partial differentiation: Del operator, gradient-directional derivative, divergence, curl - problems. Introduction to Partial differentiation - Illustrative examples.	09

[illegible]



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 3

Subject Name: UNIX and SHELL Programming Laboratory

Subject Code: IS3LB1

L-P-C: 0-3-1.5

Course Objectives:

Sl. No.	Description
1	Provide introduction to UNIX Operating System and its File System
2	Gain an understanding of important aspects related to the SHELL and the process
3	Develop the ability to formulate regular expressions and use them for pattern matching.
4	Provide a comprehensive introduction to SHELL programming, services and utilities.

	Description
1	Write a Shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, outputs the common permissions, otherwise outputs each file name followed by its permissions.
2	Write a Shell script that takes a valid directory name as an argument and recursively descends all the subdirectories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output.
3	Write a Shell script that accepts valid log-in names as arguments and prints their corresponding home directories. If no arguments are specified, print a suitable error message.
4	Write a Shell script to that accepts path names and creates all the components in that path name as directories. For example, if the script name is mpe, then the command mpe a/b/c/d should create directories a, a/b, a/b/c and a/b/c/d.
5	Write a Shell script to find and display all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify the directory in which the search is to begin. If this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking
6	Write a Shell script that reports the logging in of a specified user within one minute after he/she log in. The script automatically terminated if specified user does not log in during a specified period of time.
7	Write a Shell script that determine the period for which a specified user is working on system.
8	Write a Shell script that accept a list of filenames as its argument, count and report occurrence of each word that is present in the first argument file on other argument files.
9	Write a Shell script that deletes all lines containing a specific word in one or more file supplied as argument to it.
10	Write a Shell script that accepts file names specified as arguments and creates a shell script that contains this file as well as the code to recreate these files. Thus if the script generated by your script is executed, it would recreate the original



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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files.

Course Outcomes:

Sl. No.	Description
1	Describe the architecture and features of UNIX Operating System and distinguish it from other Operating System
2	Demonstrate UNIX commands for file handling and process control.
3	Demonstrate Regular expressions for pattern matching and apply them to various filters for a specific task.
4	Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem.



Syllabus for the Academic Year – 2021 – 2022

Department: Information Science and Engineering

Semester: 3

Subject Name: Data Structures Laboratory

Subject Code: IS3LB2

L-P-C: 0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1	Develop skills to design and analyze simple linear and nonlinear data structures.
2	Strengthen the ability to identify and apply suitable data structure for the given real world problem.
3	Gain knowledge in practical applications of data structures.

Design and develop C programs on the following concepts:

Lab Cycles	Description
I	Structures, Pointers and memory representation of records: 1. Write a C program to implement record structure of an employee. 2. Write C program to implement file operations using structures. 3. Write C program to implement complex number operations using structures.
II	Stacks, Queues and Linked lists: 4. Write C program to implement stack operations. 5. Write C program to implement Tower of Hanoi using recursion. 6. Write C program to find factorial of a given number using recursion. 7. Write C program to implement Fibonacci series using recursion. 8. Write C program to convert a number from decimal to binary using recursion. 9. Write C program to reverse a given array of elements using recursion. 10. Write C program to implement simple queue operations. 11. Write C program to implement circular queue operations. 12. Write C program to implement priority queue operation. 13. Write C program to implement linked list operation to perform the following operation: a. Insert a new node at the beginning of list. b. Inserting a new node at the end of the list. c. Deleting a node from the beginning of the list. d. Deleting a node at the end of list. e. Searching a node in the list. 14. Write a C program to implement doubly list operations to perform the following operation: a. Insert a new node at the beginning of list. b. Inserting a new node at the end of the list. c. Deleting a node from the beginning of the list. d. Deleting a node at the end of list.



	Searching a node in the list. 15. Write a C program to perform linked implementation of Stack. 16. Write a C program to perform linked implementation of Queues. 17. Write a C Program to check whether two given lists are containing the same data. 18. Write a C program to find the largest element in a given doubly linked list.
Cycle III	Trees, Sorting and Searching: 19. Write a C program to implement binary search tree operations. 20. Write C program to search an element in an array using binary search. 21. Write C program to arrange the list of numbers in ascending order using bubble sort. 22. Write C program to arrange the list of numbers in ascending order using insertion sort. 23. Write C programs for implementing the following graph traversal algorithms: a. Depth First Traversal b. Breadth First Traversal 24. Write a C program to count the number of nodes in the binary search tree. 25. Write a C program to sort a given list of strings.

Pattern for practical exam conduction:

In Semester End Practical Examination, students are allowed to pick one program from the lot of 3 cycles.

Course Outcomes:

Sl. No.	Descriptions
1	Use pointers, structures and unions in program development.
2	Apply data structures like stacks and queues to solve problems in Computer field.
3	Implement the concept of linked lists in solving problems.
4	Design and implement solutions based on advanced data structures.



Syllabus for the Academic Year – 2021 – 2022

Department: Information Science and Engineering

Semester: 3

Subject Name: Object Oriented Programming Laboratory

Subject Code: IS3LB3

L-P-C: 0-3-1.5

Course Objectives:

Sl. No.	Description
1	Learn fundamentals of object oriented programming in Java and Understand various concepts of JAVA.
2	To strengthen problem solving ability by using the characteristics of an object-oriented approach.
3	Understand the principles of Polymorphism, Inheritance, Packages and Interfaces, Exception Handling and Enumeration.

	Description
1	Design a class named Triangle to represent a triangle. The class contains: Three double instance variables named side1, side2 and side3 that specify the three sides of the triangle. The default values are 1 for all the sides. A no-arg constructor that creates a default triangle. a. A constructor that creates a triangle with the specified sides. b. A get method to return the value of the instance variables. c. A set method to set a new value of the instance variables. d. A method named getArea() that returns the area of this triangle. e. A method named getPerimeter() that returns the perimeter. Write a test program that creates two Triangle objects. Assign sides 4, 5 and 6 to the first object and 1.5, 2.5 and 3.5 to the second object. Display the properties of both objects and find their areas and perimeters. (Hint: To find square root of a number use Math.sqrt function). Note: Modify the program so that inputs can also be read from Standard Input Device, the keyboard.
2	Consider the trunk calls of a telephone exchange. A trunk call can be ordinary, urgent or lightning. The charges depend on the duration and the type of the call. Write a program using the concept of polymorphism in Java to calculate the charges
3	Write a Java Program to create an abstract class named shape that contains two integers and an empty method named printArea. Provide three classes named Rectangle, Triangle and Circle subclass that each one of the classes extends the Class Shape. Each one of the classes contains only the method printArea() that prints the area of Shape. Note: Read the input from the keyboard using Scanner Class.
4	Design a simple Java program to demonstrate different combinations of access control modifiers for: same package subclass, same package non-subclass, different package subclass, different package non-subclass. Note: Justify the result with the Access Protection table.
5	Write a program in Java to create a Player class. Inherit the classes Cricket _Player, Football _Player and Hockey _Player from Player class.
6	Write a Java Program for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
7	Write a program to make a package Balance in which has Account class with



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	Display_Balance method in it. Import Balance package in another program to access Display_Balance method of Account class.
8	Write a Java program which has: a. An interface for Stack Operations that defines push() and pop() methods. b. A class that implements the Stack Interface and creates a dynamic length Stack and does the stack operations that demonstrate the runtime binding.
9	On a single track two vehicles are running. As vehicles are going in same direction there is no problem. If the vehicles are running in different direction there is a chance of collision. To avoid collisions write a Java program using exception handling. You are free to make necessary assumptions.
10	Write a JAVA program to create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method isWorkday() to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY.

Course Outcomes:

Sl. No.	Description
1	Understand the basic concepts of Procedure-Oriented Programming and Object-Oriented Programming.
2	Identify classes, objects, members of a class and relationships among them needed for a specific problem.
3	Demonstrate Write Java application programs using OOP principles and proper program structuring.
4	Demonstrate the concepts of Polymorphism, Inheritance, Packages and Interfaces, Exception Handling and Enumeration.



CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION FOR B.E. DEGREE COURSE
(Effective from the academic year 2020-21)

IV Semester B.E. Information Science and Engineering (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.- Jan. 2018)						Teaching Hours /Week		Examination				
Sl No.	Course Code		Course Title	Teaching Department	Board of Exam	Credits	L	P	CIE	SEE	Total Marks	Exam Hours
01	B S	MA4CS1/MA4IS1	Combinatorics and Linear Algebra	MA	MA	3	3	-	50	50	100	3
02	P C	IS4TH2	Operating Systems	ISE	ISE	3	3	-	50	50	100	3
03	P C	IS4TH3	Algorithm Design and Analysis	ISE	ISE	3	3	-	50	50	100	3
04	P C	IS4TH4	Computer Networks-1	ISE	ISE	3	3	-	50	50	100	3
05	P C	IS4TH5	Python for Data Processing	ISE	ISE	3	3	-	50	50	100	3
06	P C	IS4TH6	Microprocessor and Embedded System	ISE	ISE	3	3	-	50	50	100	3
07	P C	IS4LB1	Algorithms Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
08	P C	IS4LB2	Data Processing Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
09	P C	IS4LB3	Microprocessor and Microcontroller Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
10	H S	SK4DP1	Skill Development-I	HS	HS	1	-	2	50	-	50	-
Total						23.5	18	11	500	450	950	-
L-Lecture Hours, P-Practical Hours, CIE-Continuous Internal Evaluation, SEE-Semester End Examination												

Note:

- There is no SEE for Skill Development-II course. However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.



Syllabus for the Academic Year: 2021-22

Department: Mathematics

Semester: 4

Subject Name: Combinatorics and Linear Algebra

Subject Code: MA4CS1/MA4IS1

L-P-C: 3-0-3

Course Objectives:

Sl. No	Descriptions
1	Provide the students with a foundation in linear algebra, Numerical methods and Combinatorics.
2	Understand concepts of Matrices to linear systems and Vectors spaces.
3	The concepts of Eigen values, Eigen vectors and functions to linear algebra.
4	Apply the concepts of inner products to matrix decomposition.

Prerequisite: Concept of solution of Simultaneous equations.

UNIT	Description	Hours
I	Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge- Kutta method of fourth order, Milne's and Adams-Bashforth Predictor and Corrector methods (No derivation of formulae) problems. Numerical Integration: Simpson's $1/3^{rd}$, $3/8^{th}$ rule, Weddle's rule, (without proof), problems.	08
II	Generating functions: Introductory examples. Definition and examples, Calculational Techniques, Partition of Integers, Exponential generating function, problems.	07
III	Vector spaces: Solution of system of equations by LU decomposition method. Vector space, Subspaces, Linear Combinations, Linear Spans, row space and column space of a Matrix, Linear Dependence and Independence (all statements only).	09
IV	Basis and Dimensions: Basis and Dimensions of Vector space and problems. Linear transformation: Introduction, Linear Mappings, Kernel and Image of a linear transformations, Matrix representation of linear transformations, Range space, Null space, Nullity, Rank-Nullity Theorem, Singular and Nonsingular linear transformations (all	08
V	Inner Product spaces: Inner product, norms of a vector, angle between vectors. Orthogonal vectors, orthogonal and orthonormal basis, projections of a vector. Gram-Schmidt orthogonalization process, QR-factorization (all statements only), problems.	08



Syllabus for the Academic Year – 2021 – 2022

Department: Information Science and Engineering

Semester: 4

Subject Name: Operating Systems

Subject Code: IS4TH2

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Course Objectives
1	Know the functionalities of Operating Systems.
2	Understand how the processes are managed by the Operating Systems.
3	Learn how the memory is managed by operating system.
4	Know how Operating System handles mass storage, files System and its protection.

UNIT	Description	Hours
I	Introduction to Operating Systems and System Structures: What operating systems do; Computer System architecture; Operating System structure; Kernel Data Structures; Computing Environment, Operating System Structures: System calls; Types of system calls; System programs; Operating System structure; Virtual machines.	08
II	Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication. Threads concept; Multi Thread Programming: Overview; Multithreading models; Threading issues. Process Scheduling basic concepts; Scheduling criteria; Scheduling algorithms. Case study.	08
III	Process Synchronization: Introduction; The Critical section problem; Peterson's solution; mutex lock: Semaphores; Classical problems of synchronization; Monitors. Process deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention and avoidance; Deadlock detection and recovery from deadlock. Case study.	08
IV	Memory Management: Introduction; Swapping; Contiguous memory allocation; Segmentation; Paging; Structure of page table;. Virtual Memory concept; Demand paging; Copy-on write; Page replacement; Allocation of frames; Thrashing. Case study.	08
V	Secondary Storage Structures: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. File concept; Access methods; Directory structure; File protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights.	08



Text Book:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Operating System Principles	Peter Baer Galvin, Greg Gagne	9 th Edition, Wiley-India, 2013 ISBN: 9788126554270, 8126554274.

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Operating Systems Internals and Design Principles	William Stallings	9th Edition Pearson education India March 2018.
2	Modern Operating Systems	Andrew Tanenbaum	4th Edition, Pearson PLC, March 2014.

Course Outcomes:

Sl. No.	Descriptions
1	Explain the functionalities of operating systems.
2	Apply appropriate process management techniques to solve machine-critical problems in multi-process environment.
3	Select suitable techniques for efficient memory management.
4	Outline the concepts of file and storage management.



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 4

Subject Name: Algorithm Design and Analysis

Subject Code: IS4TH3

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Learn how to design recursive and non-recursive algorithms.
2	Know different Algorithm Design Techniques for effective problem solving.
3	Learn how to analyze the algorithm with respect to space and time complexity.
4	Understand basic efficiency classes and asymptotic notations to express the complexity.

UNIT	Description	Hours
I	Introduction, Fundamentals of the Analysis of Algorithm Efficiency, Brute Force: Algorithm Definition, Fundamentals of algorithmic problem solving, Analysis Framework, Formal Definitions of Asymptotic Notations, Basic efficiency classes, Mathematical analysis of Non-Recursive and recursive Algorithms with Examples. Brute Force: Selection Sort, String Matching, Exhaustive Search.	08
II	Divide and Conquer: Merge Sort, Quick Sort, Finding the Maximum and Minimum. Decrease and Conquer: Insertion Sort, Topological Sorting.	08
III	Transform and Conquer: Heaps and Heap Sort and Balanced Search Trees. Space and Time Tradeoffs: Input Enhancement in String Matching- Horspool's algorithm, Hashing: Hash table, Hash functions, Collision handling by open addressing and chaining.	08
IV	Greedy Technique: Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm and Huffman trees and codes. Dynamic Programming: Floyd's Algorithms, Knapsack Problem and Memory Functions.	08
V	Back tracking: n-Queen's Problem, Subset-Sum Problem, Branch and Bound: Assignment Problem, Knapsack Problem, and Traveling Salesman Problem.	08

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to the Design & Analysis of Algorithms	AnanyLevitin	3 rd Edition, Pearson Education, 2012, ISBN-13: 978-0-13-231681-1
2	Computer Algorithms/C++	Ellis Horowitz, Satraj Sahni and Rajasekaran	2 nd Edition, 2014, Universities Press, ISBN-13:978-8173716119



Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to Algorithms	Cormen T.H, Leiserson C.E. & Rivest R.L	3 rd Edition, PHI, 2009, ISBN-13: 978-0262033848
2	Fundamental of algorithms	Gilles Brassard & Paul Bratley	2 nd Edition, PHI 1999, ISBN-13: 978-120311312

Course Outcomes:

Sl. No.	Description
1	Understand the basic concepts of design and analysis of algorithms.
2	Demonstrate various algorithm design techniques to solve a given problem.
3	Design/Develop an algorithm using algorithm design technique and analyze its complexity to rank order of growth.
4	Apply the appropriate algorithm design technique to solve the given problem instance.



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 4

Subject Name: Computer Networks-1

Subject Code: IS4TH4

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Explain the basics of data communication and various types of computer networks.
2	Comprehend the types of transmission techniques for exchange of data between two or more networks.
3	Illustrate switching and TCP/IP protocol suite.
4	Learn Medium Access Control protocols for reliable and noisy channels.

UNIT	Description	Hours
I	Data Communications and Network Models Introduction: Data communications: Components, Data Representation, Data Flow, Networks: Network Criteria, Physical structure, Network Types, Local Area Network, Wide Area Network, switching, The Internet, Standards and Administration: Internet Standards, Internet Administration. Network models: Protocol Layering: Scenarios, Principles of layering, Logical Connection, TCP/IP Protocol Suite: Layered architecture, Layers in the TCP/IP Protocol Suite, Description of each layer, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model, OSI versus TCP/IP.	08
II	Physical Layer and Media Data and Signals: Analog and digital Data, Analog and Digital Signals, Periodic and Non-periodic, Digital Signals, Bit rate, Bit Length, Digital Signal as a composite Analog signal, Transmission of Digital Signals. Transmission impairment: Attenuation, Distortion, Noise. Data rate limits: Noiseless Channel-Nyquist Bit Rate, Noisy Channels-Shannon Capacity, Using both limits. Performance: Bandwidth, Throughput, Latency, Bandwidth Delay Product, Jitter. Digital Transmission: Digital-to-Digital conversion; Analog-to-Digital conversion; Transmission modes.	08
III	Physical Layer and Media Contd... Analog Transmission: Digital - to - Analog conversion; Analog - to - Analog conversion. Bandwidth Utilization: Multiplexing; Spread spectrum. Transmission media: Guided media, unguided media. Switching: Three Methods of Switching, Switching and TCP/IP Layer, Circuit switched networks, Packet Switching: Data gram networks Virtual-circuit networks, Structure of a switch.	08



IV	Data Link layer Introduction, Link-Layer Addressing, Error Detection and Correction: Introduction, Block coding; Cyclic Codes: Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder using Polynomials, Cyclic Code Analysis, Advantages of Cyclic Codes, Other Cyclic Codes, Hardware Implementation, Checksum, Forward Error Correction, Data Link Control: DLC Services, Data-Link Layer Protocols, HDLC, Point-to-Point Protocol, Media Access Control: Random Access, Controlled Access, Channelization.	08
V	Data Link layer Contd... Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet. Wireless LAN's: Introduction, IEEE 802.11 Project, Bluetooth. - Architecture, Bluetooth Layers, Connecting Devices and Virtual LANs: Connecting Devices, Virtual LANs, ATM: Design goals, problems, architecture	08

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Data Communications and Networking,	Behrouz A. Forouzan	5 th Edition, Tata McGraw Hill, July 2017, ISBN 978-1259064753
2	TCP/IP Protocol Suite	Behrouz A. Forouzan	4 th Edition, McGraw-Hill, July 2017, Indian Edition ISBN-13 : 978-0070706521

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Data and Computer Communication	William Stallings	9 th Edition, Pearson Education, 2011, ISBN-13: 9780131392052
2	Computer and Communication Networks	Nader F. Mir	Pearson Education, 2007, 978-81-317-1543-7
3	Computer Networks	Andrew S. Tanenbaum	4 th Edition, Pearson Education, 2008, ISBN: 978-01-306-6102-9
4	Communication Network – Fundamental Concepts and Key Architectures	Alberto Leon-Garcia and Indra, Widjaja	2 nd Edition, Tata McGraw-Hill, 2004, ISBN: 978-0-07-059501-9

Course Outcomes:

Sl. No.	Description
1	Explain the structure of layered approach and its standards in computer networks.
2	Demonstrate the different data formats, transmission and conversions
3	Identify the errors in data communication and apply appropriate methods for correction
4	Solve problems to improve the performance of computer networks



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 4

Subject Name: Python for Data Processing

Subject Code: IS4TH5

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Acquire the programming skills in core python.
2	Understand the functionalities available in Python libraries.
3	Familiar with rich data structures of Python to work with structured data in fast, easy and expressive way.
4	Learn data cleaning and preparation tools for data analysis.

UNIT	Description	Hours
I	Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics: Running the IPython Shell, Running the Jupyter Notebook, Tab Completion, Introspection, The %run Command, Executing Code from the Clipboard, Terminal Keyboard Shortcuts, About Magic Commands, MatplotlibIntegration, Python Language Basics: Language Semantics, Scalar Types, Control Flow.	08
II	Built-in Data Structures, Functions, and Files: Data Structures and Sequences: Tuple, List, Built-in Sequence Functions, dict, set, List, Set, and Dict Comprehensions, Functions: Namespaces, Scope, and Local Functions, Returning Multiple Values, Functions Are Objects, Anonymous (Lambda) Functions, Currying: Partial Argument Application, Generators, Errors and Exception Handling, Files and the Operating System: Bytes and Unicode with Files.	08
III	NumPy Basics: Arrays and Vectorized Computation: The NumPy ndarray: A Multidimensional Array Object: Creating ndarrays, Data Types for ndarrays, Arithmetic with NumPy Arrays, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Transposing Arrays and Swapping Axes, Universal Functions: Fast Element-Wise Array Functions, Array-Oriented Programming with Arrays: Expressing Conditional Logic as Array Operations, Mathematical and Statistical Methods, Methods for Boolean Arrays, Sorting, Unique and Other Set Logic, File Input and Output with Arrays, Linear Algebra, Pseudorandom Number Generation, Example: Random Walks: Simulating Many Random Walks at Once.	08
IV	Getting started with pandas: Introduction to pandas Data Structures: Series, Data Frame, Index Objects, Essential Functionality: Reindexing, Dropping Entries from an Axis, Indexing, Selection, and Filtering, Integer Indexes, Arithmetic and Data Alignment, Function Application and Mapping, Sorting and Ranking, Axis Indexes with Duplicate Labels, Summarizing and Computing Descriptive Statistics: Correlation and Covariance, Unique Values, Value Counts, and Membership.	08



V	Data Loading, Storage, and File Formats, Data Cleaning and Preparation: Reading and Writing Data in Text Format: Reading Text Files in Pieces, Writing Data to Text Format, Working with Delimited Formats, Binary Data Formats: Using HDF5 Format, Reading Microsoft Excel Files Interacting with Web APIs, Interacting with Databases, Handling Missing Data, Data Transformation, String Manipulation.	08

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Python for Data Analysis	Wes McKinney	2nd Edition, O'Reilly Media, ISBN: 978-1-491-95766-0, 2018

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Data Analytics using Python	Bharti Motwani	Wiley Publications, June 2020, ISBN-13: 978-8126502950,

Course Outcomes:

Sl. No.	Description
1	Develop programs to solve real world problems using Python Data structures and reusable functions.
2	Apply major tools to work with numerical and tabular array data.
3	Make use of functions to load and store the data from different sources.
4	Utilize the set of tools to manipulate data into the right form for data analysis.



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 4

Subject Name: Microprocessor and Embedded System

Subject Code: IS4TH6

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Understand the architecture of Microprocessor and Microcontroller.
2	Develop the ability to write programs in assembly and in C for microcontroller based system.
3	Learn interfacing the external devices with microcontroller.
4	Understand the concepts of embedded system and identify the sensors.

UNIT	Description	Hours
I	ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extension.	08
II	Introduction to the ARM Instruction Set: Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instructions, Program Status Register Instructions, Loading Constants, Conditional Execution, Simple Programming exercises.	08
III	LPC2148 ARM based microcontroller, Interfacing LPC2148 with peripherals: General description, Salient features of LPC 2148, Architectural overview, Memory mapping, Register Description, Functional pin diagram, Features of different blocks. Description of General purpose Input/output ports(GPIO) and pin control block, Simple Application Programming: LEDs , 7 segment display, 4X4 key pad, Stepper motor, DAC and UART interfacing design and their programming using C.	08
IV	Sensors and Transducers: Introduction, basic operating principles of sensors and their features. Types of sensors: Temperature sensor (Thermistor), Light sensor (Photodiode and LDR), Moisture/rain sensor, Motion sensors (IR sensors), Gas and chemical sensor, Proximity Sensor.	08
V	Embedded System Components: Embedded v/s General computing system, Classification of Embedded systems, Major applications and purpose of embedded systems. Core of an Embedded System, Memory, Communication Interface, Embedded Firmware.	08



Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	ARM system developers' guide	Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier	Morgan Kaufman publishers, 2008, ISBN-13: 978-1558608740.
2	Embedded Systems	Shibhu K V	2nd Edition, McGraw Hill Education, 2017 ISBN-13 : 978-9339219680

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to Sensors	John Vetelino, AravindReghu	1st edition, CRC Press; August 2010, ISBN-13 : 978-1439808528
2	Pantech Solutions (https://www.pantechsolutions.net/.../user-manual-arm7-lpc2148-development-kit)		

Course Outcomes:

Sl. No.	Description
1	Describe the architectures of ARM7 processor and embedded system.
2	Write assembly/C programs for a given problem.
3	Design I/O interfaces with LPC2148 Microcontroller.
4	Implement the sensors according the real time scenario.



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 4

Subject Name: Algorithms Laboratory

Subject Code: IS4LB1

L-P-C: 0-3-1.5

Course Objectives:

Sl. No.	Description
1	Understand different algorithms for searching, sorting and graph problems and analyze the same.
2	Learn how to analyze the performance of algorithms practically.
3	Understand various Algorithm Design Techniques.

Note: Implement the following using C / C++ / Java Programming Language.

Lab Cycles	Description
I	Brute Force: 1.String matching. 2.Sort a given set of elements using Selection sort. 3.Solving Travelling salesman problem. Divide and Conquer: 4.Sort a given set of elements using Merge sort. 5.Sort a given set of elements using Quick Sort. 6.Finding the Maximum and Minimum element in an array of 'n' integers. Decrease and Conquer: 7.Print the vertices of the directed acyclic graph in topological order using: i. Source Removal Method ii. DFS Method
II	Decrease and Conquer: 8. Sort a given set of elements using Insertion Sort. Transform and Conquer: 9. Create a heap tree for a given list of N elements using: i. Top-Down approach. ii. Bottom-up approach. And sort the elements using Heap Sort technique. Space and Time Tradeoffs: 10. Implement Horspool algorithm for String Matching. Greedy Technique: 11. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm. 12. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm. 13. From a given vertex in a weighted connected graph, find the shortest paths to other vertices using Dijkstra's algorithm.



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III	Dynamic Programming:
	14. Solve Knapsack problem and print the solution vector.
	15. Find all pair shortest path using Floyd's Algorithm.
	Back Tracking:
	16. Implement N Queen's algorithm.
	17. Find a subset of a given set S of N positive integers whose sum is equal to a given positive integer D.
	Branch and Bound:
	18. Solve Knapsack problem and print the solution vector
	19. Solve Job Assignment Problem and print the solution.
	20. Solving Travelling Salesman problem and print the solution.

Course Outcomes:

Sl. No.	Description
1	Identify the algorithm design technique for the given problem.
2	Design/Develop a solution for the given problem using a high level language.
3	Analyze the performance of various algorithms.
4	Compare the performance of different algorithms for same problem.



Syllabus for the Academic Year – 2021– 2022

Department: Information Science and Engineering
4

Semester:

Subject Name: Data Processing Laboratory

Subject Code: IS4LB2

L-P-C: 0-3-1.5

Course Objectives:

Sl. No	Description
1	Learn the basics of python programming language.
2	Understand the usage of built-in functions and file operations.
3	Acquire the knowledge of modules available in NumPy package.
4	Familiar with data structures and data manipulation tools available in pandas library.

Note: Implement the following using Python Programming Language:

Lab Cycles	Description
I	Basics of Python Programming: 1. Write a program to demonstrate different number datatypes in python. 2. Write a program to create, concatenate and print a string and accessing substring from a given string. 3. Write a program to create, append and remove lists in python. 4. Write a program to demonstrate working with tuples in python. 5. Write a program to demonstrate working with dictionaries in python. 6. Write a program to convert temperature to and from Celsius to Fahrenheit. 7. Write a program to construct the following pattern using nested for loop. * ** *** **** ***** ***** ***** **** *** ** * 8. Write a program to find factorial of a number using recursion. 9. Write a program to define a module to find Fibonacci Numbers and import the module to another program. 10. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first the second file.
II	Basics of Python Programming and numpy Library: 11. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order. 12. Write a Python class to reverse a string word by word. 13. Python program to remove Duplicates elements from a List. 14. Write a program to double a given number and add two numbers using lambda ()?



15. Demonstrate a python code to print try, except and finally block statements.
16. Using a numpy module create an array and check the following:
 - a) type of an array b) axis of an array c) shape of an array d) type of elements in an array.
17. Using a numpy module create array and check the following:
 1. List with type float 2. 3*4 array with all zeros 3. From tuple 4. Random values
18. Using a numpy module create array and check the following:
 1. Reshape 3X4 array to 2X2X3 array
 2. Sequence of integers from 0 to 30 with steps of 5
 3. Flatten array
 4. Constant value array of complex type.
19. Write a program to concatenate the dataframes with two different objects.
20. Write a python code to read a csv file using pandas module and print the first and last five lines of a file.

numpy and Pandas Library:

21. Write a program to generate an infinite number of even numbers (Use generator).
22. Write a program to get a list of even numbers from a given list of numbers. (Use only comprehensions).
23. Write a program to sort words in a file and put them in another file. The output file should have only lower case words, so any upper case words from source must be lowered.(Handle exceptions).
24. Write a Python program to read a list of numbers and sort the list in a non-decreasing order without using any built in functions. Separate function should be written to sort the list wherein the name of the list is passed as the parameter.
25. Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.

Sample DataFrame:

```
exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']
```

III

26. Write a Pandas program to select the specified columns and rows from a given DataFrame.

Select 'name' and 'score' columns in rows 1, 3, 5, 6 from the following data frame.

Sample DataFrame:

```
exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']
```

27. Write a Pandas program to rename columns of a given DataFrame.

Sample data:

Original DataFrame

	col1	col2	col3
0	1	4	7
1	2	5	8
2	3	6	9

New DataFrame after renaming columns:

	Column1	Column2	Column3
0	1	4	7
1	2	5	8



2 3 6 9

28. Write a Pandas program to drop a list of rows from a specified DataFrame.

Sample data:

Original DataFrame:

	col1	col2	col3
0	1	4	7
1	4	5	8
2	3	6	9
3	4	7	0
4	5	8	1

New DataFrame after removing 2nd & 4th rows:

	col1	col2	col3
0	1	4	7
1	4	5	8
3	4	7	0

29. Write a Pandas program to reset index in a given DataFrame. Sample data:

Original DataFrame:

	Attempts	name	qualify	score
0	1	Anastasia	yes	12.5
1	3	Dima	no	9.0
2	2	Katherine	yes	16.5
3	3	James	no	NaN
4	2	Emily	no	9.0
5	3	Michael	yes	20.0
6	1	Matthew	yes	14.5
7	1	Laura	no	NaN
8	2	Kevin	no	8.0
9	1	Jonas	yes	19.0

After removing first and second rows:

	attempts	name	qualify	score
2	2	Katherine	yes	16.5
3	3	James	no	NaN
4	2	Emily	no	9.0
5	3	Michael	yes	20.0
6	1	Matthew	yes	14.5
7	1	Laura	no	NaN
8	2	Kevin	no	8.0
9	1	Jonas	yes	19.0

Reset the Index:

	index	attempts	name	qualify	score
0	2	2	Katherine	yes	16.5
1	3	3	James	no	NaN
2	4	2	Emily	no	9.0
3	5	3	Michael	yes	20.0
4	6	1	Matthew	yes	14.5
5	7	1	Laura	no	NaN
6	8	2	Kevin	no	8.0
7	9	1	Jonas	yes	19.0

30. a) Write a Pandas program to detect missing values of a given DataFrame. Display True or False.

b) Write a Pandas program to replace NaNs with median or mean of the specified



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columns in a given DataFrame.

Test Data:

	ord_no	purch_amt	ord_date	customer_id	salesman_id
0	70001.0	150.50	2012-10-05	3002	5002.0
1	NaN	270.65	2012-09-10	3001	5003.0
2	70002.0	65.26	NaN	3001	5001.0
3	70004.0	110.50	2012-08-17	3003	NaN
4	NaN	948.50	2012-09-10	3002	5002.0
5	70005.0	2400.60	2012-07-27	3001	5001.0
6	NaN	5760.00	2012-09-10	3001	5001.0
7	70010.0	1983.43	2012-10-10	3004	NaN
8	70003.0	2480.40	2012-10-10	3003	5003.0
9	70012.0	250.45	2012-06-27	3002	5002.0
10	NaN	75.29	2012-08-17	3001	5003.0
11	70013.0	3045.60	2012-04-25	3001	NaN

Course Outcomes:

Sl. No.	Description
1	Develop programs for the given problem statement in the real world.
2	Implement the programs on object oriented concepts.
3	Demonstrate the usage of NumPy module for numerical data analysis.
4	Apply data manipulation tools available in pandas for data cleaning and analysis.

Pattern for practical exam conduction:

In Semester End Practical Examination, students are allowed to pick one program from the lot of 3 cycles.



Syllabus for the Academic Year – 2021 - 2022

Department: Information Science and Engineering

Semester: 4

Subject Name: Microprocessor and Microcontroller Laboratory

Subject Code: IS4LB3

L-P-C: 0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1	Able to learn coding knowledge on ARM assembly language programming.
2	Familiar with practical aspects on connectivity of interfacing devices using Microcontroller-LPC2148.
3	To implement few basic application programs using Aurdino Uno board.

Lab Cycles	Description
I	Develop and execute the following using ARM Assembly 1) To perform arithmetic operations on a set of integers of different sizes. 2) To perform data handling operations using Logical, Shift, Rotate and Compare instructions. 3) To perform block move and block exchange operations. 4) Searching and sorting of a set of elements using different techniques.
II	Develop and execute the following using C 5) Program to interface LEDs and to blink the LEDs in a specified fashion. 6) Program to realize decimal up / down counter using 7 segments Display 7) Program to interface and rotate stepper motor in clockwise/anticlockwise direction 8) Program to interface DAC and generate waveforms 9) Program to interface UART to display text messages
III	Develop and execute the following using the Genuino Aurdino Uno 10) Build a Motion detector using a PIR sensor and display appropriate messages 11) Controlling the LED with a push button – turn on /turn off LED photo resistors LDR) – switch on the LED when light level goes below a particular threshold. Plot the light intensity in the room at various time intervals 12) Rain Indicator using a Rain sensor and a water source

Pattern for practical exam conduction:

In Semester End Practical Examination, students are allowed to pick one experiment from the lot of 1 to 12.

Course Outcomes:

Sl. No.	Descriptions
1	Write and execute assembly programs to manipulate the data in the memory using ARM processor.
2	Implement and execute interfacing programs in C to control the functioning of peripheral circuits using ARM based microcontroller LPC2148.
3	Develop and execute simple applications programs using Aurdino Uno board and few sensors
4	Apply the knowledge to build projects for real world applications.



Subject Name: Integral Transforms and Numerical Techniques

Semester: III

Subject Code: MA3TH1

L-T-P-C: 4-0-0-4

Course Objectives:

	Course Objectives
1	Introduce the concept of Laplace Transform and problems on periodic function.
2	Introduce the concept of Fourier series and problems arising up in engineering problems.
3	Introduce the concept of Fourier transform and Z-transform.
4	To develop the proficiency in Numerical techniques and solving Ordinary Differential Equations arising in engineering applications.

UNIT	Description	Hours
UNIT I	Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's and Adams-Bashforth Predictor and Corrector methods (No derivation of formulae) problems. Numerical Integration: Simpson's $1/3^{rd}$, $3/8^{th}$ rule, Weddle's rule, (without proof), problems.	10
UNIT II	Laplace Transforms: Definition, Laplace transforms of elementary functions.(Statement only).Derivations: Laplace transform of t^n , Laplace transform of division by t , Laplace transform of $\int_0^t f(t)dt$. Laplace transforms of Periodic function (Statement only) and problems on square wave, saw-tooth wave, triangular wave, full and half wave rectified form, Unit step functions - problems.	10
UNIT III	Inverse Laplace transforms: Definition, properties, evaluation using different methods. Convolution theorem (without proof), evaluation of $L^{-1}\{F(s)\}$ using convolution theorem. Application to solve ordinary linear differential equations by Laplace transforms method.	10
UNIT IV	Fourier Series: Periodic function, Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with period 2π and with arbitrary period $2l$. Applications to Engineering problems: Fourier series for Periodic square wave, Half wave rectified form, Full wave rectified form, Saw-tooth wave with graphical representation. Half range Fourier series, Practical harmonic analysis.	12
UNIT V	Fourier Transforms: Infinite Fourier transforms. Fourier Sine and Cosine transforms. Inverse Fourier transforms, and simple problems. Z-Transforms: Basic definitions of Z-transform, Standard Z-transforms, Damping rule, Shifting rule, Initial value and Final value theorems(without proof), problems, Inverse Z-transform, problems. Applications-solutions of difference equations using Z-transforms.	10

Text Books:



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SI No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications, 2015. ISBN:9788174091956
2	Higher Engineering Mathematics	B.V.Ramana	1 st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190

Reference Books:

SI No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Advanced Engineering Mathematics	E.Kreyszig	10 th Edition Jon Wiley & Sons, 2015. ISBN:9780470913611
2	Higher Engineering Mathematics	H.K.Das and Er.Rajnish Verma	1 st Edition, Chand publishing, 2011. ISBN:9788121938907



Subject Name: OOPS with C++ and its Applications in Medicine

Semester: III

Subject Code: ML3TH2

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Understand the difference between top-down and bottom-up approach.
2.	Learn writing inline functions for efficiency and performance and the syntax and semantics of the C++ programming language.
3	Learn the design of C++ classes for code reuse and to implement copy constructors and class member functions.
4.	Learn the use of overload functions and operators in C++ and to use inheritance and virtual functions implementation and use of exception handling in C++ programs.

Unit	Course content	Teaching hrs
Unit I	Introduction: Oops paradigm, difference between pop and oop, basics concepts of oops, benefits of oops, applications of c++, a simple C++ program, C++ statements, structure of C++ program, data types, operators in C++, variable, expressions and their types, implicit conversion, precedence of an operator, control structures.	08
Unit II	Functions and Classes: passing arguments, returning values, reference arguments, overloaded functions, inline functions, introduction to class, class specification, defining member functions, nesting member functions, array within a class, static data members and member functions, friend functions, returning objects, constructors and destructors, applications in the medical field.	08
Unit III	Operator Overloading, Pointers, Virtual Functions and Polymorphism: introduction, definition, overloading unary operators, overloading binary operators, rules to overload operators, type conversions, pointers: array, strings, functions, objects, this pointer, virtual functions, rules for virtual functions, use friend functions to overload operators, applications in the medical field.	09
Unit IV	Inheritance: Introduction, definition, types of inheritance: single, multiple, multilevel, hybrid, hierarchical, member accessible specifiers, making private member inheritable, virtual base class, constructors in derived classes, applications in the medical field.	07
Unit V	Streams and I/O Operations and Files: C++ streams and classes, unformatted I/O operations, formatted I/O operations, classes for file stream operations, opening and closing files, detecting end of file, sequential input and output operations, exception handling basics and mechanism, throwing, catching and rethrowing mechanism.	07



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Differentiate between structure-oriented programming and object-oriented programming and use object-oriented programming language like C++ and associated libraries to develop object-oriented programs for handling different types of data.
CO2	Identify, analyze and apply the concepts of classes, Objects and other advanced OOPs concepts like inheritance, data abstraction, encapsulation, operator overloading, functions, polymorphism.
CO3	Implement the algorithms using standard libraries and templates and exception handling to manage data.
CO4	Implement, analyze, demonstrate, document and present the concepts as application to healthcare implemented in groups or individual.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Object Oriented Programming with C++	E Balaguruswamy	TMH, 3 rd edition 2020

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Object Oriented Programming in C++	Robert Lafore	Golgotia Publications Pvt. Ltd. 4 th edition, 2008
2.	The complete reference C	Herbert shieldt	Tata McGraw Hill Publication, 4 th edition, 2013



Subject Name: Human Anatomy and Physiology

Semester: III

Subject Code: ML3TH3

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Provides students the relationship between anatomy and physiology.
2.	Describes the cells, its types and different functions.
3.	Understand the blood and its compositions.
4.	Describes the different organs of the body and its functions.

Unit	Course content	Teaching hrs
Unit I	Introduction: homeostasis, tissue, cartilage: The internal environment and homeostasis, movement of substances within the body, body fluids, action potential, propagation of action potential. Epithelial tissue- simple epithelium, stratified epithelium, connective tissue- cells of connective tissue, loose connective tissue, Adipose tissue, Dense connective tissue, Lymphoid tissue, Cartilage- Hyaline cartilage, Fibrocartilage, Elastic cartilage.	08
Unit II	Cardiovascular System: Introduction, Blood vessels- Arteries and Arterioles, Veins and Venules, capillaries and sinusoids, control of blood vessel diameter, blood supply- internal respiration, cell nutrition. Heart- position, structure pericardium, myocardium, endocardium, flow of blood through the heart, blood supply to heart, conducting system of the heart, factors affecting heart rate, the Cardiac cycle, cardiac output, blood pressure.	08
Unit III	Respiratory System: Introduction, Nose and Nasal cavity- position, structure and functions, pharynx, position, structure, functions. Larynx: position, structure and functions. Trachea, bronchi, bronchioles and alveoli, lungs- position, associated structure, pleura and pleural cavity. Respiration- muscles of respiration cycle of respiration, variables affecting respiration, lung volumes and capacities.	07
Unit IV	Nervous System: Neurons: Properties of neurons, Cell bodies, Axon and Dendrites, types of nerves, Synapse and neurotransmitters, neuromuscular junction. Central nervous system: neuroglia, meninges, ventricles of the brain and CSF. Brain: Cerebrum, functions of cerebrum, functional areas of the cerebrum. Brainstem: Cerebellum, Spinal cord- grey matter, white matter, motor nerve tracts, spinal nerves: nerve roots, plexuses, cranial nerves.	08
Unit V	Digestive System: Introduction, Organs of the digestive system- mouth: tongue, teeth, salivary glands, oesophagus, stomach, gastric juice and functions of stomach- small intestine: structure, chemical digestion in small intestine, large intestine: structure, functions of the large intestine, rectum and anal canal, pancreas and liver.	08



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Identify and explain the structural and functional anatomy of the different types of tissues.
CO2	Analyze the generation and transmission of action potential within the cells.
CO3	Know the functions and blood supply to various parts of the body.
CO4	Identify the factors affecting performance of the vital systems.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Anatomy and Physiology in Health and Illness .	Ross and Wilson	International Publication, 12 th edition, 2018.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Human Anatomy and Physiology for Pharmacy	Dr A K Jain	Arya Publication, 3 rd edition, 2017
2	Introduction to the Human Body, The Essentials of Anatomy and Physiology	Tortora G.J. and Derrickson B.,	Wiley, USA, 2011, ISBN 0470598921.



Subject Name: Biomedical Instrumentation

Semester: III

Subject Code: ML3TH4

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Interpret technical aspects of medicine.
2.	Comprehend different bio signals and their measurement.
3.	Study the principles of various diagnostic and therapeutic equipment's.
4.	Distinguish the sub systems used in a typical man-machine system.

Unit	Course content	Teaching hrs
Unit I	Introduction to Biomedical Instrumentation: Introduction to the man instrument system, components of the man instrument system, Physiological systems of the body, problems encountered in measuring living systems, sources of electric potentials: Resting and action potentials, propagation of action potentials, the bioelectric potentials.	08
Unit II	The Cardiovascular system: The heart and cardiovascular system, the heart, electrocardiograph, blood pressure and its measurements, characteristics of blood flow, measurements of blood flow and cardiac output, Plethysmography, heart sounds and its measurements.	08
Unit III	Other Bio-electric signals & systems: Electro-oculogram(EOG), Electro-encephalogram(EEG), Electro-myogram (EMG), Electro retinogram(ERG) Recording Electrodes: Electrode tissue interference polarization, Skin contact impedance, Silver-Silver chloride electrodes for ECG, Electrodes for EEG, EMG, Electrical conductivity of electrode jellies & creams, microelectrodes.	08
Unit IV	Measurements respiratory system: The physiology of the Respiratory system test & instrument for the Mechanics of breathing. Gas exchange & distribution, respiratory therapy equipments.	08
Unit V	Cardiac Pace Maker & Patient Safety: Need for Cardiac Pacemaker, external pacemaker, implantable pace maker, types of implantable pacemakers. Patient Safety: Electric shock hazards, leakage currents, safety codes & analyzer, Biomedical telemetry, single channel telemetry, multi-patient telemetry, Implantable telemetry & telemedicine.	07

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Understand the need for engineering skills in medical applications
CO2	Understand the need & advantages of Sources of Bio-Electric potentials, Transducers, Biosensors and its type.
CO3	Record and analyze biological parameters like EEG, EMG and ECG.
CO4	Foster the knowledge on Cardiac Pace Maker and patient safety measures.



Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation & Measurements.	Cromwell etal	2e, PHI/Pearson Education, 2009
2	Principles of Applied Biomedical Instrumentation.	Geddes and Baker	3e, John Wiley, 1989

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation Technology and Applications	R. S Khandpur	McGraw-Hill, 3 rd e, 2014.
2	Biomedical Instrumentation	M Armugam	Anuradha Publications, 2 nd edition. 1994.
3	Fundamentals of biomedical instrumentation	Dr. O N Pandey	Katson Books, 2012.
4	Biomedical Instrumentation Systems	Shakthi Chatterji	Delmar Cengage Learning, 2014.



Subject Name: Analog and Digital Electronic Circuits

Semester: III

Subject Code: ML3TH5

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To design and analyze amplifiers.
2.	To explain various logic families.
3.	To explain combinational and sequential circuits with its applications.

Unit	Course content	Teaching hrs
Unit I	Diodes and Transistors: Types of diodes, Application in various contexts, comparison of different transistor configuration (CE, CB, CC), Design of RC Coupled amplifier, characteristics parameters and impedance measurement.	08
Unit II	Transistor Amplifiers: Design of CC Amplifier (Emitter follower), Darlington emitter follower, Power amplifier and types, multistage amplifier, feedback amplifiers, types-positive and negative feedback, advantages.	08
Unit III	Introduction to digital logic families: Digital IC Terminology, The TTL Logic Family, TTL loading and Fan out, MOS Technology, Digital MOSFET circuits, Complementary MOS Logic, Tristate (Three-State) Logic outputs, ECL digital logic family, Comparative study of data sheets of TTL and CMOS circuits for NAND gates.	08
Unit IV	Combinational Logic circuits: Introduction to simplification of Logic circuits, Parallel adder, BCD adder, decoders, encoders, multiplexers, de-multiplexers, comparators, Applications of combinational logic circuits	07
Unit V	Sequential Logic Circuits: Introduction to NAND and NOR Latch, S-R Flip-Flop, J-K Flip-Flop, J-K Master slave Flip-flop, D Flip-Flop, T Flip-Flop, Shift registers, Asynchronous and synchronous counters, Up/Down Counters and presetable Counters, applications of counters.	08

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Apply the basic knowledge of transistor and diode to design various transistor amplifiers.
CO2	Understand the concept of feedback, power and cascading effect in respect to multistage transistor amplifiers.
CO3	Interpret various characteristics of digital logic families.
CO4	Analysis the performance of decoders, encoders, multiplexers, demultiplexers and code converters and apply the knowledge of flip-flops in designing synchronous and asynchronous counters.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.



Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Systems Principles and Applications	Ronald J Tocci, Neal S Widmer Gregory L. Moss	Printice hall 12th Edition, 2018 .
2	Electronic Devices and Circuit Theory	Robert L. Boylested and Louis Nashelsky	Pearson Education. 11th Edition, 2015.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electronic Devices and Circuits	David A. Bell	PHI, 5th Edition, 2010
2	Digital Logic – Application and Design	John M Yarbrough	Thomson Brooks/Cole 7thEdition, 2012



Subject Name: Biosensors and Measurements

Semester: III

Subject Code: ML3TH6

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Define and understand accuracy and precision, types of errors, statistical and probability analysis.
2.	Learn and understand the concepts of oscilloscopes and signal generators, their types and functions.
3.	Understand the working of different types of transducers.
4.	Know the different types of biosensors and its applications.

Unit	Course content	Teaching hrs
Unit I	Measurement and Error: Static characteristics, error measurements, types of static errors, error sources, measurement error combinations, basics of statistical analysis. (Text 1:1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8). Ammeters: DC Ammeter, multirange ammeter, Ayrton shunt or universal shunt, requirements of shunt, extending ammeter ranges, RF ammeter (thermocouple), limitation of thermocouple. (Text 1:3.1,3.2,3.3,3.4,3.5,3.6,3.7) Digital voltmeters: Introduction, RAMP technique, Dual Slope integrating type DVM, integrating type DVM, principles of ADC, successive approximations ADC, resolution and sensitivity of digital meters, general specifications of DVM. (Text 1:5.1,5.2,5.3,5.4,5.5,5.6,5.8,5.9,5.10)	08
Unit II	Oscilloscopes: Introduction, Basic principles, block diagram of oscilloscope, Typical CRT connections, Dual beam and dual trace oscilloscope, sampling and storage oscilloscopes, measurement of frequency by Lissajous method, electronic switch. Digital storage oscilloscopes. (Text: 7.1, 7.2, 7.4, 7.14, 7.15, 7.16, 7.17, 7.18, 7.20, 7.32) Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and square wave generator, Function generator, Square and Pulse generators (Text: 8.1, 8.2, 8.3, 8.5, 8.6, 8.7, 8.8, 8.9)	08
Unit III	Transducers: Introduction, electrical transducer, selecting a transducer, resistive transducer, strain gauges: bounded, unbounded, types of strain gauges, thermometer, thermistor, inductive transducer, capacitive transducer, pressure inductive transducer, LVDT, piezo electric transducer, photo electric transducer. (Text 1: 13.2, 13.3, 13.4, 13.6, 13.7, 13.8, 13.9, 13.11, 13.12, 13.13, 13.14, 13.15, 13.16).	09
Unit IV	Measurements of Resistance, inductance and capacitances: Introduction, Wheatstone's bridge, kelvin's bridge, AC bridges, capacitance comparison bridge, inductance comparison bridge, schering's bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection.	07



	(Text 1:11.1,11.2,11.3,11.8,11.9,11.11,11.14,11.15) Data Acquisition System (DAS): Introduction, objective of DAS, signal conditioning of inputs, single channel DAS, multi-channel DAS, computer-based DAS. (Text 17.1, 17.2, 17.3, 17.4, 17.5, 17.6).	
Unit V	Biosensors: Introduction, types: electrochemical biosensors, amperometric biosensors, potentiometric sensors, conductometric sensors, optical biosensors, piezoelectric biosensors, calorimetric biosensors, applications: clinical diagnostics, environmental monitoring, defense industries, food and water safety. (Text book 2: 1.1, 5.1, 5.2.1, 5.3, 5.4, 5.5).	07

Course Outcomes:

Sl. No.	
CO1	Measure various electrical parameters with accuracy, precision, resolution and interpret various types of errors and their statistical analysis.
CO2	Enhance their knowledge on the working principles of different oscilloscopes and signal generators and their functions.
CO3	Choose different types of transducers, data acquisition system and bridges required to build the different circuits.
CO4	Choose the required sensor for various biomedical applications.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electronic Instrumentation	H. S. Kalsi	McGraw Hill, 2 nd Edition., 2012
2	Biosensors: Fundamentals and Applications	Bansi Dhar Malhotra and Chandra Mouli Pandey	Smithers Rapra Technology Ltd, 2015

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Sensors and Transducers	D Patranabis	PHI publications, 2 nd edition, 2018.
2	Electronics and Electrical Measurements	A. K. Sawhney	Dhanpat Rai & Sons, 2015
3	Biosensor	<u>Elizabeth A. H. Hall</u>	Prentice Hall, 2010



Subject Name: Biomedical Instrumentation Lab

Semester: III

Subject Code: ML3LB1

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1.	Interpret technical aspects of medicine.
2.	Comprehend different bio signals and their measurement.
3.	Study the principles of various diagnostic and therapeutic equipment's.

Sl no.	Course Contents
1	Determining the characteristics of the following amplifiers using op-amps (a) Inverting amplifier (b) Non-Inverting Amplifier (c) Differential Amplifier (d) Isolation Amplifier (e) Instrumentation Amplifier
2	To Analyze Active 1 st & 2 nd order filters for the given cutoff frequency. (i) Low pass Filter (ii) High Pass Filter (iii) Band Pass Filter (iv) Band Stop Filter
3	To Obtain & observe various Bioelectric signals on DSO or Biokit Physiograph module kit. (i) Electrocardiograph (ii) Electro-oculograph (iii) Electromyograph (iv) Electroencephalograph
4	Study Experiments: (i) Spectrophotometer (ii) Ultrasound Scanner (iii) X-Ray machines (iv) MRI Scanner & CT-Scanner

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Reminisce the basics of measurements and the generic sensors used.
CO2	Accent the determination of characteristics of sensors used to measure various variables
CO3	Illustrate the usage of various sensors for signal acquisition.
CO4	Implement linear ICs for signal amplification.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation & Measurements	Cromwell et al	PHI/Pearson Education, 2 nd Ed., 2011
2	Principles of Applied Biomedical	Geddes and Baker	John Wiley, 3 rd



	Instrumentation		Ed., 2008

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation Technology and Applications	R. S. Khandpur	McGraw-Hill, 2 nd Ed., 2018
2	Biomedical Instrumentation	M Armugam	Anuradha Publications, 2 nd edition. 1994.
3	Fundamentals of biomedical instrumentation	Dr. O N Pandey	Katson Books, 2009
4	Biomedical Instrumentation Systems	Shakthi Chatterji	Delmar Cengage Learning, 2014



Subject Name: Analog and Digital Electronics Lab

Semester: III

Subject Code: ML3LB2

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1.	To design and analyse amplifiers.
2.	To design and analyse oscillators.
3.	To verify logical gates.

Course content	
1	Design and verification of frequency response of RC coupled amplifier.
2	Design and analysis of Emitter follower circuit.
3	Design and analysis of Darlington & Bootstrapped Darlington circuit.
4	Design and verification of characteristics of negative feedback amplifier.
5	Design and verification of Hartely and Colpitts oscillator.
6	Design and verification of crystal and RC phase shift oscillators.
7	Verification of encoder and decoder.
8	Implementation of half adder and full adder using MUX 74153.
9	Verification of Parallel Adder Using 7483.
10	Implementation of code converters using DEMUX- 74139.
11	Implementation of 1bit and 2bit comparator using logic gates and NAND gates.
12	Implementation T and D flip-flop using JK Master slave configuration and IC 7446.
13	Implementation of MOD N Counters using ICs 7476, 7490.
14	Verification of SISO, SIPO, PIPO, PISO operation using shift register 7495.

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Design various linear and nonlinear circuits for required applications.
CO2	Demonstrate the practical skills of building circuits.
CO3	Analyse the Outputs both theoretically and practically.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Systems Principles and Applications	Ronald J Tocci, Neal S Widmer Gregory L. Moss	Printice hall 12th Edition, 2018 .
2	Electronic Devices and Circuit Theory	Robert L. Boylested and Louis Nashelsky	Pearson Education. 11th Edition, 2015.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electronic Devices and Circuits	David A. Bell	PHI, 5th Edition, 2010
2	Digital Logic – Application and Design	John M Yarbrough	Thomson Brooks/Cole 7thEdition, 2012



Subject Name: OOPS with C++ Lab

Semester: III

Subject Code: ML3LB3

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1.	To understand the difference between top-down and bottom-up approach.
2.	To learn writing inline functions for efficiency and performance and the syntax and semantics of the C++ programming language.
3	To learn the design of C++ classes for code reuse and to implement copy constructors and class member functions.
4.	To learn the use of overload functions and operators in C++ and to use inheritance and virtual functions implementation and use of exception handling in C++ programs.

Unit	Course content	Teaching hrs
	C++ Lab: 1. Write a C++ program to calculate the sum of the series i) $1+x+x^2+x^3+\dots+x^n$. ii) $-1+2-4+8-16+\dots 1024$. 2. Write a C++ program to sort the elements of an array using i) Selection sort ii) Bubble sort 3. Write a C++ program to accept two arrays of different lengths. Merge the two accepted arrays. 4. Write a C++ program to accept two 2-dimensional arrays and perform addition, subtraction and multiplication. 5. Write a C++ program to find the LCM and GCD of 2 given numbers using functions. 6. Write a C++ program to find the factorial of a given number using recursive function. 7. Write a C++ program to find the largest, smallest and their averages using functions. 8. Write a C++ program to find the sum of two complex numbers using classes by overloading operator +. 9. Write a C++ program to multiply two numbers using Multiple Inheritance. 10. Write a C++ programs to display medical signals and images. 11. Write a C++ programs to add noisy data and display medical signals and images. 12. Write a C++ programs to used different types of filters on various signals and images display clear medical signals and images.	3 Hrs/Week

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Identify and apply data types to implement the programs and declare variables.
CO2	Implement the concepts of functions, arrays, classes & objects.
CO3	Implement Operator Overloading and inheritance for effective programming.
CO4	Use medical data to perform operations like filtering.



Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Object Oriented Programming with C++	E Balaguruswamy	TMH 2020, 8th edition.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Object Oriented Programming in C++	Robert Lafore	Golgotia Publications Pvt. Ltd, 4 th Edition, 2008
2.	The complete reference C	Herbert shieldt	Tata McGraw Hill Publication, 4 th edition.



Subject Name: Probability and Complex Analysis

Semester: IV

Subject Code: MA4ES1

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	Understand the least square method to fit a curve for the given data and evaluate the correlation coefficient and regression lines for the data.
2	To develop probability distribution of discrete and continuous random variables.
3	Study the concept of joint probability distribution and Markov chain.
4	To learn the concept on complex analysis.

UNIT	Description	Hours
I	Statistics: Correlation and regression- Karl Pearson's coefficient of Correlation, problems. Regression analysis- lines of regression (without proof) problems. Curve Fitting: Curve fitting by the method of least square- Fitting of the curves: Linear, polynomial, exponential function of the form $y=ab^x$.	8
II	Probability Distributions: Review of basic probability theory. Random variables (Discrete and Continuous), Probability of mass/density functions. Binomial distribution, Poisson's distribution, exponential distribution and Normal distribution (without derivations) and problems.	7
III	Joint probability distribution: Joint probability distribution for two discrete random variables, Marginal distributions, Expectation, covariance, problems. Markov Chain: Probability Vector, Stochastic Matrix, Regular Stochastic Matrix, definition of Markov chain, Transition Probabilities and Transition probability Matrix, Higher Transition Probabilities, stationary distribution of regular Markov chains, problems.	8
IV	Complex Analysis: Review of function of a complex variables, limits, continuity and differentiability. Analytic functions, Cauchy-Reimann equations in Cartesian and polar forms (without proof). Properties and construction of analytic functions by Milne-Thompson Method. Bilinear Transformations.	9
V	Complex Integration: Line integral of complex function, Cauchy's theorem and Cauchy's integral formula (without proof) and problems. Taylor's theorem and Laurent's theorem (Statements only), Singular points: poles, Residues and Residue theorem (Without proof), problems.	8



Course Outcomes

Course outcome	Descriptions
CO1	Understand the concept of statistics probability distributions and stochastic process.
CO2	Use the concept of analytic function, complex integration and Residue theorem to solve the problem in Engineering field.
CO3	Apply probability distribution and stochastic process to design and analyse in Engineering fields.
CO4	Make use of Correlation and regression analysis and complex analysis to solve the problems in Engineering fields.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications,2015. ISBN:9788174091956
2	An Introduction to Probability Theory and its Applications	W.Feller	3 rd Edition, John Wiley & Sons, Inc, 2008. ISBN:9788126518050

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	A First Course in Probability	S.Ross	8 th Edition, Pearson, 2010. ISBN:9780136033134
2	Higher Engineering Mathematics	B.V. Ramana	1st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190



Subject Name: Signals and Systems

Semester: IV

Subject Code: ML4TH2

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Classify the continuous time signals and systems and discrete-time signals and systems
2.	Analyze the continuous time signals using Fourier series and Fourier transforms
3.	Understand the concepts of z-transform and discrete Fourier transform.
4.	Analyze the discrete time and continues time systems.

Unit	Course content	Teaching hrs
Unit I	Introduction To Signals: Definitions of a signal, elementary signals, classification of signals and basic operations on signals. Introduction to Biomedical signals.	08
Unit II	Introduction to Systems: Definition of a system, properties of systems. Representations of LTI systems, Convolution sum and integral. Block Diagram Representation.	07
Unit III	Transforms of Continuous time signals: Fourier Transform of time domain signal and its inverse, Relationship between FT and Laplace transform (only Properties statements).	07
Unit IV	Transforms of discrete time signals: DTFT of time domain signals and its inverse, Z-transform and its inverse, relationship between DTFT and Z-Transform, ROC properties and properties of DTFT and Z-Transform(only statements).	09
Unit V	Analysis of continuous and discrete time systems: Transfer function, Impulse response, Frequency response, and differential and difference equations.	08

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Ability to classify signals and operations of signals.
CO2	Identify system properties and determine the response of LTI systems using convolution.
CO3	Analyze the spectral content of signals using different transforms.
CO4	Demonstrate the understanding of the relation among transfer function, frequency response and impulse response.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100%syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.



Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	Simon Haykin and Barry Van Veen	John Wiley & Sons, 2009.
2	Signals and Systems	Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab	Pearson EducationAsia / PHI, 2nd edition,2007.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	H.Phsu, R.Ranjan	Scham's outlines,TMH, 2018.
2	Linear Systems and Signals	B.P.Lathi.	Oxford University Press, 2015 Wileyand Sons.



Subject Name: Circuit Theory And Analysis

Semester: IV

Subject Code: ML4TH3

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To introduce various circuit analysis methods.

Unit	Course content	Teaching hrs
Unit I	Basic concepts: Introduction, Network terminologies, Review of KVL & KCL, Energy sources – ideal & practical, Source Transformations, Mesh Analysis of DC & AC circuits, Nodal analysis of DC & AC circuits, Star – Delta transformations.	08
Unit II	Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.	08
Unit III	Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their representation, evaluation of initial and final conditions using differential equations of circuits with AC and DC excitation.	08
Unit IV	Circuit Analysis using Laplace Transforms: Step response of RL, RC & RLC circuits, Circuit analysis with LT using partial fraction expansion.	07
Unit V	Resonance: Series resonance, resonant frequency, reactance curves, voltage & current variable with frequency, Selectivity & bandwidth, Q – factor, circuit magnification factor Selectivity with variable C & variable L Parallel resonance, resonant frequency, impedance, selectivity, bandwidth Maximum impedance conditions with C, L, & f variable, current & Q – factor.	08

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Recall the fundamentals of electrical circuits and simplify the given circuits.
CO2	Solve for the circuit parameters by reducing the given circuit using network theorems.
CO3	Illustrate the behavior of circuit elements and analyze the behavior of the given circuits.
CO4	Analyze the given circuits using different methods of analysis. Determine the performance parameters of the given circuits.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.



Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Basic Engineering Circuit Analysis	J. David Irwin, R. Mark Nelms	8th edition, John Wiley & Sons, 2006.
2	Network Analysis	M E Van Valkenburg	3 rd Edition, 2007.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Engineering Circuit Analysis	William H.Hayt, Jr, Jack E.Kimmerly, Steven M.Durbin	6 th edition, Tata McGraw-Hill, 2002.
2	Networks and Systems	D. Roy Choudhury	New Age International, Reprint 2005.



Subject Name: Physiological Control System

Semester: IV

Subject Code: ML4TH4

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To study system concept and different mathematical techniques applied in analyzing any given system.
2.	Analysis of given system in time domain and frequency domain.
3.	To study the techniques of plotting the responses in both domain analysis.
4.	To apply these analysis to study the biological systems.

Unit	Course content	Teaching hrs
Unit I	Introduction: Examples of Control Systems, open loop vs Closed loop Systems, Mathematical Modelling of Linear Systems: Transfer functions, Mechanical Systems, Analogous Systems, Block diagram, Signal Flow graph. Difference between Engineering and Physiological Control System, Case study: Block diagram representation of the muscle stretch reflex.	08
Unit II	Time-Domain Analysis of the Control System: Step response of first order, second order systems, response specification, steady state error and error constants. Case study: Steady State Characteristics of the Muscle Stretch Reflex Model components, Regulation of Cardiac Output.	08
Unit III	Stability Analysis: Concept of stability, RH criterion, applications of RH criterion with limitations. Root locus technique: Introduction to root locus concepts, Construction rules, Analysis of stability by root locus plot.	08
Unit IV	Identification of Physiological control systems: Nonparametric and parametric identification of methods: discussion of it, Identification of closed loop systems: case studies: The starling Heart-Lung Preparation, minimal model of blood glucose regulation, respiratory control system.	08
Unit V	Frequency response Analysis: Bode plots, Relative stability and Frequency domain specification. Case studies; Bode plots of frequency response of the linearized lung mechanics.	07

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Obtain mathematical models of open loop and closed loop physical and physiological control systems.
CO2	Apply mathematical techniques to perform time response analysis of a physiological control systems.
CO3	Carry out stability analysis using different mathematical techniques on physiological systems by system identification.
CO4	Analyze physiological systems using frequency domain techniques.



Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Physiological control system	Michael. C.K .Khoo	PHI, 2012
2	Engineering control systems	Norman S. Nise	John WILEY & sons, 5 th Ed., 2015

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Modern control Engineering	Ogata	Prentice Hall, 2016
2	Automatic Control Systems	B.C Kuo	John Wileyand Sons, 2010
3	Control Engineering	Nagrath & Gopal	New Age International Publishers, 2010



Subject Name: Linear Integrated Circuits

Semester: IV

Subject Code: ML4TH5

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To understand the basic concepts of operational amplifier and its various applications.
2.	To understand the basics of PLL and its practical applications.
3.	To know about analog multipliers, analog switches and different A/D and D/A convertors.
4.	To introduce the concepts of waveform generation and introduce some special function ICs.

Unit	Course content	Teaching hrs
Unit I	Operational Amplifier Characteristics: Introduction, Amplifiers in closed loop configuration, DC and AC Characteristics, Frequency compensation. Operational Amplifier Applications: Instrumentation Amplifier, V to I and I to V converter, Op-amp circuits using Diodes – Half wave and Full wave rectifiers, peak detector, Sample and hold circuit.	08
Unit II	Comparators and waveform Generators: Introduction, comparator, Schmitt Trigger, Square wave generator using Astable Multivibrator, Monostable Multivibrator, Triangular wave generator. Sinusoidal oscillators - RC phase shift and Wien bridge oscillators.	08
Unit III	Voltage Regulators and Active Filters: Introduction, RC Active Filters, First order low pass filter, second order active filter, Higher order low pass filter, High pass active filter, All pass filter-phase shift lead and lag circuit.	08
Unit IV	D-A and A-D converters: Introduction, Analog and Digital data converter, specifications of D/A and basic DAC techniques-weighted resistor DAC, R-2R ladder DAC, A-D Converters: Specifications of A/D converter, classification of ADCs- The parallel Comparator/Flash ADC, counter type ADC, Successive Approximation Converter, single slope type ADC and Dual slope type ADC, Sigma – delta ADC.	08
Unit V	Timers : Functional block diagram of 555, Applications - Astable and Monostable multivibrators, Ramp generator. Phase locked loops: Introduction, Basic principles, phase detector/comparator, voltage controlled oscillator, PLL in frequency multiplication/Division.	07



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Apply the knowledge of electronic engineering fundamentals to comprehend linear integrated circuits based systems.
CO2	Interpret and analyze the effects of DC and AC limitations of Operational Amplifiers.
CO3	Implement linear integrated circuits in the areas of power sourcing, signal generation and conditioning, and analog communication.
CO4	Design and develop analog sub-circuits for linear and non-linear applications. Experiment and document the test results of various applications of linear integrated circuits, working both independently and in teams.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Linear Integrated Circuits	.Salivahanan & V.S.Kanchana Bhaaskaran	Tata McGraw - Hill Publication, 2014
2	Linear Integrated circuits	D Roy Choudhury &shail B Jain	New Age Publication, 2012

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Opamps and Linear ICs	David A.Bell	Prentice-Hall Publications,2007
2	Op-Amps and Linear Integrated Circuits	Ramakanth A.Gayakwad	4th ed, PHI, 2005



Subject Name: **Microcontrollers**

Semester: IV

Subject Code: **ML4TH6**

L-T-P-C: 3-0-0-

3

Course Objectives:

Sl. No.	Course Objectives
1.	To impart detailed different computer architectures and the detailed architecture of 8051.
2.	To impart detailed Addressing modes and instruction sets of 8051.
3.	To learn Internal interrupts, timers, counters.
4.	To learn External interface with devices like LCD, ADC, DAC and Stepper motor and Serial communication.

Unit	Course content	Teaching hrs
Unit I	Microprocessors and microcontroller: Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture. The 8051 Architecture: Introduction, Features of 8051, Architecture of 8051, Pin diagram of 8051, Memory organization.	07
Unit II	Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. 8051 programming: Assembler directives, Assembly language programs. 8051 Ports: Basics of I/O concepts, Port structure and Operation.	08
Unit III	8051 Interrupts and Timers/counters: Time delay calculations. Basics of interrupts, 8051 interrupt structure, 8051 timers/counters. Interfacing with external memory: memory address decoding.	08
Unit IV	8051 Interfacing and Applications: Interfacing 8051 to LCD, ADC, DAC, Stepper motor interfacing and DC motor interfacing. Programming examples in assembly language Case Study: ECG waveform Display/Body temperature measurement and display using sensor LM35.	08
Unit V	8051 Serial Communication: Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, 8051 Serial communication Programming in assembly language.	08

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Compare & differentiate different computer architectures.
CO2	Identify the different addressing modes, Instruction set and I/O Ports of 8051. Write software programs using all the instructions.
CO3	Design interface for ADC/DAC, LCD, Stepper & DC Motor and external memory with 8051. Case study for some medical applications.
CO4	Incorporate the Timer, Interrupts and Serial Communication in developing application programs.



Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller and Embedded Systems – using assembly and C	Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay	PHI, 2006.
2	8051 Microcontroller - Hardware, Software and Applications	V. Udayashankara and M.S. Mallikarjunaswamy	Tata McGraw-Hill, 2009.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller and embedded systems	Kenneth J. Ayala and Dhananjay V.Gadre	Cenegage learning, 2012
2	Programming and customizing the 8051 Microcontroller	Predko	TMH, 2007
3	Microcontrollers- Theory and Applications	Ajay V.Deshmukh	TMH, 2005



Subject Name: Microcontroller Lab

Semester: IV

Subject Code: ML4LB1

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1.	To impart detailed different computer architectures and the detailed architecture of 8051.
2.	To impart detailed Addressing modes and instruction sets of 8051.
3.	To learn Internal interrupts, timers, counters.
4.	To learn External interface with devices like LCD, ADC, DAC and Stepper motor and Serial communication.

Course content
I. PROGRAMMING for 8051 1 Familiarisation of Addressing modes. 2 Write programs for implementing ALU for given specifications. 3 Write programs to count different events. 4 Implementation of subroutines. 5 Write programs to implement standard code convertors. 6 Programs to generate delay, Programs using serial port and on-Chip timer / counter.
II. INTERFACING: 7 Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface 8 Stepper and DC motor control interface

Course Outcomes:

Sl. No.	Course Outcomes
CO1	To write program based on 8051.
CO2	Interface typical external hardware to 8051.
CO3	Handle versatile tool: Keil IDE.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller and Embedded Systems – using assembly and C	Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay	PHI, 2006.
2	8051 Microcontroller - Hardware, Software and Applications	V. Udayashankara and M.S. Mallikarjunaswamy	Tata McGraw-Hill, 2009.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller and embedded systems	Kenneth J. Ayala and Dhananjay V.Gadre	Cenegage learning, 2012
2	Programming and customizing the 8051 Microcontroller	Predko	TMH, 2007
3	Microcontrollers- Theory and Applications	Ajay V.Deshmukh	TMH, 2005



Subject Name: Biosensors and measurements Lab

Semester: IV

Subject Code: ML3LB2

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1.	To know and demonstrate basic knowledge of electrical wiring circuits, protective devices to work in biomedical engineering field.

Sl no.	Course Contents
1	(i)Introduction to Lab components & Instruments. (ii)Hands on Soldering.
2	Analyze the following Bridge circuits & list its applications. (i) Wheat Stone Bridge (ii) Maxwells Inductance & Capacitive Bridge
3	Demonstrate pH Instrument Calibration & Determine pH of the given buffer solution.
4	Illustrate Indirect Blood Pressure measurement using (i) Analog method (ii) Digital method
5	Calculate change in Strain Guage resistance & plot its characteristics.
6	To plot characteristics of temperature transducer.
7	To plot characteristics of polarized electrodes & non polarized electrodes.
8	To plot characteristics of multi-point electrodes.
9	To test concentration of given solution using photoelectric calorimeter.
10	To study & plot characteristics of Photo Electric Transducer (LDR).

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Comply with the safety procedures.
CO2	Apply the fundamentals of electricity.
CO3	Install and test electrical system.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electrical and Electronic Measurements and Instrumentation	A. K. Sawhney and Puneet Sawhney	Dhanpat Rai and Co. 2015

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electronic Devices and Circuit Theory	Robert L. Boylested and Louis Nashelsky	Pearson Education, 11th Edition, 2015



Subject Name: Signals and Control System Lab

Semester: IV

Subject Code: ML4LB3

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1.	Classify the continuous time signals and systems and discrete-time signals and systems.
2.	Analyze the continuous time signals using Fourier series and Fourier Transforms.
3.	Understand the concepts of z-transform and discrete Fourier transform.
4.	Analyze the discrete time and continues time systems.

Sl no.	Course Contents
1	Generation of Elementary signals.
2	Analysis of LTI Systems.
3	DTFT of a time domain signal.
4	Draw pole-zero plot.
5	Finding impulse response of a given difference equation.
6	Convolution of two time domain sequences.
7	Plot root locus and bode plot of the given transfer function.
8	Obtain step response of a second order system
9	Find Fourier Transform of a signal.
10	Plot Power Spectrum of a signal.

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Design a suitable experimental/simulation procedure for practical investigations on signals, systems.
CO2	Implement transformation techniques to analyze signals & systems.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	Simon Haykin and Barry Van Veen	John Wiley & Sons, 2001
2	Engineering control systems	Norman S. Nise	John WILEY & sons, 5 th Edition, 2010

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	H.Phsu,R.Ranjan,	Scham's outlines,TMH, 2006
2	Linear Systems and Signals	B.P.Lathi,	Oxford University Press, 2005 hn Wileyand Sons
3	Modern control Engineering	Ogata	Prentice Hall, 2010
4	Automatic Control Systems	B.C Kuo	John Wileyand Sons, 2010



Syllabus for 5th Semester (2020 Scheme)

V Semester B.E. Computer Science and Engineering (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.-Jan. 2018)						Teaching Hours/week				Examination			
SI No .	Course and Course Code		Course Title	Teaching dept.	Board of Exam	L	T	P	C	Duration in Hrs.	CI E	SE E	Total Marks
01	PC	CS5TH1	Web Technologies	CS	CS	3	-	-	3	3	50	50	100
02	PC	CS5TH2	Object Oriented Modelling and Design	CS	CS	3	-	-	3	3	50	50	100
03	PC	CS5TH3	Data Communication	CS	CS	3	-	-	3	3	50	50	100
04	PC	CS5TH4	Database Management	CS	CS	3	-	-	3	3	50	50	100
05	PE	CS5PE5x	Professional Elective-I	CS	CS	3	-	-	3	3	50	50	100
06	OE	CS5OE6x	Open Elective-I	CS	CS	3	-	-	3	3	50	50	100
07	PC	CS5MP1	Mini Project-I	CS	CS	-	-	4	2		50	50	100
08	PC	CS5LB1	Database Lab	CS	CS	-	-	3	1.5	3	50	50	100
09	PC	CS5LB2	Web Technology Lab	CS	CS	-	-	3	1.5	3	50	50	100
10	HS	SK5DP3	Skill Development-III	HS	HS	-	-	2	1	3	50	-	50
						18	-	12	24	27	500	450	950

Professional Elective I	Code	Subject Name	Open Elective I	Code	Subject Name
	CS5PE51	Advanced Data Structure		CS5OE61	Data Structure and Algorithm
	CS5PE52	Fundamentals of Digital Image Processing		CS5OE62	Database Management System
	CS5PE53	Unix System Programming		CS5OE63	Operating System



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Web Technologies

Subject Code: CS5TH1

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No.	Course Objectives
1	To introduce the fundamentals of the Internet, and the principles of web design.
2	To construct basic websites using HTML and Cascading Style Sheets.
3	To build dynamic web pages with validation using Java Script, JQuery objects and by applying different event handling mechanisms.
4	To develop modern interactive web applications using JAVA

UNIT	Description	Hours
I	Introduction to Web: Definitions and history, The client server model,(till 1.3.5)where is the internet?, Domain Name system, Uniform Resource locators, Introduction to HTML: what is HTML? And where did it come from, HTML syntax, Semantic Markup, structure of HTML documents, Quick tour of HTML elements, HTML5 Semantic structure elements. HTML Tables and forms: Introducing Tables, styling Tables, Introducing forms, form control elements, Table and form accessibility, Micro formats.	8
II	Introduction to Cascaded Style Sheet: What is CSS? CSS syntax, Location of styles, Selectors, The cascade: how styles interact, The Box model, CSS text styling. JavaScript: Client side scripting: What is JavaScript and what can it do, JavaScript design Principles. Where does JavaScript go, syntax, JavaScript objects, The Document Object model (DOM), JavaScript events, Forms, jquery foundations (15.2).	8
III	Web Frameworks Introducing Bootstrap 4: Aadvantages, Implementing frame work files, Inserting the JavaScript files, starter template, Normalizing and Rebooting, Taking the starter template further, Using a static site generator, Converting the base template to a generator, Setting up the layout, Working with layouts: layouts, containers, creating a three column layout, Working with content: Reboot defaults and basics, how to style images, coding tables, Playing with components: Buttons, outlines, checkbox, radio etc.,	8
IV	JDBC: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC / ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.	8
V	Servlet: Background; The Life Cycle of a Servlet; Servlet Development Options, Using Tomcat; A simple Servlet; The Servlet API; The javax.servlet Package; Reading Servlet Parameter; The javax.servlet.http package; Handling HTTP Requests and Responses, Using Cookies, Session Tracking. JSP: Java Server Pages: JSP, JSP Tags, Request string User Sessions, Cookies, Session Objects.	8



Course Outcomes:

Sl. No	Descriptions
1.	Explain the fundamentals of web Technologies.
2.	Design and validation of webpages using cascaded style sheets and frameworks.
3.	Apply the JDBC APIs for accessing databases.
4.	Illustrate the use of servlet APIs and JSP Scriptlets
5.	Design single page websites.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Fundamentals of Web Development	Randy Connollyy, Ricardo Hoar	2 nd edition, Pearson, 2017, ISBN 13: 978-0-13-340715-0
2	Learning Bootstrap 4	Matt Lambert	2 nd edition, PACKT Publishing(open source), 2016 ISBN 978-1-78588-100-8
3	Java - The Complete Reference	Herbert Schildt	9 th Edition, Tata McGraw Hill, 2014 ISBN: 978-1-25-900659-3
4	J2EE - The Complete Reference	Jim Keogh	Enterprise Edition, Tata McGraw Hill, ISBN-13:978-0-07-052912-0 ISBN-10: 0-07-052912-4

Reference Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Programming the World Wide Web	Robert. W. Sebesta	8 th edition, Pearson,2015, ISBN-13: 978-0-13-377598-3
2	Introduction to Java Programming	Y Daniel Liang	10 th edition, PHI ISBN-13: 978-0133761313 ISBN-10: 0133761312
3	The Java® Language Specification	James Gosling Bill Joy, Guy Steele GiladBracha Alex Buckley	Java SE 7 Edition ISBN-13: 978-0133260229 ISBN-10: 0133260224



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering
Subject Name: Object Oriented Modeling and Design
Subject Code: CS5TH2

Semester: 5
L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	Apprehend the basic Object Oriented Modeling concepts with UML notations.
2	Describe the overview of Object Oriented Software Development Process.
3	Understand modeling concepts for the Object Oriented Analysis of real world applications.
4	Learn various modeling concepts for the Object Oriented Design and Implementation of real world applications.

UNIT	Description	Hours
I	Introduction What is Object Orientation? What is Object Oriented development? Object Oriented themes. Modeling as Design Technique Modeling; abstraction; The three models. Class Modeling Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models. Advanced class modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages;	8
II	State Modeling Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips. Interaction Modeling Use case models; Sequence models; Activity models; Use case relationships; Procedural sequence models; Special constructs for activity models.	8
III	Process Overview Development stages; Development life cycle. System Conception Devising a system concept; elaborating a concept; preparing a problem statement Domain Analysis Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis Application interaction model; Application class model; Application state model; Adding operations	8



IV	System Design Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.	8
V	Class Design Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. Implementation modeling Overview of implementation, Fine tuning classes, Fine tuning generalizations, Realizing associations.	8

Course Outcomes:

Sl. No.	Descriptions
1.	Describe the basic concepts of Object Oriented Modeling.
2.	Formulate and Interpret Object Oriented Models.
3.	Construct Domain and Application Analysis Models.
4.	Build Design and Implementation Models
5.	Design Object Oriented solutions for real time problems.

Text Book:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Object-Oriented Modeling and Design with UML	Michael R Blaha, James R Rumbaugh	2 nd Edition, Pearson Education, 2005, ISBN-13:978-0130159205

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Object-Oriented Analysis and Design with Applications	Grady Booch et al	3 rd Edition, Pearson, 2007, ISBN:9780201895513
2	Practical Object-Oriented Design with UML	Mark Priestley	2 nd Edition, Tata McGraw-Hill, 2003. ISBN:9780077103934
3	The Unified Modeling Language User Guide	Booch, G., Rumbaugh, J., and Jacobson	2 nd Edition, Pearson, 2005, ISBN:9780201571684



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Data Communication

Subject Code: CS5TH3

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No	Course Objectives
1	Understand the basics of data communication
2	Describe the types of transmission and conversion techniques for exchange of data between two or more networks
3	Understand the error detection and correction techniques
4	Acquire the knowledge of services and features of various protocols

UNIT	Description	Hours
I	Data Communications and Network Models Introduction: Data communications: Components, Data Representation, Data Flow, Networks: Network Criteria, Physical structure, Network Types, Local Area Network, Wide Area Network, switching, The Internet, Standards and Administration: Internet Standards, Internet Administration. Network models: Protocol Layering: Scenarios, Principles of layering, Logical Connection, TCP/IP Protocol Suite: Layered architecture, Layers in the TCP/IP Protocol Suite, Description of each layer, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model, OSI versus TCP/IP.	8
II	Physical Layer and Media Data and Signals: Analog and digital Data, Analog and Digital Signals, Periodic and Non-periodic, Digital Signals,: Bit rate , Bit Length, Digital Signal as a composite Analog signal, Transmission of Digital Signals. Transmission impairment: Attenuation, Distortion, Noise. Data rate limits: Noiseless Channel-Nyquist Bit Rate, Noisy Channels-Shannon Capacity, Using both limits. Performance: Bandwidth, Throughput, Latency, Bandwidth Delay Product, Jitter. Digital Transmission: Digital-to-Digital conversion; Analog-to-Digital conversion; Transmission modes.	8
III	Physical Layer and Media Contd... Analog Transmission: Digital - to - Analog conversion; Analog - to - Analog conversion. Bandwidth Utilization: Multiplexing; Spread spectrum. Transmission media: Guided media, unguided media Switching: Three Methods of Switching, Switching and TCP/IP Layer, Circuit switched networks, Packet Switching: Data gram networks Virtual-circuit networks, Structure of a switch.	8



IV	Data Link layer Introduction, Link-Layer Addressing, Error Detection and Correction: Introduction, Block coding; Cyclic Codes: Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder using Polynomials, Cyclic Code Analysis, Advantages of Cyclic Codes, Other Cyclic Codes, Hardware Implementation, Checksum, Forward Error Correction, Data Link Control: DLC Services, Data-Link Layer Protocols, HDLC, Point-to-Point Protocol, Media Access Control: Random Access, Controlled Access, Channelization.	8
V	Data Link layer Contd... Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet. Wireless LAN's: Introduction, IEEE 802.11 Project, Bluetooth. - Architecture, Bluetooth Layers, Connecting Devices and Virtual LANs: Connecting Devices, Virtual LANs,	8

Course Outcomes:

Sl. No.	Descriptions
1.	Describe the general principles of data communication
2.	Identify the different types of signals and data codes for data communication
3.	Analyze flow control and error control mechanisms and apply them using standard protocols
4.	Identify the different types of communication media and compare the performance
5.	Illustrate the applications of OSI & TCP/IP Model

Text Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Data Communications and Networking,	Behrouz A. Forouzan:	5 th Edition, Tata McGraw Hill, 2006 978-1-25-906475-3

Reference Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Communication Network – Fundamental Concepts and Key	Alberto Leon-Garcia and Indra, Widjaja:	2 nd Edition, Tata McGraw-Hill, 2004. 978-0-07-059501-9
2	Data and Computer Communication,	William Stallings	8 th Edition, Pearson Education, 2007. 978-81-317-1536-9
3	Computer and Communication Networks	Nader F. Mir	Pearson Education, 2007, 978-81-317-1543-7
4	Computer Networks	Andrew S. Tanenbaum	4 th Edition, Pearson Education, 2008 978-01-306-6102-9



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering Semester: 5

Subject Name: Database Management System

Subject Code: CS5TH

L-T-P-C: 3–0–0–3

Course Objectives:

Sl.No.	Course Objectives
1	Knowledge of the architecture and functioning of Database Management Systems.
2	Understand and apply the principles of data modeling using Entity Relationship and develop a good database design.
3	Understand the use of Structured Query Language (SQL) and NoSQL
4	Apply normalization techniques to normalize a database and understand the need of database transaction.

UNIT	Description	Hours
I	Introduction : Introduction, An example, Characteristics of Database approach, Actors on the scene, Workers behind the scene, Advantages of using DBMS approach, A brief history of database applications, when not to use a DBMS. Data models, schemas and instances, Three schema architecture and data independence, Database languages and interfaces, The database system environment, Centralized and client-server architectures, Classification of Database Management systems.	8
II	Data Modeling using the Entity-Relationship (ER) Model : Using High-Level Conceptual, Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship types of degree higher than two. Relational Database Design, Using ER- to-Relational Mapping. Relational Model : Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and dealing with constraint violations.	8
III	SQL : Data Definition and Data Types, Specifying constraints in SQL, Basic queries in SQL, Insert, Delete and Update statements in SQL, More complex SQL Queries, Views (Virtual Tables) in SQL, Schema change statements in SQL.	8
IV	Database Design : Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys. Transaction Management, ACID properties, Transaction and schedules, Introduction to ARIES and WAL Protocol.	8
V	Introduction to NoSQL (Not Only SQL) : Where is it used? , what is it?, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, What we miss with NoSQL?, use of NoSQL in industry, NoSQL vendors, SQL versus NoSQL, NewSQL Introduction, Comparison of SQL, NoSQL and NewSQL	8



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Course Outcomes:

Sl. No.	Descriptions
1.	Explain the concepts of database management system.
2.	Design database using conceptual and relational model.
3.	Illustrate various DBMS commands using SQL and NoSQL
4.	Apply normalization for Relational schema.
5.	Design a database for various applications.

Text Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Fundamentals of Database Systems	Elmasri and Navathe	7 th Edition, Pearson Education, 2017, ISBN-13: 978-9332582705.
2	Big data And Analytics	Seema Acharya, Subhashini Chellappan, Infosys Limited	Publication Wiley India Private Limited, 1 st Edition 2015. ISBN:978- 81-265-5478-2

Reference Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	3 rd Edition, McGraw-Hill, 2014, ISBN-13:978-9339213114.
2	An Introduction to Database Systems	C.J. Date, A. Kannan, S. Swamynatham	8 th Edition, Pearson education, 2017, ISBN-13:978-8175855568.



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Advanced Data Structures and Algorithms

Subject Code: CS5PE51

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To provide the foundations of the practical implementation and usage of Algorithms and Data Structures
2	To extend the students' knowledge of algorithms and data structures
3	To enhance students expertise in algorithm design techniques.
4	To enhance students expertise in analysis of algorithms.

UNIT	Description	Hours
I	Review of basic Data Structures: Importance and need of good data structures and algorithms, Strategies for choosing the appropriate data structures. Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, the recurrence – tree method, the master method.	8
II	Advanced Data Structures: Splay Trees, B-trees, Fenwick tree, Fibonacci heaps, Data Structures for Disjoint Sets, Augmented Data Structures.	8
III	Graph Algorithms: Bellman-Ford Algorithm, Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method.	8
IV	Number -Theoretic Algorithms : Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element;	8
V	String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; Knuth-Morris-Pratt algorithm.	8

Course Outcomes:

Sl. No.	Descriptions
1.	Explain advanced algorithm and practical problem solving skills.
2.	Comprehend advanced data structures and its requirement.
3.	Analyze the efficiency and prove the correctness.
4.	Select appropriate data structures and algorithm design approaches in a problem specific manner.



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Text Book:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to Algorithms	T. H Cormen, C E Leiserson, R L Rivest and C Stein	3rd Edition, Prentice-Hall of India, 2010, ISBN-13:9780262033848

Reference Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Algorithm Design	Kleinberg J., Tardos	1st Edition, Pearson, 2012, ISBN-13:9780321295354



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Fundamentals of Digital Image Processing

Subject Code: CS5PE52

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No	Course Objectives
1	Acquire fundamental concepts of digital image processing
2	Learn image preprocessing techniques
3	Gain the knowledge of extracting the features from digital image
4	Exposure to simulate simple image processing algorithms

UNIT	Description	Hours
I	Introduction: What is Digital Image Processing?, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Digital image representation, examples of field that use DIP. Simple image model, Sampling and quantization, some basic relationships between pixels, some basic transformations	8
II	Digital image properties: Histogram, Entropy, Eigen Values and Image quality metrics Operations on digital images: Addition, subtraction, multiplication and division. Logical operations: AND, OR and NOT. Spatial operations: Single pixel, neighborhood, contrast stretching, intensity slicing, Bit-plane slicing and power law transformations	8
III	Image enhancement in the spatial domain: Background, Basic gray level transformations, histogram processing, enhancement using arithmetic/logic operations, basics of spatial filtering, smoothing and sharpening spatial filters, combining spatial enhancement methods.	8
IV	Image enhancement in the frequency domain: Introduction to the frequency domain, smoothing and sharpening frequency domain filters, Homomorphic filtering, implementation, generation of spatial masks from frequency domain specifications, basics of color image processing	8
V	Image segmentation: Edge Detection - Line Detection - Curve Detection, Boundary Representation, Region Representation And Segmentation, Morphology-Dilation, Erosion, Opening And Closing	8



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Course Outcomes:

Sl. No.	Descriptions
1.	Describe the fundamental concepts of a digital image processing and pattern classification.
2.	Analyze image preprocessing techniques.
3.	Employ basic segmentation procedures to extract region of interest.
4.	Apply suitable morphological operations for region description
5.	Use modern tools to Simulate image processing concepts in a team.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Digital Image Processing using MatLab	R. C. Gonzalez, R. E. Woods	Publisher: Pearson-Prentice-Hall, ISBN: 0-13-008519-7, 2 nd Edition: 2018
2	Image Processing and Analysis	Jayaraman and Esaki Rajan	Mc Hill India, 2009

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“Digital Image Processing”	R. C. Gonzalez and R. E Woods	Publisher: Pearson Education, ISBN-10: 013168728X, 3 rd Edition: 2007.
2	“Pattern Classification”	R. O. Duda, P. E. Hart, D. G. Stork,	Publisher: Wiley ISBN-13: 978-1-118-45668-2, ISBN: 1-118-45668-8, 3 rd Edition, 2016



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Unix System Programming

Subject Code: CS5PE53

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	Understand the fundamental design of the UNIX operating system
2	Learn to use UNIX Application Program Interface
3	Develop system level programs in the UNIX environment
4	Design and build applications over the UNIX operating system.

UNIT	Description	Hours
I	File Types, Inodes in UNIX System V, and Application Program Interface to Files, UNIX Kernel support for files, Relationship of C Stream pointers and file descriptors. General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.	8
II	Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions. Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Interpreter Files, system Function	8
III	Introduction, Terminal Logins, Network Logins, Process Group, Sessions, Controlling Terminal, Tcgetpgrp, tcsetpgrp and tcgetsid functions, Job Control. Signal Concepts, Signal function, Kill and raise functions, Signal sets, Sigpromask, sigpending, sigaction, abort sleep functions.	8
IV	Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model. Introduction, Pipes, popen and pclose functions, FIFOs, Message Queues, Semaphores.	8
V	Socket APIs, Simple example using Socket APIs, History of RPC, RPC Programming Interface Levels, RPC Library Functions, rpcgen.	8

Course Outcomes:

Sl.No.	Descriptions
1.	Explain the fundamental concepts of UNIX APIs.
2.	Create and handle the process synchronization.
3.	Demonstrate various signal APIs.
4.	Apply the concept of Inter Process Communication using IPC APIs.
5.	Implement client – server application using IPC APIs.



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Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Unix System Programming Using C++	Terrence Chan	Prentice Hall India, 2016 ISBN: 10: 0133315622
2	Advanced Programming in the UNIX Environment	W.Richard Stevens	3rd Edition, Pearson Education / PHI, 2017 ISBN: 978-0-321-63773-4

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	The Design of the UNIX Operating System	Maurice.J.Bach	Pearson Education / PHI, 1996 ISBN: 10 -0132017571
2	Advanced Unix Programming	Marc J. Rochkind	2 nd Edition, Pearson Education, 2005,ISBN: 10: 0131411543



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Data Structures and Algorithms

Subject Code: CS5OE61

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No	Course Objectives
1	Know efficient storage mechanisms of data for an easy access.
2	Design and implementation of various basic data structures.
3	Introduce various techniques for representation of the data in the real world.
4	Develop application using data structures.

UNIT	Description	Hours
I	Introduction: History of Algorithms, Definition, Structures and Properties of Algorithms, Development of an Algorithm, Data Structures and Algorithms, Data Structures - Definition and Classification. Analysis of Algorithms: Efficiency of Algorithms, Asymptotic Notations. Arrays: Introduction, Array Operations, Number of Elements in an Array, Representation of Arrays in Memory.	8
II	Stacks Introduction, Stack Operations: Stack Implementation, Implementation of push and pop operations, Applications: Recursive programming, Infix, Prefix and Postfix Expressions, Evaluation of postfix expressions.	8
III	Queues Introduction, Operations on Queues: Insert and Delete operations. Queue Implementation: Implementation of insert and delete operations on a queue, Limitations of linear queues. Circular Queues: Operations on a circular queue.	8
IV	Linked Lists Singly Linked List: Representation of a singly linked list, Insertion and deletion in a singly linked list. Doubly Linked List: Representation of a doubly linked list, Advantages and disadvantages of a doubly linked list, Operations on doubly linked lists.	8
V	Trees Trees: Definition and Basic Terminologies, Representation of Trees Binary Trees: Basic Terminologies and types, Representation of Binary Trees, Binary Tree Traversals.	8



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Course Outcomes:

Sl. No.	Descriptions
1.	Describe the basics of algorithms and data structures.
2.	Explain the working principle of linear data structures and non-linear Data structures.
3.	Illustrate different operations on data structures.
4.	Demonstrate applications of linear data structures and non-linear data structures.

Text Book:

Sl. No	Text Book title	Author	Volume and Year of Edition
1	Data Structures and Algorithms: Concepts, Techniques and Applications	G.A. Vijayalakshmi Pai	Tata McGraw Hill Education (2015) ISBN 10: 0070667268 ISBN 13: 9780070667266

Reference Book:

Sl. No	Text Book title	Author	Volume and Year of Edition
1	Data Structures A Pseudocode approach with C	Richard F. Gilberg and Behrouz A. Forouzan	Thomson, 2005.



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Database Management System

Subject Code: CS5OE62

L-T-P-C: 3–0–0–3

Course Objectives:

Sl. No.	Course Objectives
1	Knowledge of the architecture and functioning of Database Management Systems.
2	Understand and apply the principles of data modeling using Entity Relationship and develop a good database design.
3	Understand the use of Structured Query Language (SQL).
4	Apply normalization techniques to normalize a database and understand the need of database transaction and controlling the consequences of concurrent data access.

UNIT	Description	Hours
I	Introduction : Introduction, An example, Characteristics of Database approach, Actors on the scene, Workers behind the scene, Advantages of using DBMS approach, A brief history of database applications, when not to use a DBMS. Data models, schemas and instances, Three schema architecture and data independence, Database languages and interfaces, The database system environment.	8
II	Entity-Relationship (ER) Model : Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues.	8
III	SQL : Data Definition and Data Types, Specifying constraints in SQL, Basic queries in SQL, Insert, Delete and Update statements in SQL, More complex SQL Queries, Views (Virtual Tables) in SQL, Schema change statements in SQL.	8
IV	Database Design : Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.	8
V	Transaction Management : The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock- Based Concurrency Control, Dealing with Deadlocks, Transaction support in SQL. Introduction to ARIES and Write –Ahead Log protocol.	8



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Course Outcomes:

Sl. No.	Descriptions
1	Explain the concepts of database management system.
2	Design database using conceptual and relational model.
3	Apply normalization to create and manipulate a relational database using SQL.
4	Explain the basics of transactions processing and consistency control.
5	Design a database for various applications.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Fundamentals of Database Systems	Elmasri and Navathe	7th Edition, Pearson Education, 2017, ISBN-13: 978-9332582705.
2	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	3rd Edition, McGraw-Hill, 2014, ISBN-13:978-9339213114.

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Data base System Concepts	Silberschatz, Korth and Sudharshan	7th Edition, Mc-GrawHill, 2019, ISBN-13: 978-0078022159.
2	An Introduction to Database Systems	C.J. Date, A. Kannan, S. Swamynatham	8th Edition, Pearson education, 2017, ISBN-13:978-817585568.



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Operating system

Subject Code: CS5OE63

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To learn the classes of operating system, design architecture and system calls. 4 To learn the mechanisms involved in resource management in an OS.
2	To understand the concepts of process synchronization and scheduling through various algorithms.
3	To gain knowledge on system concepts that includes Mutual exclusion algorithms and deadlock detection algorithms.
4	To learn the mechanisms involved in resource management in an OS.

UNIT	Description	Hours
I	Introduction to Operating Systems and System Structures: What operating systems do? Computer System architecture; Operating System structure. System Structures : Operating System Services, System calls; Types of system calls; Operating System structure;	8
II	Process Management: Process concept: Overview; Process scheduling; Operations on processes; Inter process communication. Multithreaded Programming: Overview: Motivation, Benefits; Multithreading models; CPU Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms: First Come, First Served Scheduling, Shortest-Job First Scheduling, Priority Scheduling, Round-Robin Scheduling.	8
III	Process Coordination: Synchronization: Background; The Critical section problem; Peterson's solution; Mutex Locks; Semaphores; Classical problems of synchronization; Monitors: Monitor usage, Dining philosophers using monitors. Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection; Recovery from deadlock.	8
IV	Memory Management: Memory Management Strategies: Background; Swapping; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy- on write; Pag; Transaction Processing; Metadata, Data types; Exceptions.	8
V	Storage Management: File System: File concept; Access methods; File system mounting. Implementing File Systems: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. Mass storage structures; Disk structure ; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix	8



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Course Outcomes:

Sl. No.	Descriptions
1	Explore the fundamental concepts of various operating system services.
2	Describe various process management techniques to solve problems in multi-process environment.
3	Select and apply suitable techniques for efficient management of system resources. Analyze the performance of various resource management techniques.
4	Analyze the performance of various resource management techniques.
5	Design Linux, Windows and MacOS X.

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Operating System Principles	Peter Baer Galvin, Greg Gagne	9 th Edition, WileyIndia, ISBN: 9788126554270, 8126554274.

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Operating systems - A concept based Approach	D.M Dhamdhere:	3 rd Edition, Tata McGraw-Hill,2008, ISBN: 13:9781259005589,10:1259005585
2	An Introduction to Operating Systems; Concepts and Practice	P.C.P. Bhatt	4 th Edition, PHI, 2013, ISBN: 9788120348363
3	Operating Systems	Harvey M Deital:	3 rd Edition, Addison Wesley, 2007, ISBN: 9788131712894, 8131712893.



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Mini Project –I

Subject Code: CS5MP01

L-T-P-C: 0-0-4-2

Description
Mini Project Work Guidelines:
As a part of Mini project, all the students must carry out the following activities:
1. Students should form a group to carry out their project. The minimum of 1 student and a maximum of 2 in a group. 2. The groups will be attached to one Internal Guide by the Department. 3. Students have to carry out a detailed survey on the Topic on which they are interested to carry out the Mini-Project work. Students are expected to submit the Synopsis. 4. Based on survey identify the Problem statement in concerned with guide and prepare the squire specification report. 5. Implement the project work within the timeline. 6. Prepare and Give the presentation on time. 7. Prepare Project document and demonstrating their work.
Note:
• Department encourages to do the interdisciplinary projects. (Guides will look in to that.) • Students can do the mini project in such a way that he/she may continue the same project work in 6th semester and final year.

Procedure for Guide allotment
Collecting the area of interest both from Students and as well as the staff and then we match the area of each other and allocate the guides
Mini Project Work Evaluation Scheme Evaluation Scheme:
Continuous evaluation will be done by respective Project Guides based on the following points: Regularity, Technical Knowledge and Competence, Programming Skills, Communication Skills, Demonstration skills, Technical Competence, presentation, Team Work and Documentation Skills of the students.

Course Outcomes:

Sl.No.	Descriptions
1	Apply the engineering knowledge to identify the problem in a specified area.
2	Analyze the problem and design the high level modules.
3	Design the suitable ecological algorithms / methodologies and plan to work with a team.
4	Implement the solutions by selecting suitable language / tools / platforms / frameworks.
5	Communicate effectively through oral presentation and prepare detailed report describing the project and results.



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester:

5 Subject Name: Database Lab

Subject Code: CS5LB1

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No	Course Objectives
1	To understand how a real world problem can be mapped to schemas.
2	To solve different industry level problems & to learn its applications.

Lab Cycles	Description SQL Programming
I	A. Consider the following schema for Insurance database: PERSON (driver_id , name, address) CAR (regno, model, year) ACCIDENT (reportno, accd_date, location) OWNS (driver_id , regno) PARTICIPATED (driver_id, regno, reportno, damage_amt) B. Consider the following database schema for student database: STUDENT (usn, name, major, bdate) COURSE (courseno, cname, dept) TEXT (book_ISBN, book_title, publisher, author) ENROLL (usn, courseno, sem, marks) BOOK _ ADOPTION (courseno, sem, book_ISBN) C. Consider the following schema for a Library Database: BOOK (Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS (Book_id, Author_Name) PUBLISHER (Name, Address, Phone) BOOK_COPIES (Book_id, Branch_id, No-of_Copies) CARD(Card_No) BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date) LIBRARY_BRANCH (Branch_id, Branch_Name, Address)



II	D. Consider the following schema for Order Database: SALESMAN (Salesman_id, Name, City, Commission) CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) E. Consider the schema for Movie Database: ACTOR (Act_id, Act_Name, Act_Gender) DIRECTOR (Dir_id, Dir_Name, Dir_Phone) MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST (Act_id, Mov_id, Role) RATING (Mov_id, Rev_Stars) F. Consider the schema for Company Database: DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate) EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DLOCATION (DNo,DLoc) PROJECT (PNo, PName, PLocation, DNo) WORKS_ON (SSN, PNo, Hours) Instructions: Using given schema 1. Draw an Entity-Relationship(ER) Model. 2. Implement SQL Queries using DDL and DML Statements. 3. Implement SQL Nested queries and Views

Course Outcomes:

Sl. No.	Descriptions
1	Design database schema for a given problem-domain and enforce different constraints on a database using RDBMS.
2	Demonstrate the usage of SQL DML/DDL commands to populate and query a database.
3	Interpret, test and debug the program.
4	Communicate effectively through viva and write a report describing the experiment and its results.



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 5

Subject Name: Web Technologies Lab

Subject Code: CS5LB2

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1	To introduce the fundamentals of the Internet, and the principles of web design.
2	To construct basic websites using HTML and Cascading Style Sheets.
3	To build dynamic web pages with validation using Java Script, JQuery objects and by applying different event handling mechanisms.
4	To develop modern interactive web applications using JAVA

UNIT	Description
I	1. Design web pages using HTML. 2. Style web pages using CSS features.
II	3. Accepting and validating user entered data using JavaScript. 4. Design a webpage and handle the events using JQuery.
III	5. Write a program to design a webpage using frameworks
IV	6. Write a Java program to handle the result sets in different ways. 7. Write a Java program to display the content of a table into a webpage.
V	8. Write a Servlet to store form data to database. 9. Write a program to handle the session in different ways. 10. Demonstrate the different types of JSP tags.

Course Outcomes:

Sl.No.	Descriptions
1	Design web pages and style them using markup language.
2	Design and validate client side applications.
3	Develop database based applications and Server side Programs.
4	Interpret, test and debug the program.
5	Communicate effectively through viva voce and write a report describing the experiment and its results.



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Syllabus for 6th Semester (2020 Scheme)

VI Semester B.E. Computer Science and Engineering (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.- Jan. 2018)						Teaching Hours/week				Examination			
SI No .	Course and Course Code		Course Title	Teaching dept.	Board of Exam	L	T	P	C	Duration in Hrs.	CI E	SE E	Total Marks
01	PC	CS6TH1	Artificial Intelligence and Machine Learning	CS	CS	3	-	-	3	3	50	50	100
02	PC	CS6TH2	Compiler Design	CS	CS	3	-	-	3	3	50	50	100
03	PC	CS6TH3	Computer Networks	CS	CS	3	-	-	3	3	50	50	100
04	PC	CS6PE4x	Professional Elective-II	CS	CS	3	-	-	3	3	50	50	100
05	PE	CS6OE5x	Open Elective-II	CS	CS	3	-	-	3	3	50	50	100
06	OE	CS6MP1	Mini Project-II	CS	CS	-	-	6	3	3	50	50	100
07	PC	CS6LB1	Machine Learning Lab	CS	CS	-	-	3	1.5	3	50	50	100
08	PC	CS6LB2	Computer Networks Lab	CS	CS	-	-	3	1.5	3	50	50	100
09	HS	SK6DP4	Skill Development-IV	HS	HS	-	-	2	1	3	50	-	50
						15	-14	22		27	450	400	850

Professional Elective II	CODE	Name	Open Elective II	CODE	Name
	CS6PE41	Information Storage Management		CS6OE51	Java Programming
	CS6PE42	IOT		CS6OE52	Python Programming
	CS6PE43	Data Science			



Syllabus for the Academic Year 2022 – 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Artificial Intelligence and Machine Learning

Subject Code: CS6TH1

L-T-P-C:

3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	Understand Artificial Intelligence concept and its problem space.
2	Learn the field of Machine Learning, describing a variety of learning paradigms, algorithms, theoretical results, and applications.
3	To study the basics of supervised and unsupervised learning
4	Illustrate ML algorithm and their use in appropriate applications.

UNIT	Description	Hours
I	Introduction to Artificial Intelligence History of Artificial Intelligence, What Is Artificial Intelligence? Emergence of AI, Cognitive Science and AI, Logical Intelligence. Propositional Logic: Basics of Propositional Logic, Syntax, Semantics, Tautologies and Logical Implication, Logical Arguments, Derivation Systems, Resolution, Normal Forms, Derivations Using Resolution, Resolution Algorithm.	8
II	First-Order Logic Basics of First-Order Logic, Syntax, Semantics, Validity and Logical Implication. Derivation Systems, Modus Ponens for First-Order Logic. Introduction to Machine Learning What is machine learning?, What kind of problems can be tackled using machine learning, A Simple Machine-Learning Task: Training Sets and Classifiers, Minor Digression: Hill-Climbing Search, Hill Climbing in Machine Learning, Some Difficulties with Available Data.	8
III	Bayesian Classifiers The Single-Attribute Case, Vectors of Discrete Attributes, Probabilities of Rare Events: Exploiting the Expert's Intuition, How to Handle Continuous Attributes, Gaussian "Bell" Function: A Standard pdf, Approximating PDFs with Sets of Gaussians. Nearest-Neighbor Classifiers The k-Nearest-Neighbor Rule, Measuring Similarity, Irrelevant Attributes and Scaling Problems, Performance Considerations, Weighted Nearest Neighbors, Removing Dangerous Examples, Removing Redundant Examples.	8



IV	Artificial Neural Networks Multilayer Perceptrons as Classifiers, Neural Network's Error, Backpropagation of Error, Special Aspects of Multilayer Perceptrons, Architectural Issues. Decision Trees Decision Trees as Classifiers, Induction of Decision Trees, How Much Information Does an Attribute Convey?, Binary Split of a Numeric Attribute, Pruning, Converting the Decision Tree into Rules.	8
V	Unsupervised Learning Cluster Analysis, A Simple Algorithm: k-Means, More Advanced Versions of k-Means, Hierarchical Aggregation. Performance Evaluation Basic Performance Criteria, Precision and Recall, Other Ways to Measure Performance, Learning Curves and Computational Costs, Methodologies of Experimental Evaluation.	8

Course outcome:

Sl.No.	Descriptions
1	Explain the concepts of Artificial intelligence and Machine Learning.
2	Describe various supervised and unsupervised machine learning algorithms.
3	Illustrate the working of Machine Learning Algorithms.
4	Compare and analyze the performance of classifiers.
5	Apply variety of machine learning algorithms on data sets.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Artificial Intelligence With an Introduction to Machine Learning	Richard E. Neapolitan Xia Jiang	2 nd Edition, Chapman and Hall/CRC, May 2018, ISBN-13: 9781138502383 ISBN-10: 1138502383
2	An Introduction to Machine Learning	Miroslav Kubat	2 nd Edition, Springer, ISBN 978-3-319-63913-0 (eBook) ISBN 978-3-319-63912-3

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Machine Learning	Tom M. Mitchell	India Edition 2013, McGraw Hill Education, ISBN:13:9780070428072
2	Machine Learning – An Algorithmic Perspective	Stephen Marsland	2 nd Edition, Chapman and Hall/CRC, 2014, ISBN-10:1466583282 ISBN-13:978-146 583283



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Compiler Design

Subject Code: CS6TH2

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No.	Course Objectives
1	Learn different phases of compiler design in detail.
2	Gain knowledge about the parsing techniques using top-down and bottom-up approach.
3	Understand the techniques of Syntax Directed Translation.
4	Gain knowledge about intermediate code generation and target code generation.

UNIT	Description	Hours
I	Introduction, Lexical analysis Language processors; The structure of a Compiler; Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Recognition of tokens. Syntax Analysis Introduction: The role of the parser, Syntax-Error Handling, Error-recovery strategies; Writing a Grammar: Lexical versus Syntactic analysis.	8
II	Syntax Analysis Contd... Elimination of left-recursion and left-factoring; Top-down Parsing: Recursive-Descent Parsing, FIRST and FOLLOW; LL(1) Grammars, Non recursive Predictive Parsing.	8
III	Syntax Analysis Contd... Bottom-up Parsing: Reductions, shift-reduce parsing, Conflicts during shift-reduce parsing, Introduction to LR parsing: Simple LR: Why LR Parsers? Items and the LR(0) automaton, The LR parsing algorithm, Constructing SLR-parsing tables.	8
IV	Syntax-Directed Translation Syntax-Directed Definitions; Evaluation order for SDDs: Dependency graphs, Ordering the Evaluation of Attributes, S-attributed and L-attributed definitions; Applications of SDT; Syntax Directed Translation Schemes- Postfix Translation Scheme, Parser stack implementation of postfix SDT's, SDT's with actions inside productions.	8
V	Intermediate-Code Generation, Code Generation Intermediate-Code Generation: Variants of syntax trees: Directed Acyclic Graphs for expressions; Three-address code: Addresses and Instructions, Quadruples, Triples. Translation of expressions; Control-flow and Switch statements. Code Generation: Issues in the design of a Code Generator, The Target Language: A Simple Target Machine Model; Addresses in the target code; Basic blocks and Flow graphs, Optimization of basic blocks.	8



Course Outcomes:

Sl.No.	Descriptions
1	Describe the structure of a compiler along with the functionalities of different phases.
2	Apply different techniques to perform top-down and bottom-up parsing.
3	Illustrate the Syntax Directed Translation techniques in the construction of compiler.
4	Demonstrate the techniques of Intermediate Code Generation and target code generation in the design of a compiler.
5	Use modern tools to design a simple lexical analyzer and a parser for a programming language in a team.

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Compilers- Principles, Techniques and Tools	Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman	2 nd Edition, Addison-Wesley, 2007. ISBN: 0-321-48681-1

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Modern Compiler Implementation in C	Andrew W Apple	1 st Edition, (Revised) Cambridge University Press, 2004 ISBN-13: 978-0521607650
2	Compiler Construction Principles & Practice	Kenneth C Loudon	1 st Edition, Thomson Education, 1997. ISBN-13: 97 -0534939724



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Computer Networks

Subject Code: CS6TH3

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	Understand the routing algorithms and congestion control techniques
2	Analyze the services and features of transport layer protocols.
3	Understand the principles and operations behind various application layer protocols
4	Acquire the knowledge of Network Security

UNIT	Description	Hours
I	Network Layer Network Layer Design Issues: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks. Routing Algorithms: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast routing, Multicast routing, Congestion Control Algorithms: Approaches to Congestion Control, Traffic-aware routing, Admission control, Traffic throttling, Load Shedding	8
II	Network Layer continued Quality of Service: Application requirements, Traffic shaping, Packet scheduling, Admission control, Internetworking: How networks differ, how networks can be connected, Tunneling, Internetwork routing, Packet fragmentation. The Network Layer in the Internet: The IP version 4 protocol, IP addresses, IP version 6, Internet control protocols.	8
III	Transport Layer Services Provided to the Upper Layers, Transport Service Primitives, Berkeley Sockets, Elements of Transport protocols: Addressing, Connection establishment, Connection release, Error control and Flow control, Multiplexing, Crash recovery, Introduction to UDP, Remote Procedure Call. Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.	8



IV	Transport layer continued, Application Layer TCP Connection Management Modeling, TCP Sliding window, TCP Timer Management, TCP Congestion Control. DNS-Domain Name System: The DNS Name Space, Domain Resource Records, Name Servers. Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery. HTTP-The Hyper Text Transfer Protocol.	8
V	Network Security Introduction: Security Goals, Attacks, Services and Techniques. Confidentiality: Symmetric Key Ciphers, Asymmetric Key Ciphers. Other aspects of security: Message Integrity, Message Authentication, Entity Authentication, Key Management.	8

Course Outcomes:

Sl.No.	Descriptions
1	Analyze and apply various routing algorithms to find shortest paths for packet delivery
2	Interpret the appropriate protocol for reliable/unreliable communication.
3	Explain the features and operations of various application layer protocols
4	Identify the basic security threats of a network
5	Design subnets and calculate the IP addresses to fulfill the network requirements

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Computer Networks	Andrew S. Tanenbaum and David J Wetherall.	5 th Edition, 2019, ISBN 978-93-325-1874-2
2	Data Communications and Networking	Behrouz A. Forouzan	5 th Edition, ISBN-13: 978-1-25-906475-3

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Computer Networking- A Top-Down approach	James F Kurose and Keith W Ross	6 th Edition, Pearson Education, 2017 ISBN-13: 978-0-13-285620-1
2	Data and Computer Communications	William Stallings	8 th Edition, Pearson Education, ISBN- 978-81-317-1536-9
3	Communication Networks – Fundamental Concepts and Key architectures	Alberto Leon-Garcia and Indra Widjaja	2 nd Edition, Tata McGraw-Hill, 2017,ISBN-13:978-0-07-059501-9 ISBN-13: 978-0072463521



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Information Storage & Management

Subject Code: CS6PE41

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To understand the basics of Storage Networks and Devices
2	To understand the availability of different storage technologies
3	To understand the working and availability of channels for communication
4	To know the applications of storage technologies, Backup & Recovery mechanisms

UNIT	Description	Hours
I	Introduction: Introduction, Information Storage, Data center infrastructure, Key challenges, Information Life cycle, Server centric IT architecture and its limitations, Storage centric IT architecture and its advantages, Case study: Replacing a server with storage networks.	8
II	Intelligent Disk Subsystems: Architecture of intelligent disk subsystems, Hard disks and internal I/O channels, JBOD, Storage virtualization using RAID and different RAID levels, RAID 0, RAID 1, RAID 10, RAID 01, RAID 4 and RAID 6, RAID Comparisons, Caching: Acceleration of hard disk access, Caching: Intelligent disk subsystems, Logical Unit Numbers, Remote Mirroring, Comparison, Availability of disk subsystems.	8
III	Fiber Channel: The physical i/o path from the CPU to the storage system, SCSI(Small Computer System Interface): basics, Storage Networks, Fiber Channel Protocol Stack: Links & Topologies, (Fiber Channel 0) FC0, (Fiber Channel 1) FC1, (Fiber Channel 2) FC2, (Fiber Channel 3) FC3, Link & Fabric Services, (Fiber Channel 4) FC4 & (Upper Layer Protocols) ULPs.,	8
IV	Network Attached Storage: Local file systems: File systems and Databases, Journaling, Snapshots, Volume Manager, Network file systems and file servers, Shared disk file systems, Comparison: NAS (Network Attached Storage), FC SAN (Fiber Channel Storage Area Networks) and iSCSI SAN	8
V	Storage Virtualization: Definition of Storage virtualization, Implementation considerations, Storage virtualization on Block or File level, Symmetric and Asymmetric storage virtualization.	8



Course Outcomes:

Sl.No.	Descriptions
1	Describe the concepts of Storage networks and its various technologies.
2	Apply different storage technologies like RAID, LUN, Instant Copying, Remote Mirroring etc., to establish Data center to fulfill the storage requirements.
3	Design error free, efficient and effective data transmission between nodes and data centers using Fiber channel, SCSI and other technologies.
4	Analyze the problems in different scenarios to provide the solutions.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	“Storage networks explained”	Ulf troppens, Rainer erkins and Wolfgang Muller	Wiley India, 2017
2	Information Storage and Management,	G.Somasundaram, Alok Shrivastava(Editors)	EMC Education Services, Wiley-India, 2016.

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Storage area network essentials: A complete guide to understanding and implementing SANs	Richard Barker and Paul Massiglia	John wiley India, 2012.
2	Storage networks: the complete reference	Robert spalding	Tata Mcgraw-hill, 2003.



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Internet of Things

Subject Code: CS6PE42

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1	To understand the vision and introduction of IoT.
2	To learn the concepts of IOT in market perspective
3	To Learn Data and Knowledge Management and use of Devices in IoT Technology
4	To Understand the IoT Reference Models ,Real World Design Constraints and Asset Management

UNIT	Description	Hours
I	M2M to IoT - The Vision : Introduction, From M2M to IoT - A brief background, M2M communication, IoT, M2M towards IoT-the global context - Game changers, General technology and scientific trends, Trends in information and communications technologies, , A use case example, Differing Characteristics.	8
II	M2M to IoT- A Market Perspective: Introduction - Information marketplaces, Some Definitions - Global value chains, Ecosystems vs. value chains, Industrial structure, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT - The information-driven global value chain.	7
III	M2M and IoT Technology Fundamentals : Devices and gateways - Introduction, Basic devices, Gateways, Data management - Introduction, Managing M2M data, Considerations for M2M data, Business processes in IoT - Introduction, IoT integration with enterprise systems, Distributed business processes in IoT, Knowledge Management - Data, information, and knowledge, A knowledge management reference architecture.Retrial Layer	9
IV	Architecture Reference Model: Introduction, Reference Model and architecture, IoT Reference Model - IoT domain model, Information model, Functional model, Communication model, Safety, privacy, trust, security model.	8
V	Real-World Design Constraints: Introduction, Technical Design constraints hardware is popular again - Devices and networks, Data representation and visualization, Interaction and remote control. Asset Management: Introduction, Expected benefits, -Maintenance in the M2M Era, Hazardous goods management in the M2M Era	8

Course Outcomes:



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY. TUMKUR

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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Sl.No.	Descriptions
1	Interpret the vision of IoT from a global context and determine the market perspective of IoT
2	Compare and contrast the use of devices, gate ways and, data management in IoT
3	Analyze and design different reference models in IoT
4	Evaluate the applications of IoT and identify real world design constraints.
5	Design IoT System For Real Time Applications

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence	Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle	1st Edition, Academic Press, 2014. (ISBN-13: 978-0124076846)

Reference Book:

Sl. No.	Reference Book title	Author	Volume and Year of Edition
1	Internet of Things (A Hands-on-Approach)	Vijay Madisetti and Arshdeep Bahga	1st Edition, VPT, 2014 (ISBN-13: 978-8173719547)
2	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything	Francis da Costa	1st Edition, A press Publications, 2013 (ISBN-13: 978-1430257400)



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Data Science and Analytics

Subject Code: CS6PE43

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To learn the fundamentals of data science and big data
2	To gain in-depth knowledge on descriptive data analytical techniques.
3	To gain knowledge to implement simple to complex analytical. Algorithms in big data frameworks.
4	To develop programming skills using required libraries and packages to perform data analysis in Python.
5	To understand and perform data visualization, web scraping, machine learning and natural language processing using various Data Science tools

UNIT	Description	Hours
I	INTRODUCTION TO DATA SCIENCE AND BIG DATA Data Science – Fundamentals and Components – Data Scientist – Terminologies Used in Big Data Environments – Types of Digital Data – Classification of Digital Data – Introduction to Big Data – Characteristics of Data – Evolution of Big Data – Big Data Analytics – Classification of Analytics – Top Challenges Facing Big Data – Importance of Big Data Analytics – Data Analytics Tools.	8
II	DESCRIPTIVE ANALYTICS USING STATISTICS Types of Data – Mean, Median and Mode – Standard Deviation and Variance – Probability – Probability Density Function – Types of Data Distribution – Percentiles and Moments – Correlation and Covariance – Conditional Probability – Bayes' Theorem – Introduction to Univariate, Bivariate and Multivariate Analysis – Dimensionality Reduction using Principal Component Analysis and LDA – Dimensionality Reduction using Principal Component Analysis and Linear Discriminant Analysis (LDA) – Principal Component Analysis (PCA) example with Iris Data Set from UCI repository. Transactions and dealing with constraint violations.	8
III	PREDICTIVE MODELING AND MACHINE LEARNING Linear Regression – Polynomial Regression – Multivariate Regression – Multi Level Models – Data Warehousing Overview – Bias/Variance Trade Off – K Fold Cross Validation – Data Cleaning and Normalization – Cleaning Web Log Data – Normalizing Numerical Data – Detecting Outliers – Introduction to Supervised And Unsupervised Learning – Reinforcement Learning – Dealing with Real World Data – Machine Learning Algorithms – Clustering – Python Based Application.	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY. TUMKUR

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IV	DATA ANALYTICAL FRAMEWORKS Introducing Hadoop –Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Introduction to NoSQL: CAP theorem – MongoDB: RDBMS Vs MongoDB – Mongo DB Database Model – Data Types and Sharding – Introduction to Hive – Hive Architecture – Hive Query Language (HQL).	8
V	DATA SCIENCE USING PYTHON Introduction to Essential Data Science Packages: Numpy, Scipy, Jupyter, Statsmodels and Pandas Package – Data Munging: Introduction to Data Munging, Data Pipeline and Machine Learning in Python – Data Visualization Using Matplotlib – Interactive Visualization with Advanced Data Learning Representation in Python.	8

Course Outcomes

Sl. No.	Descriptions
1	Identify the real world business problems and model with analytical solutions.
2	Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
3	Demonstrate simple applications involving analytics using Hadoop and MapReduce.
4	Use open source frameworks for modelling and storing data. :
5	Perform data analytics and visualization using Python

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Hands On Data Science and Python Machine Learning	Frank Pane	Packt Publishers, 2017. ISBN-13 978-1787280748
2	Bigdata And Analytics	SeemaAcharya, Subhashini Chellappan, Infosys Limited	Publication:Wiley India Private Limited,1st Edition 2015. ISBN:978-81-265-5478-2

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Python Data Science Essentials	Alberto Boschetti, Luca Massaron	Packt Publications, 2nd Edition, 2016. ISBN 9781789537864
2	Big Data Black Book	DT Editorial Services	Dream Tech Press, 2015 ISBN 13 9789351197577
3	Python Machine Learning	Yuxi (Hayden) Liu	Packt Publication, 2017 ISBN-13 978-1783553112



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Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Java Programming

Subject Code: CS6OE51

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No	Course Objectives
1	Understand the fundamentals of Object-Oriented Programming in Java.
2	Understand the principles of inheritance, packages and interfaces.
3	Understand fundamentals of exception handling mechanisms.
4	Write Object oriented programs.

UNIT	Description	Hours
I	History and Evolution of Java An overview of Java: The Java's Magic: The Bytecode, The Java buzzwords, object-oriented programming, A first simple program, A second short program, two control statements, Java keywords. Data types, Variables and Arrays: The primitive types, Integers, Floating-Point types, characters, Booleans, variables, types conversion and casting, automatic type promotion in expressions, arrays.	8
II	Operators and Control Statements Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The? Operator, Operator Precedence, Using Parentheses. Control Statements: Java's selection statements: if and switch, iteration statements: while, do-while, for, the for-each version of the for loop, nested for loops, Jump statements: using break, continue and return.	8
III	Introducing Classes and A Closer Look at Methods and Classes Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this keyword, Garbage Collection, The finalize() method, A Stack Class. A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Introducing Access Control, Understanding Static, Introducing final, Introducing Nested and Inner Classes.	8
IV	Inheritance and Packages Inheritance: Inheritance Basics, Using Super, Creating Multilevel Hierarchy, When Constructors are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance. Packages: Packages, Access Protection, Importing Packages.	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY. TUMKUR

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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V	Interfaces and Exception Handling Interfaces: Defining and Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces can be Extended. Exception Handling: Exception-handling fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions.	8

Course Outcomes:

Sl.No.	Descriptions
1	Describe the fundamentals of Object-Oriented Programming.
2	Identify classes, objects, members of a class and relationships among them needed for specific problem.
3	Design and implement object oriented solutions involving multiple objects, packages and interfaces.
4	Develop programs by using exception handling mechanisms.

Text Book:

Sl. No.	Title	Author	Edition, Publisher, Year, ISBN
1	Java – The Complete Reference	Herbert Schildt	9 th Edition, Tata McGraw Hill, 2014, ISBN-13 :978-93-392-1209-4

Reference Book:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to Java Programming	Y. Daniel Liang	10 th Edition, Pearson Education, 2015, ISBN : 978-0-13-3761313



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Python Programming

Subject Code: CS6OE52

L-T-P-C: 3-0-0-3

Course Objectives:

Sl No	Course Objectives
1	Learn the procedure of Python interpreter installation and its working.
2	Understand the concepts of conditional and loop statements
3	Implement built-in and user defined functions.
4	Build and execute lists, tuples, dictionaries and sets in Python.

UNIT	Description	Hours
I	The Context of Software Development: About Python, Installing Python, The Python Interpreter, Python editors and IDEs, Learning Programming with Python, Writing a Python Program, A Longer Python program. Values and Variables: Integer Values, Variables and Assignment, Identifiers, Floating-point Numbers, Control Codes within Strings, User Input, Controlling the print Function, String Formatting, Multi line Strings. Expressions and Arithmetic: Expressions, Mixed Type Expressions, Operator Precedence and Associativity, Formatting Expressions, Comments, Errors, Syntax Errors, Run-time Errors, Logic Errors, Arithmetic Examples, More Arithmetic Operators.	8
II	Conditional Execution: Boolean Expressions, The Simple if Statement The if/else Statement, Compound Boolean Expressions, The pass Statement, Floating-point Equality, Nested Conditionals, Multi-way Decision Statements, Conditional Expressions, Errors in Conditional Statements. Iteration: The while Statement, Definite Loops vs. Indefinite Loops, The for Statement, Nested Loops, Abnormal Loop Termination, while/else and for/else, Infinite Loops, Iteration Examples, Computing Square Root, Drawing a Tree, Printing Prime Numbers, Insisting on the Proper Input.	8
III	Using Functions: Introduction to Using Functions, Functions and Modules, The Built-in Functions, Standard Mathematical Functions, time Functions, Random Numbers, System-specific Functions. Writing Functions: Function Basics, Parameter Passing, Documenting Functions, Function Examples, Better Organized Prime Generator, Command Interpreter ,Restricted Input, Better Die Rolling Simulator, Tree Drawing Function , Floating-point Equality.	8
IV	More on Functions: Global Variables, Default Parameters, Recursion, Making Functions Reusable, Functions as Data. Lists: Motivation, List Structures, Lists (Sequences) in Python, Iterating Over Lists (Sequences) in Python, More on Python Lists. Objects: Using Objects, String Objects, List Objects.	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY. TUMKUR

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V	Dictionaries, and Sets: Dictionaries, Using Dictionaries, Counting with Dictionaries, Grouping with Dictionaries, Keyword Arguments, Sets, Set Quantification with all and any, Enumerating the Elements of a Data Structure.	8

Course Outcomes:

Sl.No.	Descriptions
1	Explain the Python syntax and be fluent in the use of Python flow control and iterations.
2	Describe the type of operators, built-in libraries and functions.
3	Develop Python programs using List and object concepts.
4	Create, run and manipulate the Python programs using core data structures like tuples, dictionaries and sets.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Fundamentals of Python Programming	Richard L. Halterman	Southern Adventist University, 2019, E-book, ISBN:9781539530268
2	Introduction to Computer Science Using Python: A Computational Problem-Solving	Charles Dierbach	1 st Edition, Jhon Wiley & Sons, Inc. Publications, 2012, ISBN:9780470555156

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Think Python	Allen Downey	2 nd Edition, O'Reilly Media, ISBN: 9781491939369
2	Learning Python	B.Nagesh Rao	1 st Edition, A cyberplus publication, 2017, ISBN:9788193392300



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6 Subject

Name: Mini Project - II

Subject Code: CS6MP01

L-T-P-C: 0-0-6-3

Description
Mini Project Work Guidelines: As a part of Mini project, all the students must carry out the following activities: 1. Students should form a group to carry out their project. The minimum of 1 student and a maximum of 2 in a group. 2. The groups will be attached to one Internal Guide by the Department. 3. Students have to carry out a detailed survey on the Topic on which they are interested to carry out the Mini-Project work. Students are expected to submit the Synopsis. 4. Based on survey identify the Problem statement in concerned with guide and prepare the squire specification report. 5. Implement the project work within the timeline. 6. Prepare and Give the presentation on time. 7. Prepare Project document and demonstrating their work. Note: • Department encourages to do the interdisciplinary projects. (Guides will look in to that.) • Students can do the mini project in such a way that he / she may continue the same project work for final year.
Procedure for Guide allotment Collecting the area of interest both from Students and as well as the staff and then we match the area of each other and allocate the guides'
Mini Project Work Evaluation Scheme Evaluation Scheme: Continuous evaluation will be done by respective Project Guides based on the following points: Regularity, Technical Knowledge and Competence, Programming Skills, Communication Skills, Demonstration skills, Technical Competence, presentation, Team Work and Documentation Skills of the students.

Course Outcomes:

Sl.No.	Descriptions
1	Apply the engineering knowledge to identify the problem in a specified area.
2	Analyze the problem and design the high level modules.
3	Design the suitable ecological algorithms / methodologies and plan to work with a team.
4	Implement the solutions by selecting suitable language / tools / platforms / frameworks.
5	Communicate effectively through oral presentation and prepare detailed report describing the project and results.



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6 Subject

Name: Machine Learning

Subject Code: CS6LB1

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No	Course Objectives
1	Make use of Data sets in implementing the machine learning algorithms.
2	Implement the machine learning concepts and algorithms in any suitable language of choice.
3	Understand and present the key algorithms and theorems that form the core of machine learning.
4	Discuss how the learning performance varies with the number of training examples presented.

CYCLE - I

1	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
2	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
3	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
4	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
5	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

CYCLE- II

6	Solve the given machine learning problem by applying the concepts discussed in the course 18CS603: Naive Bayes, Linear Regression, ANN, K-Nearest Neighbors, Support Vector Machine and K – Means



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY. TUMKUR

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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V Semester B.E. ECE (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)							Examination			
Sl	Course Code		Course Title	Teaching dept.	Board of Exam.	Credits	CIE	SEE	Total Marks	Exam Hrs.
01	PC	EC5TH1	Digital Signal Processing	ECE	ECE	3	50	50	100	3
02	PC	EC5TH2	Embedded System Design	ECE	ECE	3	50	50	100	3
03	PC	EC5TH3	Fundamentals of CMOS VLSI Design	ECE	ECE	3	50	50	100	3
04	PC	EC5TH4	Microwave Theory and Antennas	ECE	ECE	3	50	50	100	3
05	PE	EC5PE5x	Professional Elective-I	ECE	ECE	3	50	50	100	3
06	O E	EC5OE6x	Open Elective-I	ECE	ECE	3	50	50	100	3
07	PC	EC5MP1	Mini Project-I	ECE	ECE	2	50	50	100	3
08	PC	EC5LB1	DSP Lab	ECE	ECE	1.5	50	50	100	3
09	PC	EC5LB2	VLSI Lab	ECE	ECE	1.5	50	50	100	3
10	HS	SK5DP3	Skill Development-III	HS	HS	1	50	-	50	-
Total						24	500	450	950	
CIE-Continuous Internal Evaluation, SEE-Semester End Examination										

There is no SEE for Skill Development-IV Course. However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject (SK5DP3).

Professional Elective I:	Open Elective I:
EC5PE51: Python Programming EC5PE52: Robotics and Automation EC5PE53: Sensors and Signal Conditioning	EC5OE61: Information Theory and Coding EC5OE62: Sensors and Instrumentation



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY. TUMKUR

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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VI Semester B.E. ECE (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)							Examination			
SI	Course Code		Course Title	Teaching dept.	Board of Exam.	Credits	CIE	SEE	Total Marks	Exam Hrs.
01	PC	EC6TH1	Digital Communication	ECE	ECE	3	50	50	100	3
02	PC	EC6TH2	Digital Image Processing	ECE	ECE	3	50	50	100	3
03	PC	EC6TH3	Computer Communication Networks	ECE	ECE	3	50	50	100	3
04	PE	EC6PE4x	Professional Elective-II	ECE	ECE	3	50	50	100	3
05	OE	EC6OE5x	Open Elective-II	ECE	ECE	3	50	50	100	3
06	PC	EC6MP2	Mini Project-II	ECE	ECE	3	50	50	100	3
07	PC	EC6LB1	Advanced Communication Lab	ECE	ECE	1.5	50	50	100	3
08	PC	EC6LB2	CCN Lab	ECE	ECE	1.5	50	50	100	3
09	HS	SK6DP4	Skill Development-IV	HS	HS	1	50	-	50	-
Total						22	450	400	850	
CIE-Continuous Internal Evaluation, SEE-Semester End Examination										

There is no SEE for Skill Development-IV course. However, all the students should maintain a minimum

85% of attendance and 40% of CIE to get pass in the subject.

Professional Elective II:	Open Elective II:
EC6PE41: Analog and Mixed Signal VLSI Design EC6PE42: Artificial Intelligence EC6PE43: Cryptography and Information security	EC6OE51: Robotics EC6OE52: Pattern Recognition



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Department: ECE

Semester: 5

Subject Name: DIGITAL SIGNAL PROCESSING

Subject Code: EC5TH1

L-T-P-C: 3-0-0-3 (39 Hours)

Course Objectives: This course will enable students to:	
1	Understand the basics of digital signal processing.
2	Develop algorithms using DFT and FFT.
3	Understand the concepts of analog and digital filter design and its structures.
4	Study the architecture and instruction set of TMS32067x processor.

UNIT	Description	Hours
1	Frequency Domain Sampling: Frequency domain sampling and reconstruction of discrete time signals Discrete Fourier Transform (DFT): Discrete Fourier Transform, DFT as a linear transformation, Relationship of DFT to other transforms, Properties of DFT (without derivation. (Text 1: 7.1, 7.2)	8
2	Linear Filtering: Use of DFT in linear filtering, Filtering long data sequences: overlap-save, overlap-add method Fast Fourier Transform (FFT) algorithms: Direct computation of DFT, Radix-2 FFT algorithm: Decimation-in-time algorithm, Decimation-in-frequency algorithm (without derivation). (Text 1: 7.3.1, 7.3.2, 8.1.1 to 8.1.3)	7
3	FIR Filters and its applications: Design of FIR filters: Symmetric and anti-symmetric FIR filters, Design of linear phase FIR filters using windows and frequency sampling methods, FIR differentiators Structures for FIR Systems: Direct form structures, cascade form structures and linear phase structures. (Text 1: 10.2.1, 10.2.2 to 10.2.3, 10.2.5, 10.2.6, 9.2.1 and 9.2.2)	8
4	IIR Filters: Analog filter specifications, Classification of analog filters: Butterworth and Chebyshev approximations, Frequency transformations, Design of analog filters. Digital IIR filter design using impulse invariant technique, Bilinear transformations. IIR filter structures: Direct form (I and II), Cascade, Parallel structures. (Text 1: 10.3.2, 10.3.3, 10.3.5, 9.3.1, 9.3.3, 9.3.4)	8
5	Architecture and Instruction set of TMS320C67x processor: Architecture, Pipelining, Linear and circular addressing modes, Instruction sets, Assembler directives, Interrupts, Memory considerations, Fixed and floating point formats, Implementation of FIR and IIR filters. (Text 2: 3.1 to 3.9.3, 3.14, 3.18, 4.7, 5.4)	8



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Text Books:

Sl	Author	Text Book title	Publisher	Volume / Issue	Year of Publication
1	J. G. Proakis, D. G. Manolakis	Digital Signal Processing: Principles, Algorithms and Applications 4 th Edition,	Pearson Education Asia/Prentice Hall of India	ISBN 9780131873742	2014.
2	Rulph Chassaing, Donald Reay	Digital Signal Processing and Applications with TMS320C6713 and TMS320C6416 DSK 2 nd Edition	Wiley India	ISBN 9788126528745	2014

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Publication
1	S. K. Mitra	Digital Signal Processing: A Computer based Approach	McGraw Hill 4 th Edition	ISBN 978-0073380490	2013
2	Sen M. Kuok, Woon-Seng S. Gan	Digital Signal Processors – Architectures, Implementations and Applications	Pearson/ Prentice Hall,	---	2005.
3	Emmanuel Ifeachor, Barrie W. Jervis	Digital Signal Processing: A Practical Approach	Pearson Education 2 nd Edition	ISBN 9788131708248	2002.

Course Outcomes: After completing the course the students will be able to	
CO1	Apply the transform domain and its significance in linear filtering applications. (L3).
CO2	Interpret the computational complexity of DFT using FFT algorithms.(L2).
CO3	Design digital filters and examine the applications of filters and their realizations. (L3).
CO4	Outline the architecture and instruction set of TMS32067xxprocessor. (L2).



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Department: ECE

Semester: 5

Subject Name: Embedded System Design

Subject Code: EC5TH2

L-T-P-C: 3-0-0-3(39 Hours)

Course Objectives: This course will enable students to:	
1	To provide an overview of Design Principles of Embedded System.
2	To provide clear understanding about the role of firmware, operating systems in correlation with hardware systems.
3	To make students to aware of single purpose processors for specific applications.
4	To explore students to the concept of interrupts, their service mechanism and scheduling.

UNIT	Description	Hours
1.	INTRODUCTION TO EMBEDDED SYSTEMS: Overview of embedded systems, Embedded system design challenges, Common design metrics and optimizing them, Processor Technology, Design Technology, IC Technology. (Text1: section1.1 to 1.5)	8
2.	GENERAL-PURPOSE PROCESSORS: Basic Architecture, Operation, Programmer's View, Development Environment, ASIPS. (Text1: section 3.1 to 3.6)	8
3.	SINGLEPURPOSE PROCESSORS: Standard Single-Purpose Peripherals, Timers, Counters, UART, PWM, LCD Controllers, Keypad controllers, Stepper Motor Controller, A to D Converters, Examples. (Text1: section 4.1 to 4.8 & Ref1) Text 1 (Section 6.1 to 6.8)	8
4.	INTERRUPTS: Introduction, Shared Data Problem, Interrupt latency, Survey of Software Architectures: Round Robin, Round Robin with Interrupts, Function Queues scheduling RTOS architecture. (Text2: section 4.1 to 4.4, section 5.1 to 5.4)	8
5.	INTRODUCTION TO RTOS: Task- states, Semaphores and shared data. More operating systems services - Message Queues, Mail Boxes, Pipes, Timers, Events. (Text2: section 6.1 to 6.3, section 7.1 to 7.3)	7

Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Publication
1	Frank Vahid, Tony D. Givargis	Embedded System Design: A Unified Hardware/Software Introduction	John Wiley & Sons Inc.	ISBN: 978-0-471-38678-0	2001
2	David E. Simon	An Embedded software Primer	Pearson Education	ISBN:81-7758-154-6	2002



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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Reference Books:

Sl	Author	Text Book title	Publisher	Volume / Issue	Year of Publication
1	Phillip A Laplante, Seppo J Ovaska	Real-Time Systems Design and Analysis	John Weily India Pvt. Ltd	ISBN:978 -81-265-4193-5	2015
2	Shibu K.V	Introduction to Embedded Systems	McGraw-Hill Education(IND I A) Private limited	2nd edition, ISBN:978 -0-07-14589-4	2017
3	Raj Kamal, TMH. 2008 Education Asia / PHI	Embedded Systems: Architecture and Programming	Indian Reprint 2002	2nd edition, ISBN:978 -0-07-066764-8	1997

Course Outcomes: After completing the course the students will be able to

CO1	Select embedded system components suitable to address design challenges and optimization needs. (L1)
CO2	Interpret the internal architecture of microcontroller and interfacing of different peripheral devices integrated with RTOS. (L2)
CO3	Solve interrupt handling problem through interrupt priority, interrupt enabling and disabling, and different software architectures. (L3)
CO4	List and analyze shared data problems in an embedded system and their solution through real time operating system services. (L4)



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Department: ECE

Semester: 5

Subject Name: Fundamentals of CMOS VLSI Design

Subject Code: EC5TH3

L-T-P-C: 3-0-0-3 (39 Hours)

Course Objectives: This course will enable students to:

1	Learn the Principles, Operations and Applications of MOSFETs.
2	Realize the stick diagrams and layouts using Lambda based design rules for a given schematic and to categorize the different MOS technologies.
3	Understand the modelling of digital circuits using different CMOS design styles.
4	Acquire the knowledge about scaling parameters, subsystem design and memory design.

UNIT	Description	Hours
1.	Overview of VLSI: Introduction, VLSI Design Flow, Ideal Switches and Boolean operations, MOSFET as switches, FET Threshold voltage concepts, Pass Transistors and characteristics, CMOS Logic - Basic gates and Compound gates, MOS layers, Layout and Stick diagrams of simple logic gates, Transmission Gate Circuits. (Text Book 1: 1.1, 2.1, 2.2, 2.3, 2.4, 2.5. Text Book 2: 3.1,3.2,3.7)	8
2.	MOS Transistor theory: Introduction, I-V Characteristics, DC analysis of CMOS Inverter. Fabrication: n MOS fabrication, CMOS fabrication. Lambda-based design rules. (Text Book 1: 7.1, Text Book 2: 1.7, 1.8, 2.1.1,2.1.2, 3.3.1)	8
3.	Basic Circuit Concepts: Sheet resistance, Area capacitances, Capacitance calculations. Delay unit, Inverter delays, Switching Characteristics, Rise Time and Fall Time Calculations, Propagation delay. (Text Book 2: 4.1,4.3,4.4,4.5,4.6, Text Book 1: 7.2.1,7.2.2, 7.2.3)	8
4.	CMOS Subsystem Design and Process: Architectural issues, Switch logic, Gate logic-NMOS and BiCMOS of Inverter, NAND and NOR, ALU subsystem Design-Datapath of a processor, Standard Adder Element Design, Implementation of 4-bit Adder and ALU. (Text Book 2: 6.1, 6.2, 6.3.1,6.3.2,6.3.3, 8.2, 8.3)	8
5.	Memory elements: Static RAM-General SRAM cell, 6T and 4T SRAM Models, Multiport SRAM, SRAM Arrays, DRAM- 1T DRAM cell, Write and Read Operations. Scaling of MOS Circuits: Constant Voltage, Constant field, Combined Voltage and Dimension Scaling Models, Scaling factors for Device Parameters. (Text Book 1: 13.1,13.2,13.3, Text Book 2: 5.1, 5.2)	7

Text Books:

Sl. No.	Author	Text Book title	Publisher/ Edition	Volume / ISBN	Year of Edition
1	John P Uyemura	Introduction to VLSI circuits and systems	John Wiley & sons	1-265-0915-5	2006.
2	Douglas A. Pucknell& Kamran Eshraghian	Basic VLSI Design	PHI 3rd Edition	978-81-203-0986-9	2005.

ECE Department



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY. TUMKUR

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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Sl. No.	Author	Text Book title	Publisher/ Edition	Volume / ISBN	Year of Edition
1	Neil H. E. Weste, David Harris and Ayan Banerjee	CMOS VLSI Design: A Systems Perspective	Pearson Education Pvt. Ltd., 3 rd Edition	81-7758-568-1	2006.
2	M. K. Achuthan and K.N. Bhat	Fundamentals of Semiconductor Devices	Tata McGraw-Hill	978-00706122-04	2006.
3	Sung-Mo Kang & Yusuf Leblebici	CMOS Digital Integrated Circuits: Analysis and Design	Tata McGraw-Hill 3 rd Edition	978-0-07-053077-5	2003.
4	Wayne Wolf	Modern VLSI Design- IP Based Design	PHI Publishers 4 th Edition	978-81-203-3824-1	2009.

Course Outcomes: After completing the course the students will be able to

CO1	Analyze transistor level schematics, scaling parameters and outline the various fabrication processes. (L2)
CO2	Estimate the design parameters for speed, area and power optimization. (L3)
CO3	Apply the different design techniques used in modeling the digital circuits. (L3)
CO4	Design the sub systems using different CMOS design styles. (L4)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Department: ECE

Semester: 5

Subject Name: Microwave Theory and Antennas

Subject Code: EC5TH4

L-T-P-C: 3-0-0-3 (39 Hours)

Course Objectives: This course will enable students to:

1	Describe the microwave active devices for generation of microwaves.
2	Understand microwave passive devices for several applications.
3	Understand the basics of Antennas and describe various types of antennas.
4	Understand application of Microwaves.

UNIT	Description	Hours
1.	Microwaves: Introduction, Transmission lines (end equations only for Reflection Coefficient and Transmission Coefficient, Standing Wave and Standing Wave Ratio), Smith Chart: solve transmission line problems analytically and verify using smith chart. Microwave Vacuum Tubes: Introduction, Reflex Klystron Oscillator, Mechanisms of Oscillations, Modes of oscillations, Travelling wave Tube Amplifier, Magnetron Oscillator (Qualitative discussion, construction, operation). Microwave solid state devices: PIN diode and its application (SPST, SPDT), Gunn diode (construction and operation) (Text1: 1.1 Text2:9.1 TO 9.4, 10.2.6, 10.3)	8
2.	Microwave Network Theory and Passive Devices: Introduction, Scattering or S-Matrix Representation of Multiport Network, Properties of S-parameters. Microwave Passive Components: Coaxial Cables, Coaxial Line to Waveguide Adapters, Attenuators, Phase Shifters (Dielectric and Precision Dielectric Phase Shifters) Waveguide Tees, Magic Tee, Ferromagnetic Insert and Component: Circulators, Isolators and Directional Couplers. (Text 2: 6.1, 6.3, 6.3.1, 6.4.1, 6.4.11, 6.4.14, 6.4.15, 6.4.16, 6.4.17 & 6.4.18)	8
3.	Planar Transmission Lines: Strip Lines, Micro strip Lines, Slot Lines, Advantages and Disadvantages of Planar Transmission lines. (Text2: 3.8, 3.8.1,3.8.2, 3.8.3, 3.8.5) Antenna basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Antenna Apertures, Effective Height, Radio Communication Link, Antenna Field Zones. (Text 3: 2.1 to 2.7, 2.9 to 2.11 & 2.13)	8
4.	Point Sources and Arrays: Introduction, Point Sources, Power Patterns, Power Theorem, Radiation Intensity, Arrays of two isotropic point sources, Linear Arrays of n Isotropic Point Sources of equal Amplitude and Spacing. Electric Dipoles: Introduction, Short Electric Dipole, Radiation Resistance of a Short Electric Dipole. (Text 3: 5.1 – 5.5, 5.9, 5.13,6.1, 6.2 & 6.4)	7
5.	Antenna Types: The Helix geometry, Helix modes, Practical Design considerations for the mono-filar axial mode Helical Antenna, Yagi-Uda array, Patch or Micro strip antenna, Horn Antenna, Parabolic reflector. (Text 3: 7.19, 8.3, 8.4, 8.5, 8.8, 9.7,14.2, 14.3, 14.4) Applications of Microwaves: Introduction, Microwave Radar Systems, The Radar Range equation, Duplexer, Pulsed Radar, CW Radar, Satellite Communication Systems. (Text 2: 11.2, 11.2.1, 11.2.2, 11.2.4, 11.3.2)	8



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Text Book:

Sl. No.	Author	Text Book title	Publisher/Edition	Volume / ISBN	Year of Edition
1	Samuel Y Liao	Microwave devices and circuits	Pearson ,3 rd Edition	ISBN: 978-81-7758-353-3	2008
2	Annapurna das and Sisir K das	Microwave Engineering	McGraw Hill Education, 3 rd Edition	ISBN: 978-93-329-0287-9	2015
3	John D Kraus	Antennas and Wave Propagation	McGraw Hill Education, 4 th Edition	ISBN: 0-07-053243-5	2010

Reference Book

Sl. No.	Author	Text Book title	Publisher/Edition	Volume / ISBN	Year of Edition
1	David M Pozar	Microwave Engineering	John wiley, 2 nd Edition	ISBN: 978-81-7658-353-3	2004.
2	M Kulkarni	Microwave Engineering	Pearson Technical Publishers	ISBN: 978-93-349-0578-5	2004.
3	K.D. Prasad	Antennas and Wave Propagation	Education Asia / PHI, 2 nd edition	ISBN: 978-93-2365-7988-6	2002

Course Outcomes: After completing the course the students will be able to

CO1	Analyse microwave generation, parameters associated with active and passive devices. (L2)
CO2	Formulate Transmission lines and apply the knowledge of S-parameters to Microwave networks using microwave devices. (L3)
CO3	Analyse various antenna parameters and basic types of antennas used in designing RF systems. (L4)
CO4	Identify microwave devices for several applications in various fields. (L3)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Department: ECE

Semester: VI

Subject Name: Python Programming

Subject Code: EC5PE51

L-T-P-C:3-0-0-3 (39 Hours)

Course Objectives: This course will enable students to:

1	Acquire the knowledge on fundamentals of python scripts.
2	Learn core python scripting elements such as variables and flow control structures.
3	Write Python functions to facilitate code reuse.
4	Develop the ability to write database applications in python.

UNIT	Description	Hours
1	Parts of Python Programming Language: Data types, indentation, comments, reading input, print output, type conversions, the type() function and is operator, dynamic and strongly typed language. Control flow statements: The if decision control flow statement, the if...else decision control flow statement, the if...elif...else decision control statement, nested if statement, the while loop, the for loop, the continue and break statements, catching exceptions using try and except statement, functions, built-in functions, commonly used modules, function definition and calling the function, the return statement and void function, scope and lifetime of variables, default parameters, keyword arguments, *args and **kwargs, command line arguments. (Text 1: 2.7 to 4.9)	8
2	Strings: Creating and storing strings, basic string operations, accessing characters in string by index number, string slicing and joining, string methods, formatting strings, lists, creating lists, basic list operations, indexing and slicing in lists, built-in functions used on lists, list methods, the del statement. (Text 1: Chapter 5 & chapter 6)	8
3	Dictionaries: Creating dictionary, accessing and modifying key:value pairs in dictionaries, built-in functions used on dictionaries, dictionary methods, the del statement, tuples and sets, creating tuples, basic tuple operations, indexing and slicing in tuples, built-in functions used on tuples, relation between tuples and lists, relation between tuples and dictionaries, tuple methods, using zip() function, sets, set methods, traversing of sets, frozenset. (Text 1: Chapter 7 & chapter 8)	8
4	Files, types of files, creating and reading text data, file methods to read and write data, reading and writing binary files, the pickle module, reading and writing CSV Files, Python OS and OS path modules. (Chapter 9)	7
5	NumPy Basics: Arrays and vectorized computation, the numpy ndarray, a multidimensional array object, creating ndarrays, data types for ndarrays, arithmetic with numpy arrays, basic indexing and slicing, boolean indexing, fancy indexing, transposing arrays and swapping axes, universal functions: fast element-wise array functions, array-oriented programming with arrays: expressing conditional logic as array operations, mathematical and statistical methods, methods for boolean arrays, sorting, unique and other set logic, file input and output with arrays, linear algebra, pseudorandom number generation. (Chapter 4)	8



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Sl. No.	Author	Text Book title	Publisher/ Edition	Volume / ISBN	Year of Edition
1	Gowrishankar S, Veena A	Introduction to Python Programming	CRC Press/Taylor & Francis, 1 st edition	978-0815394372	2018
2	Wes McKinney	Python for Data Analysis	O'Reilly Media 2 nd edition	978-1-491-95766-0	2018

Sl. No.	Author	Book Title	Publisher	Volume/ISBN	Year OF Edition,
1.	Bharti Motwani	Data Analytics using Python	Wiley Publications,	2nd edition	June 2020
2.	John M Zelle	Python Programming	Ingram short	1590282752	2018
3	Eric Matthes	Python Crash Course	No Starch Press	1593279280	2 nd Edition,
4	Ike Beck	Python For Beginners: The Easiest and Quickest Way to Learn Python Coding,	Siemen Mayer	9783986532222	Edition 2022,

Course Outcomes: After completing the course the students will be able to

CO1	Describe basic principles of Python programming language. (L1)
CO2	Programming using python for solving problems.(L2)
CO3	Apply the functions to load and store the data from different sources. (L3)
CO4	Employ the packages to effectively write the code. (L3)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Department: ECE

Semester: 5

Subject Name: ROBOTICS AND AUTOMATION

Subject Code: EC5PE52

L-T-P-C: 3-0-0-3 (39 hours)

Course Objectives: This course will enable students to:

1	The fundamental concepts in robotics.
2	Understand the knowledge in kinematics and programming.
3	Get exposed to a broad range of topics in robotics with emphasis on basics of manipulators, coordinate transformation and kinematics, trajectory planning, control techniques, sensors and devices, robot applications and vision analysis.

UNIT	Description	Hours
1.	UNIT 1: BASIC CONCEPTS: Evolution of robots and robotics, Laws of Robot, Robot definition, Generations of Robots, Robot anatomy, Coordinate frames, mapping and transforms. (Text 1: 1.1 to 1.6, 2.1 to 2.5)	8
2.	UNIT 2: END EFFECTORS: Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Consideration. (Text 2: 5.1 to 5.4)	8
3.	UNIT 3: KINEMATICS: Direct kinematic model: Mechanical structure and notations, Description of joints and links. Kinematic modeling of the manipulator. Denavit –Hartenberg Notation. ROBO Software implementation of kinematic models. (Text1: 3.1 to 3.4)	8
4.	UNIT 4: PATH PLANNING: Definitions and planning tasks, joint space techniques, Cartesian space techniques. (Text 1: 7.1 to 7.3)	8
5.	UNIT 5: ROBOTIC SENSORS AND VISION: Definitions, Sensors and Robotics, Kinds of sensors used in Robotics. Robotic Vision, Industrial applications of vision –controlled robotic vision systems. (Text 1: 9.1 to 9.5)	7

Text Books:

Sl. No.	Author	Text Book title	Publisher/ Edition	Volume / ISBN	Year of Edition
1	R K Mittal And I J Nagarth	Robotics And Control	Mc Graw – Hill	978-0-07-048	2003
2	M.P.Groover	Industrial Robotics – Technology, Programming and Applications	McGraw-Hill	-978-1- 25- 9000621-0	2001



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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Reference Books:

Sl. No.	Author	Text Book title	Publisher/ Edition	Volume / ISBN	Year of Edition
1	Fu.K.S. Gonzalz.R.C., and Lee C.S.G.,	Robotics Control, Sensing, Vision and Intelligence	Mc Graw – Hill	978-0-07-048	1987
2	K.S.Fu., R.C.Gonalez, C.S.G.Lee	Robotics Control sensing, Vision andIntelligence	McGraw-Hill	-978-1- 25-9000621-0	1987
3	Richard D. Klafter, Thomas A. Chmielewski and Michael Negin,	Robotic engineering- An Integrated Approach	Prentice Hall Inc	978-0134687520	1989
4	Janakiraman.P.A	Robotics and Image Processing	Tata McGraw-Hill	9780074621677	1995

Course Outcomes: After completing the course the students will be able to	
CO1	Understand the fundamental concepts of robot (L1)
CO2	Calculate the forward kinematics of serial robots.(L3)
CO3	To do the path planning for a robotic system.(L6)
CO4	To familiarize various robot sensors and their perception principles that enable a robot(L2)



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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Department: ECE

Semester: 5

Subject Name: SENSORS AND SIGNAL CONDITIONING

Subject Code: EC5PE53

L-T-P-C: 3-0-0-3 (39Hours)

Course Objectives: This course will enable students to:

1	Understand various technologies associated in manufacturing of sensors
2	Acquire knowledge about types of sensors used in modern digital systems
3	Get acquainted about material properties required to make sensors
4	Study intelligent sensors used in signal processing.

UNIT	Description	Hours
1.	INTRODUCTION TO SENSOR BASES MEASUREMENT SYSTEMS: General concepts and terminology, sensor classification, primary sensors, material for sensors, micro sensor technology, magneto resistors, light dependent resistors, resistive hygrometers, resistive gas sensors, liquid conductivity sensors (Text1: 1.2 to 1.8)	8
2.	REACTANCE VARIATION AND ELECTROMAGNETIC SENSORS: Capacitive Sensors, Inductive Sensors, Electromagnetic Sensors. Signal Conditioning for Reactance Variation Sensors-Problems and Alternatives, ac Bridges Carrier Amplifiers, Coherent Detection, Specific Signal Conditioners for Capacitive Sensors, Resolver-to-Digital and Digital-to-Resolver Converters. (Text1: 2.4 to 2.10)	8
3.	SELF-GENERATING SENSORS: Thermoelectric sensors, piezoelectric sensors, pyroelectric sensors, photovoltaic sensors, electrochemical sensors. (Text1: 3.6 to 3.12)	7
4.	DIGITAL AND INTELLIGENT SENSORS: Introduction, position encoders, resonant sensors, sensors based on quartz resonators, SAW sensors, Vibrating wire strain gages, vibrating cylinder sensors, Digital flow meters. (Text 1: 4.1 to 4.12)	8
5.	SENSORS BASED ON SEMICONDUCTOR JUNCTIONS: Introduction, Thermometers based on semiconductor junctions, magneto diodes and magneto transistors, photodiodes and phototransistors, sensors based on MOSFET transistors, charge coupled sensors – types of CCD imaging sensors, ultrasonic-based sensors. (Text 1: 6.2 to 6.13)	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY. TUMKUR

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Ramon PallásAreny, John G. Webster	“Sensors and Signal conditioning”,	John Wiley and Sons	Vol.1 ISBN: 9789352605224	2 nd Edition, 2000

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Wai Lok, Bin Gai	Sensor Signal and Information Processing	John Willey	Vol. 6/ ISBN: 9783036500133	2 nd Edition, Feb 2020
2	Curtis D Johnson,	Process Control Instrumentation Technology	Pearson New International Technology	Vol.3/ ISBN: 9781036400144	4 th Edition June 2020

Course Outcomes: After completing the course the students will be able to

CO1	Label various types of sensors and their construction. (L1)
CO2	Classify sensors specific to the end use application. (L2)
CO3	Apply the knowledge of Sensors for developing prototype models. (L3)
CO4	Analyze the sensors performance in integrated system design. (L4)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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OPEN ELECTIVE-1

Department: ECE

Semester: 5

Subject Name: INFORMATION THEORY AND CODING

Subject Code: EC50E61

L-T-P-C:3-0-0-3

(39 Hours)

Course Objectives: This course will enable students to:	
1	Understand the concept of Source Entropy and Information Rate with reference To dependent and independent sources.
2	Study various Source encoding Algorithms.
3	Study the basics of discrete communication channels.
4	Study various Error control coding Algorithms

UNIT	Description	Hours
1.	Information Theory: Introduction, Measure of Information, Average Information Content of Symbols in Long Independent Sequences, Average Information Content of Symbols in Long Dependent Sequences, Some properties of Entropy, Extension of a DMS, (Text1: 4.1,4.2) (Text2: 2.1)	7
2.	Mark-off Statistical Model for Information Sources, Entropy and Information Rate of Markoff Sources. Source Coding: Properties of Codes, Prefix Codes, KraftMcMillan Inequality property, Code Efficiency and Redundancy, Source Coding theorem. Shannon Fano Encoding Algorithm, Huffman codes. (Text1: 4.3,4.3.1) (Text2: 2.2,2.3)	8
3.	Communication Channels: Discrete Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, System Entropies, Mutual Information and properties of Mutual information, Rate of Information transmission over discrete channel, Channel capacity. (Text2: 2.4 to 2.9) (Text1: 4.5,4.6)	8
4.	Introduction , Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes.(Text1: 9.1, 9.2)	8
5.	Binary Cyclic Codes: Algebraic Structure of Cyclic Codes,Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction. Convolution Codes: Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram. (Text1: 9.3, 9.3.1, 9.3.2, 9.3.3)(Text2: 8.6)	8



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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Text Books:

Sl. No.	Title	Author(s)	Publisher	Volume/ ISBN	Year of Edition
1	Error Control Coding	Shu Lin and Daniel J Costello	Pearson Education Limited, 2 nd Edition	9780130426727	2011
2	ITC and Cryptography	Ranjan Bose	TMH, 2 nd Edition	9780071231336	2007
3	Elements of Information Theory	Thomas Cover, Joy Thomas	John Wiley	9780471241959	1991

Reference books:

Sl. No.	Title	Author(s)	Publisher/Edition	Volume/ ISBN	Year of Edition
1	Error Control Coding	Shu Lin and Daniel J Costello	Pearson Education Limited	9780130426727	2 nd Edition, 2011
2	ITC and Cryptography	Ranjan Bose	TMH	9780071231336	2 nd edition, 2007
3	Elements of Information Theory	Thomas Cover, Joy Thomas	John Wiley	9780471241959	New York, 1991

Course Outcomes: After completing the course the students will be able to

CO1	Acquire the basic knowledge for measuring of Information and entropy of independent & Dependent sources. (L2)
CO2	Apply various source coding techniques to reduce redundancy. (L3)
CO3	Evaluate capacity of Symmetric, Erasure, and Cascaded Channels. (L3)
CO4	Design of Encoder and Decoder circuits of Linear block codes, Binary Cyclic codes and Convolution codes. (L3)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 5

Subject Name: SENSORS AND INSTRUMENTATION

Subject Code: EC5OE62

L-T-P-C: 3-0-0-3 (39 hours)

Course Objectives: This course will enable students to:

1	Study commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
2	Learn the use of sensors for measurement of displacement, force and pressure.
3	Understand the fundamentals of intelligent sensors.

UNIT	Description	Hours
1.	Sensors & Transducer: Introduction to sensors/transducers, Principles, Classification, Parameter, Environmental parameters, Characterization. (Text1-1.1 to 1.6)	8
2.	Mechanical and Electromechanical Sensors: Introduction, Resistive potentiometer, Strain gauge, Inductive sensors, Capacitive sensors, Force sensors, Ultrasonic sensors. (Text1-2.1 to 2.7)	8
3.	Thermal, Magnetic and Radiation sensors: Introduction, Gas thermometric sensors, Thermal expansion type thermometric sensors, Acoustic temperature sensors, Magneto resistive sensors, Hall effect sensors, Inductive and eddy current sensors, Basic characteristics of radiation sensors, Types of photo detectors. (Text1-3.1 to 3.4, 4.1 to 4.5, 5.1 to 5.3)	8
4.	Data Acquisition and Conversion: Introduction, Objectives of data acquisition system, Signal conditioning of inputs, Single channel DAS, Multichannel DAS, Computer based DAS, Digital to analog converters and analog to digital converters. (Text2-6.1 to 6.7)	7
5.	Smart Sensors: Introduction, Primary sensors, Excitation, Amplification, Filters, Converters, Compensation, Information or processing, Data communication, The automation. (Text2-7.1 to 7.10)	8

Text Books:

Sl. No.	Title	Author(s)	Publisher/Edition	Volume/ ISBN	Year of Edition
1	Sensors and Transducers	D.Patranabis	PHI, 2 nd Edition	978-8120321984	2013
2	Electronic Instrumentation	H.S.Kalsi	TMH, 2 nd Edition	978-0-07-058370-2	2008



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Books:

Sl. No.	Title	Author(s)	Publisher/Edition	Volume/ ISBN	Year of Edition
1	PC interfacing for Data Acquisition & Process Control	S. Gupta, J.P. Gupta	Instrument Society of America, , 2 nd Edition	978-1556171888	1994
2	Lab VIEW Graphical Programing II	Gary Johnson	McGraw Hill , 2 nd Edition	0070326924	1997
3	Instrument Transducers	Hermann K.P. Neubert,	Oxford University Press, 2 nd Edition	978-0195629972	2012

Course Outcomes: After completing the course the students will be able to	
CO1	Understand instrumentation, sensor theory and technology.(L1)
CO2	Demonstrate the use of mechanical, thermal, magnetic and radiation sensors. (L2)
CO3	Identify and use data acquisition methods.(L3)
CO4	Analyze intelligent instrumentation in industrial automation.(L4)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 5

Subject Name: Mini Project-I

Subject Code: EC5MP1

L-T-P-C: 0-0-6-2 (39 hours)

Course Outcomes: After completing the course the students will be able to	
CO1	Identify the electronic solutions for day to day societal problems with available tools (L2)
CO2	Develop the system according to the problem stated in project work (L3)
CO3	Implement and Test the performance of the system (L4)

Description														
It is now compulsory for engineering students of the Siddhartha Institute of Technology (SSIT)-Tumkur, to complete two mini projects in V and VI Semesters respectively. This is in addition to the final project that students have to submit. The aim of this project is to bring out creativity and innovation in the students preferably in the form of a working model. This project can be taken up by a group of students (normally four members). Mini project is evaluated for 100 marks (50% CIE and 50% SEE). HOD and DAC (Department Advisory Committee) assigns guides for mini projects. The project may be based on Computer Simulation or Developing Working Model related Electronics and Communication Engineering discipline. The students should maintain a project diary consisting of day-to-day work carried out by them with monitoring by the guide on weekly basis. Project Report completed in all respects and approved by the Guide and HoD must be submitted at least one week before the commencement of theory examination of a semester. Reports submitted after the last date will not be evaluated. CIE for mini project The breakup of marks of CIE for mini project is given in the table (below) and project work will be jointly evaluated by PEC (Project Evaluation Committee) members and guide. <table border="1"> <tr> <td>Evaluation at the beginning of V Semester</td><td>15 Marks</td><td rowspan="3">CIE: Total 50 Marks (Continuous Internal Evaluation)</td></tr> <tr> <td>Evaluation at the end of V Semester</td><td>15 Marks</td></tr> <tr> <td>Evaluation by Guide</td><td>20 Marks</td></tr> </table> SEE for mini project Mini project work will be jointly evaluated by one internal and one external examiner appointed by the Chairman BoE. The breakup of marks is shown in the table (below). <table border="1"> <tr> <td>Project Report, Presentation, Demonstration and Quality of work</td><td>30 Marks</td><td rowspan="2">SEE: Total 50 Marks (Semester End Examination)</td></tr> <tr> <td>Viva-Voce</td><td>20 Marks</td></tr> </table>			Evaluation at the beginning of V Semester	15 Marks	CIE: Total 50 Marks (Continuous Internal Evaluation)	Evaluation at the end of V Semester	15 Marks	Evaluation by Guide	20 Marks	Project Report, Presentation, Demonstration and Quality of work	30 Marks	SEE: Total 50 Marks (Semester End Examination)	Viva-Voce	20 Marks
Evaluation at the beginning of V Semester	15 Marks	CIE: Total 50 Marks (Continuous Internal Evaluation)												
Evaluation at the end of V Semester	15 Marks													
Evaluation by Guide	20 Marks													
Project Report, Presentation, Demonstration and Quality of work	30 Marks	SEE: Total 50 Marks (Semester End Examination)												
Viva-Voce	20 Marks													



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: ECE

Semester: 5

Subject Name: Digital Signal Processing Lab

Subject Code: EC5LB1

L-T-P-C: 0-0-3-1.5

Course Objectives: This course will enable students to:	
1	Simulate the basics of Digital Signal Processing and its applications using MATLAB processing tool.
2	Compute solution to the difference equations and computation of convolution and correlation along with the verification of properties.
3	Implement the DSP computations on hardware using Code Composer Studio IDE and DSP kit (TMS320C67XX).

1.	Linear convolution of two sequences in time domain without using inbuilt function.
2.	circular convolution of two given sequences in time domain without using inbuilt function.
3.	Autocorrelation and Cross correlation of a given sequence and verification of its properties.
4.	Solving a given difference equation.
5.	Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum and verification of its properties.
6.	Linear convolution and Circular convolution of two sequences using DFT and IDFT.
7.	Design and implementation of FIR filter to meet given specifications.
8.	Design and implementation of IIR filter to meet given specifications.
9.	Application of FIR filters: Design of Differentiator
B. LIST OF EXPERIMENTS USING DSP PROCESSOR	
10.	Linear convolution and Circular convolution of two given sequences.
11.	Computation of N- Point DFT of a given sequence.
12.	Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
13.	Impulse response of first order and second order system.
14.	Interference suppression. To add noise above 3kHz and then remove the noise Interference using 400 Hz tone

Course Outcomes: After completing the course the students will be able to	
CO1	Apply various signal processing operations and verification of their properties using MATLAB simulation tool. (L3)
CO2	Realize and demonstrate FIR and IIR filter for DSP applications using MATLAB simulation tool and DSP Processor kit. (L2)
CO3	Verify, interpret and record the experimental data, analyse the results and prepare a formal laboratory report. (L3).

Department of Electrical & Electronics Engineering.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 5

Subject Name: VLSI Lab

Subject Code: EC5LB2

L-T-P-C: 0-0-3-1.5

Course Objectives: This course will enable students to:

1	Learn the schematic editor and physical design tool.
2	Realize the functionality of combinational and sequential circuits using CMOS logic.
3	Understand the AC and DC analysis of digital circuits.

SI	List of Experiments
	Cycle-1
1.	Draw a CMOS circuit of inverter and buffer for specified length and width using schematic and draw the layout for the same using a specified technology
2.	Realize a two input NAND gate using CMOS logic and verify its truth table in both schematic and layout for specified technology.
3.	Realize a two input NOR gate using CMOS logic and verify its truth table in both schematic and the layout for specified technology.
4.	Implement a two input XOR gate with minimum number of transistors and verify its timing diagram in both schematic and layout.
5.	Implement a full adder circuit with minimum length and width and verify its timing diagram. Make a Verilog file of the schematic and generate the layout. Verify the timing diagram in the layout.
6.	Implement a 4-bit parallel adder circuit with minimum length and width and verify its timing diagram. Make a Verilog file of the schematic and generate the layout. Verify the timing diagram in the layout.
7.	Implement a 4:1 Multiplexer using Transmission Gate (TG). Verify the truth table in the schematic editor. Make a verilog file of the schematic and generate the layout. Show the 2D and 3D view for the layout.
	Cycle-2
8.	Implement a SR flip flop with Clock, Preset and Clear. Make a verilog file of the schematic and generate the layout. Verify its timing diagram in both schematic and layout. Show the 3D and 2D view for the layout.
9.	Implement D flip flop with Clock, Preset and Clear. Make a verilog file of the schematic and generate the layout. Verify its timing diagram in both schematic and layout.
10.	Implement a JK flip flop with Clock, Preset and Clear. Make a verilog file of the schematic and generate the layout. Verify its timing diagram in both schematic and layout.
11.	Implement a T flip flop with Clock, Preset and Clear. Make a verilog file of the schematic and generate the layout. Verify its timing diagram in both schematic and layout.
12.	Implement a serial register capable of holding and shifting 4 bit words. Make a verilog file of the schematic and generate the layout. Verify its timing diagram in both schematic and layout. Show the 3D and 2D view for the layout.
13.	Implement a serial adder circuit with minimum length and width and verify its timing diagram. Make verilog file of the schematic and generate the layout. Verify the timing diagram in the layout.
14.	Design a 4-bit Binary Counter using D flip flop in schematic editor. Make a verilog file of the schematic and generate the layout. Verify the timing diagram in the schematic and layout.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes: After completing the course the students will be able to	
CO1	Model and verify the schematics and layout of digital circuits at transistor level.(L3)
CO2	Simulate and demonstrate the different parameters of digital circuits using schematic editor and layout Tool. (L2)
CO3	Interpret and record the experimental data, analyze the results and prepare a formal laboratory report. (L3)



Syllabus for the Academic Year 2022 - 2023

Department: Computer Science and Engineering

Semester: 6

Subject Name: Computer Networks Lab

Subject Code: CS6LB2

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No	Course Objectives
1	To understand fundamental underlying principles of computer networking
2	Acquire the knowledge of routing algorithms and congestion control algorithms
3	Compare the performance of various communication protocols

UNIT	Description
I	PART-A 1. Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and determine collision across different nodes. 2. Simulate an Ethernet LAN using N nodes (6-10) change error rate and data rate and compare throughput. 3. Simulate an Ethernet network of 6 to 15 nodes, for 1-persistent, vary number of transmitting nodes and compare collision count, throughput, mean delay and response time. 4. Simulate a three-node point-to-point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped. 5. Simulate a four-node point-to-point network, and connect the links as follows: n1-n3, n2-n3 and n3-n4. Apply TCP agent between n1-n4 and UDP n2-n4. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP/UDP. 6. Simulate simple BSS with transmitting nodes in wire-less LAN and determine the performance with respect to transmission of packets. 7. Simulate the different types of Internet traffic such as FTP and TELNET over a network and analyze the throughput. 8. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



PART-B

1. Write a program for Error Detecting code using CRC codes.
2. Write a program for Frame Sorting Technique used in buffers.
3. Write a program for distance vector routing algorithm to find the suitable path for transmission.
4. Write a program to find the shortest path using Link State Routing.
5. Write a program for congestion control using leaky bucket algorithm.
6. Write a program to implement Interprocess Communication (IPC) using FIFO queues.
7. Using TCP/IP sockets, write a client - server program to make the client send the file name and to make the server send back the contents of the requested file if present.
8. Write a program for simple RSA algorithm to Encrypt and Decrypt the Data.

Course Outcomes

Sl.No.	Descriptions
1	Interpret the basics principles of computer networking
2	Design and implement Routing and Congestion control Algorithms
3	Analyze and evaluate the performance of various networking protocols



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 6

Subject Name: DIGITAL COMMUNICATION

Subject Code: EC6TH1

L-T-P-C: 3-0-0-3(39 Hours)

Course Objectives: This course will enable students to:

1	Study the various waveform coding schemes.
2	Learn the various baseband transmission schemes and understand the various band pass signaling schemes.
3	Know the fundamentals of channel coding
4	Acquire the knowledge of spread spectrum techniques.

UNIT	Description	Hours
1.	Information Theory: Discrete Memory less source, Information, Entropy, Mutual Information - Discrete Memory less channels – Binary Symmetric Channel, Channel Capacity - Hartley - Shannon law - Source coding theorem - Huffman codes.(Text1: 2.1 to 2.9)	8
2.	Introduction and waveform coding techniques: Introduction, Basic signal processing operations in digital communication, PCM, Quantization noise and SNR, Robust quantization, DPCM, DM,ADM, Coding speech at low bit rates, ADPCM, Adaptive sub-band coding. (Text 1:1.2, 5.1 to 5.8)	8
3.	Base-band shaping for data transmission: Base-Band Shaping for Data Transmission, Discrete PAM signals, Power spectra of discrete PAM signals, ISI, Nyquist criterion for distortion less base-band binary transmission, Correlative coding, Eye pattern, Base-band M-ary PAM systems, Adaptive equalization for data transmission. (Text 1: 6.1 to 6.8)	8
4.	Digital modulation techniques: Digital Modulation formats, Coherent binary modulation techniques, Coherent Quadrature modulation techniques, Non-coherent binary modulation techniques. (Text1: 7.1 to 7.4)	7
5.	Spread spectrum modulation: Pseudo noise sequences, Notion of spread Spectrum, Direct sequence spread spectrum with coherent binary PSK, Frequency hop spread spectrum, Applications. (Text 1: 9.1 to 9.3, 9.6, 9.7) Error Control Coding: Channel coding theorem - Linear Block codes - Hamming codes. (Text1: 8.3 to 8.4)	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



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Sl. No.	Title	Author(s)	Publisher, Edition	ISBN	Year of edition
1	Digital communications	Simon Haykin	John wiley	81-265-0824-8	2003.
2	Digital communications	John G Proakis and Masoud Salehi	Mcgraw hill, 5 th edition.	978-0-07-295716-7	2008

Text Books:

Reference Books:

Sl. No.	Title	Author(s)	Publisher, Edition	ISBN	Year of edition
1	Digital and analog communication systems	K.Sam Shanmugam	John Wiley	978-0-47-103090-4	1996
2	Analog and Digital Communications	H P Hsu	TMH	978-0070306363	2006
3	Principles of digital communication	Taub and Schilling	Tata Mcgraw-hill, 28 th reprint,.	978-0-07-064811-1	2003
4	Digital communications	Bernard Sklar	Pearson education.	81-7808-373-6	2007

Course Outcomes: After completing the course the students will be able to

CO1	Interpret various waveform coding techniques and its variants in applications like digital telephony and speech coding at low bit rates. (L1)
CO2	Analyze the characteristics of baseband signaling schemes and their performance (L4)
CO3	Implement band pass signaling schemes (L3)
CO4	Design and explain error control coding schemes(L2)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 6

Subject Name: DIGITAL IMAGE PROCESSING

Subject Code: EC6TH2

L-T-P-C: 3-0-0-3 (39 Hours)

Course Objectives: This course will enable students to:

1	Introduce the concepts of image processing and basic analytical methods in image processing.
2	Acquire knowledge about various image processing techniques.
3	Expose to various image transformation techniques.
4	Familiarize with various image compression and transform techniques.

UNIT	Description	Hours
1.	DIGITAL IMAGE FUNDAMENTALS: Digital Image Processing definition, fundamental steps in digital image processing, classification of digital images, image file formats, Applications of Digital Image Processing, Convolution and Correlation: 2D convolution through graphical method, convolution through Z transform, 2D convolution, circular convolution, correlation through matrix analysis. (Text1: 1.1 to 1.4, Text2: chapter 1: 1.9 to 1.10 chapter 3: 3.1 to 3.7)	8
2.	ELEMENTS OF VISUAL PERCEPTION: Structure of human eye, Image formation in an eye, Brightness adaptation and discrimination, Light and Electromagnetic spectrum, Image sensing and acquisition, Image sampling and quantization, Some basic Relationship between pixels: Neighbors of a pixel, Adjacency, connectivity, regions, and Boundaries, Distance Measures. (Text1: 2.1 to 2.5)	8
3.	IMAGE TRANSFORMS: Two dimensional orthogonal and Unitary transforms, Properties of Unitary transforms, two-dimensional discrete Fourier Transform, Discrete Cosine Transforms, Sine Transforms, Hadamard Transform, Haar Transform. (Text2: 4.1 to 4.12)	8
4.	INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING: Basic Intensity transformation functions: Image Negative, Log transformation, Power Law(gamma transformation) ,Piecewise -linear transformation functions Histogram Processing: Histogram Equalization, Histogram Matching, Linear gray level transformation, local or neighborhood operation, Median filter, Spatial domain high pass filtering or Image Sharpening, Bit plane slicing, Image enhancement in the frequency domain, Homomorphic filter, zooming operation, Image Arithmetic. (Text1:3.1 to 3.4, Text2: 5.1 to 5.15)	8
5.	IMAGE CODING AND COMPRESSION: Redundancy in Images, Image compression scheme, Run length coding, Shannon Fano coding, Huffman coding, Arithmetic coding, Dictionary based compression, Transform based compression, Wavelet based image compression standard, Fractal image Compression, Block truncation coding. (Text2: 9.1 to 9.21)	7

**Text Books:****SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU**
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Sl. No.	Author	Text Book title	Publisher	ISBN	Year of Edition
1	RafaelC. Gonzalez, Richard E. Woods	Digital Image Processing	Pearson Education Pvt. Ltd.,	978-1-292-22304-9	Fourth 2018.
2	Jayaraman	Digital Image Processing	Tata McGraw-Hill Education	9780070144798	3rd Edition 2012.

Reference Books:

Sl. No.	Author	Text Book title	Publisher	ISBN	Year of Edition
1	Anil Jain K	“Fundamentals of Digital Image Processing”,	PHI Learning Pvt. Ltd.,	978-0-13-168728-8	2011.
2	William K. Pratt	Digital Image Processing	John Wiley	4th Edition,	2007.

Course Outcomes: After completing the course the students will be able to

CO1	Mathematically represent the various types of images and analyze them and review the fundamental concepts of image processing(L1)
CO2	Process the images for the enhancement and transform of certain Properties. (L3)
CO3	Analyze the Images using various Image transformation Techniques. (L4)
CO4	Interpret Image coding and Compression Standards.(L2)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 6

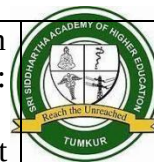
Subject Name: COMPUTER COMMUNICATION NETWORKS

Subject Code: EC6TH3

L-T-P-C:3-0-0-3(39hours)

Course Objectives: This course will enable students to:	
1	Understand the working of different layers of OSI model & TCP/IP model.
2	Analyze the various routing algorithms.
3	Know the concept of data transfer between nodes.
4	Know and learn the functions and services of each layer

UNIT	Description	Hours
1.	Data Communications: Introduction, Components, Representations, Data Flow, Networks: Physical Structures, Network Types: LAN, WAN, Switching, The Internet. Network Models: Protocol Layering: Scenarios, Principles of protocol layering, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers. In TCP/IP suite, Description of each layer, Encapsulation and De-capsulation, Addressing, Multiplexing and De-multiplexing. The OSI Model: OSI versus TCP/IP. Data-Link Layer: Introduction, Nodes and Links, Services, Categories 'of link, sub layers, Link Layer addressing: Types of addresses, ARP. Data Link Control (DLC) services: Framing, Flow and Error Control, Data Link Layer Protocols: Simple protocol, Stop and wait protocol, Piggybacking. (Text 1: 1.1 to 1.4, 2.1, 2.2, 2.3, 9.1, 9.2, 11.1, 11.2.1, 11.2.2)	9
2.	Media Access Control: Introduction. Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled Access: Reservation, Polling, Token Passing. Channelization: FDMA, TDMA, CDMA. Wired and Wireless LANs: Ethernet: Ethernet Protocol: IEEE802, Ethernet Evolution, Standard Ethernet: Characteristics, Addressing, Access Method, Efficiency, Implementation. Wireless LANs: Introduction: Architectural Comparison, Characteristics, IEEE802.11: Architecture, MAC Sub layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture. (Text1 : 12.1.1 to 12.1.3, 12.2.1 to 12.2.3, 13.1 to 13.2.5, 15.1, 15.2, 15.3.1)	8
3.	Connecting Devices: Introduction, Hubs, link layer Switches, Virtual LANs: Membership, Configuration, Communication between Switches and Routers. Network Layer: Introduction, Network Layer services: Packetizing, Routing and Forwarding, Packet Switching: Datagram Approach, Virtual Circuit Approach. IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution. (Text 1: 17.1 to 17.2.3, 18.1.1, 18.1.2, 18.2, 18.4)	8



4.	Network Layer Protocols: Introduction, Internet Protocol (IP): Datagram Format, Addressing, Agents, Layer Phases, the Efficiency of IP, Mobile IP: Addressing, Agents, Layer Phases, the Efficiency of IP, Mobile IP. Next Generation IP: IPV6 Addressing, Address Space, IPV6 Protocol- packet format, Transition from IPv4 To IPv6. Uni-cast Routing: Introduction, Routing Algorithms: Distance Vector Routing, Link State Routing.(Text 1: 19.1, 19.3 , 20.1,20.2.1,20.2.2, 22.1, 22.1.1, 22.1.2, 22.2.1, 22.4)	8
5.	Transport Layer: Introduction, Transport Layer Services, Connection less and Connection oriented Protocols, Transport Layer Protocols: Go-Back-N Protocol, Selective Repeat protocol. Transport Layer Protocols in the Internet: User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Segment, Connection, State Transition diagram, Windows in TCP, Flow control, Error control (Text 1: 23.1, 23.2, 1 to 23.2.4, 24.2,24.3.1,24.3.2,24.3.3,24.3.4,24.3.5,24.3.6,24.3.7,24.3.8)	6

Text Books:

Sl	Author(s)	Text Book title	Publisher	Volume/ISBN	Year of Edition
1	BForouzan	Data Communication and Networking	McGraw Hill,2013	ISBN:1-25-906475-3	5 th Edition
2	Andrew S.Tenenbaum	Computer networks	Pearson Prentice hall 2010	ISBN-978-81-317-0198-0	4 th Edition

ReferenceBooks:

S l	Author(s)	TextBooktitle	Publisher/Edition	Volume/ ISBN	Year of Edition
1	JamesF.KuroseKeith W.Ross	Computer Networks	2003 Pearson Edu.	0131365497801313	2 nd Edition
2	WayneTomasi	Introduction to Data Communication and Networking	Pearson Edu.	9780130494924, 0130494925	2007
3	V.S.BagadandI.A.Dotre	Computer Networks	Technicalpublications	9788-184-314-762	2 nd edition 2009

Course Outcomes: After completing the course the students will be able to

CO 1	Identify the importance of network architectures, frame formats, addressing mechanisms and Wired & Wireless architectures used for different network applications. (L4)
CO 2	Study the significance of basic concepts of computer networks which is the basis for Internet applications (L1)
CO 3	Design implement and assess computing based solution to meet the given network topologies, Protocol stack, Address space and bandwidth capacities of different data transmission standards. (L5)
CO 4	IllustratetheessenceofconnectingdevicesrequiredatdifferentlayersandVirtualLANtechnologyfeatures, facilitating the flexible network design for users. (L2)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: ECE

Semester: 6

Subject Name: Analog and Mixed Signal VLSI Design

Subject Code: EC6PE41

L-T-P-C: 3-0-0-3 (39 Hours)

Course Objectives: This course will enable students to:

1	Learn the issues of analog and digital system design.
2	Study and compare different architectures of data converters and their SNRs with pros and cons.
3	Understand the fabrication steps at submicron technology.
4	Acquire the knowledge of single stage amplifiers using MOSFET.

UNIT	Description	Hours
1.	DAC Fundamentals & Architectures: Introduction, DAC Specifications, Mixed Signal Layout Issues. DAC Architectures: Resistors String, R-2R Ladder Networks, Charge Scaling DACs, Cyclic DAC, Pipeline DAC, Problems on all types of DAC. (Text 1: 28.4, 28.6, 29.1.2, 29.1.3, 29.1.5, 29.1.6, 29.1.7)	9
2.	ADC Fundamentals & Architectures: Introduction, Analog versus Digital Discrete Time Signals, Sample and Hold characteristics, ADC Specifications, ADC Architectures: Flash ADC, 2-step Flash ADC, Pipeline ADC, Integrating ADC, Successive Approximation ADC, Problems on all types of ADC. (Text 1: 28.1, 28.3, 28.5, 29.2.1, 29.2.2, 29.2.3, 29.2.4, 29.2.5)	9
3.	Sampling and Aliasing: Impulse Sampling, Quantization noise, Spectral density of quantization noise. Data Converter SNR: Improving SNR using averaging (Excluding jitter & averaging onwards), Decimating filters for ADCs (Excluding decimating without averaging onwards), and Interpolating filters for DAC. (Text 2: 30.1.1, 30.3.2, 31.1.1, 31.1.2, 31.2.1, 31.2.2, 31.2.3)	7
4.	Sub-Micron CMOS Circuit Design: CMOS Process flow, Submicron Capacitors and Resistors. Digital Circuit Design: MOSFET switch (up to bidirectional switches), Delay, Adder elements. (Text 2: 33.1.1, 33.1.2, 33.2.1, 33.2.2, 33.2.3)	7
5.	Single Stage Amplifiers: Basic concepts, Common Source Amplifier with resistive load, diode connected load, Source Follower, Common Gate Amplifier. (Only voltage gain expressions using large signal and small signal models) (Text 3: 3.1, 3.2.1, 3.2.2, 3.3, 3.4)	7



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Text Books:

Sl. No.	Author	Text Book title	Publisher/ Edition	Volume / ISBN	Year of Edition
1	R. Jacob Baker	CMOS Circuit Design, Layout, Simulation	John Wiley & Sons, INC. 4 th Edition	978-81-265-2037-4	2019.
2	R. Jacob Baker	CMOS Mixed signal circuit design	John Wiley & Sons, INC.	Volume II 978-81-265-1657-5	2009.
3	B Razavi	Design of Analog CMOS Integrated Circuits	Tata McGraw Hill	0-07-238032-2	2009.

Reference Books:

Sl. No.	Author	Text Book title	Publisher/ Edition	Volume / ISBN	Year of Edition
1	Arjuna Marzuki	CMOS Analog and Mixed-Signal Circuit Design	CRC Press 1st Edition	9781000071511	2020
2	R. Jacob Baker, Harry W. Li, David EBoyce	CMOS Circuit Design, Layout and Simulation	IEEE Press	81-203-1682-7	2002.
3	Randall Geiger, Phillip E. Allen, Noel Stradder	VLSI Design Techniques for Analog and Digital Circuits	Tata McGraw Hill	978-00-702-3253-2	2010.

Course Outcomes: After completing the course the students will be able to

CO1	Interpret the different data converters and layout issue of mixed signal systems. (L2)
CO2	Analyze the fabrication process flow of MOSFET and passive components at submicron level. (L2)
CO3	Apply the different techniques to improve the SNR.(L3)
CO4	Design of single stage amplifiers using signal models. (L4)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: ECE

Semester:6

Subject Name: ARTIFICIAL INTELLIGENCE

Subject Code: EC6PE42

L-T-P-C: 3-0-0-3(39 Hours)

Course Objectives: This course will enable students to:	
1	Gain a historical perspective of AI and its foundations.
2	Become familiar with basic principles of AI toward problem solving
3	Get to know approaches of inference, perception, knowledge representation, and learning.
4	Study non linear planning strategies.

UNIT	Description	Hours
I	Introduction to AI: history, Intelligent systems, foundation and sub area of AI applications, current trend and development of AI. Problem solving: state space search and control strategies. (Text1: 2.3. to 2.6)	8
II	Problem reduction and Game playing: Introduction, Problem reduction, game playing, Bounded look-ahead strategy, alpha-beta pruning, Two player perfect information games. (Text1: 3.1 to 3.4, 4.1 to 4.6)	8
III	Logic concepts and logic Programming: Introduction, propositional calculus, Propositional logic, natural deduction system, semantic tableau system, resolution refutation, predicate logic, Logic programming. (Text1: 5.1 to 5.8, 6.4 to 6.8)	8
IV	Advanced problem solving paradigm: Introduction, Planning: types of planning system, block world problem, logic based planning, Linear planning using a goal stack, Means-ends analysis, Non linear planning strategies, learning plans (Text1: 7.1 to 7.8)	8
V	Knowledge Representation, Introduction, Expert system Approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, Knowledge representation using Frames. Expert system: introduction phases, architecture ES verses Traditional system (Text1: 8.1 to 8.8 and 9.1 to 9.6)	7



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)
Text Books:



Sl. No.	Author	Text Book title	Publisher	Volume / ISBN	Year of Edition
1	Saroj Kaushik	Artificial Intelligence	Cengage learning,	9789352605224	2014

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / ISBN	Year of Edition
1	Elaine Rich, Kevin Knight,	Artificial Intelligence	Tata McGraw Hill	978-0996025515	2014
2	Nils J. Nilsson	Principles of AI	Elsevier	-	1980
3	Staurt Russel, Peter Norvig	A Modern Approach	Pearson Education,		3rd Edition, 2009
4	George F. Luger	Artificial Intelligence Structure and for strategies complex	Pearson Education		5th Edition, 2011

Course Outcomes: After completing the course the students will be able to	
CO1	Recognize the need of enforcing security policies, standards and practices from intruders and viruses in an open information system, with case studies (L1).
CO2	Distinguish and infer cryptography and Steganography techniques in different domains and applications. (L2)
CO3	Apply effective cryptographic techniques for information security (L3)
CO4	Interpret different Security principles on devices and typical applications (L3)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 6

Subject Name: ROBOTICS

Subject Code: EC6OE51

L-T-P-C: 3-0-0-3(39 hours)

Course Objectives: This course will enable students to:

1	Understand the functions of the basic components of a robot.
2	Study the use of various types of end of effectors and sensors
3	Acquire the knowledge in robot kinematics and programming
4	Learn robot safety issues and economics.

UNIT	Description	Hours
1	FUNDAMENTALS OF ROBOT: Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications. (Text 1: 1.1 to 1.6, 2.1 to 2.5)	8
II	ROBOT DRIVE SYSTEMS AND END EFFECTORS: Pneumatic Drives, Hydraulic Drives, Mechanical Drives, Electrical Drives, D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations. (Text 2: 5.1 to 5.4)	8
III	KINEMATICS: Direct kinematic model: Mechanical structure and notations, Description of joints and links. Kinematic modeling of the manipulator. Denavit – Hartenberg Notation. (Text1: 3.1 to 3.4)	8
IV	PATHPLANNING: Definitions and planning tasks, joint space techniques, Cartesian space technique. (Text 1: 7.1 to 7.3)	8
V	ROBOTIC SENSORS AND VISION: Definitions, Sensors and Robotics, Kinds of sensors used in Robotics. Robotic Vision, Industrial applications of vision –controlled robotic vision systems. (Text 1: 9.1 to 9.5)	7

Text Books:

Sl. No.	Title	Author(s)	Publisher	Volume / ISBN	Year of Edition
1	Robotics And Control	R K Mittal And I J Nagarth	McGraw – Hill	978-0-07-048	2002 reprint
2	Industrial Robotics – Technology, Programming and Applications Department of Electrical & Electronics Engineering.	M.P.Groover	McGraw – Hill, 2 nd edition.	978-1- 25-9000621-0	2000 Reprint



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Books:

Sl. No.	Title	Author(s)	Publisher	Volume / ISBN	Year of Edition
1	Robotics Control, Sensing, Vision and Intelligence	Fu.K.S. Gonzalz.R.C., and Lee C.S.G.,	McGraw-Hill Book Co.	978-0070226258	2000 Reprint
2	Robotic engineering- An Integrated Approach	Richard D. Klafter, Thomas A. Chmielewski and Michael Negin,	Prentice Hall India Learning Private Limited	978-8120308428	1997
3	Robotics and Image Processing	Janakiraman.P.A	McGraw Hill Education India Pvt Ltd	978-0074621677	2002 Reprint

Course Outcomes: After completing the course the students will be able to

CO1	Identify robot sensors and their perception principles that enable a robot (L1)
CO2	Calculate the forward kinematics of serial robots (L2)
CO3	Interpret the path planning for a robotic system (L3)
CO4	Develop automation concept using fundamentals of electromechanical device (L4)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 6

Subject Name: Pattern Recognition

Subject Code: EC6OE52

L-T-P-C: 3-0-0-3(39 Hours)

Course Objectives: This course will enable students to:	
1	Study the fundamental concepts of pattern recognition systems.
2	Learn the concepts of Probability theory, random variables, joint distribution and density function.
3	Study the basic principles of statistical decision and non-parametric decision making.
4	Acquire the knowledge of various clustering methods.

UNIT	Description	Hours
1.	Introduction: Machine perception-an example, pattern recognition systems, the design cycle, learning and adaptation, applications of pattern recognition, statistical decision theory, image processing and analysis. (Text 2: 1.1-1.5, Text 1: 1.1 – 1.3)	6
2.	Probability: Probabilities of events, random variables, joint distributions and densities, moments of random variables, estimation of parameters from samples, problems. (Text 1: 2.1 – 2.6)	8
3.	Statistical decision making: Introduction, Bayes' theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, Leaving-One-Out Technique, problems. (Text 1: 3.1 -3.5, 3.8)	9
4.	Nonparametric decision making: Introduction, histograms, kernel and window estimators, adaptive decision boundaries, adaptive discriminate functions, problems. (Text 1: 4.1 – 4.4, 4.6)	9
5.	Clustering: Introduction, Hierarchical clustering: Agglomerative clustering algorithm, Single-Linkage algorithm, Complete-Linkage algorithm, Average-Linkage algorithm, Wards method, Partitioned clustering: Forgy's algorithm, K-means algorithm, Isodata Algorithm, problems. (Text 1: 5.1 – 5.3)	7



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

Sl	Author	Text Book	Publisher	Volume / ISBN	Year of Edition
1	Earl Gose, Richard Johnsonbaugh, Steve Jost	Pattern Recognition and Image Analysis	Pearson	978-93-325-4979-1	2015
2	Richard O. Duda, Peter E. Hart, David G. Stork	Pattern Classification	Wiley	978-81265-1116-7	2009

Reference Books:

Sl. No.	Author	Text Book	Publisher	Volume / ISBN	Year of Edition
1	Konstantinos Koutroumbas, Sergios Theodoridis	Pattern Recognition	Academic Press	978-1-597-49272-0	2008
2	Christopher M Bishop	Pattern Recognition and Machine learning	Springer	978-0-387-31073-2	2009
3	Narasimha Murthy	Pattern Recognition	Universities Press	978-8173-717-253	2011

Course Outcomes: After completing the course the students will be able to

CO1	Outline various techniques involved in pattern recognition. (L1)
CO2	Apply the knowledge of probability to statistical and non-parametric decision making(L3)
CO3	Analyze classification problems and estimate classifier performance. (L3)
CO4	Extend the principles of clustering approaches to pattern recognition. (L2)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 6

Subject Name: Mini Project-II

Subject Code: EC6MP2

L-T-P-C: 0-0-6-3 (39 Hours)

Description														
It is now compulsory for engineering students of Siddhartha Institute of Technology (SSIT)-Tumkur, to complete two mini projects in V and VI Semesters respectively. This is in addition to the final year project that students have to submit. The aim of this project is to bring out creativity and innovation in the students preferably in the form of a working model. This project can be taken up by a group of students (maximum four members). Mini project is evaluated for 100 marks (50% CIE and 50% SEE). HOD and DAC (Department Advisory Committee) assigns guides for mini projects. The project may be based on Computer Simulation or Developing Working Model related Electronics and Communication Engineering discipline and also interdisciplinary projects (with permission of HOD). The students should maintain a Project Diary consisting of day-to-day work carried out by them with monitoring by the guide on weekly basis. Project Report completed in all respects and approved by the Guide and HoD must be submitted at least one week before the commencement of theory examination of a semester. Reports submitted after the last date will not be evaluated (as per calendar of events). c. CIE for mini project The breakup of marks of CIE for mini project is given in the table (below) and project work will be jointly evaluated by PEC (Department Project Evaluation Committee) members and guide. <table border="1"> <tr> <td>Evaluation at the beginning of VI Semester (Phase-I)</td><td>10 Marks</td><td rowspan="3">CIE: Total 50 Marks (Continuous Internal Evaluation)</td></tr> <tr> <td>Evaluation at the end of VI Semester (Phase-II)</td><td>20 Marks</td></tr> <tr> <td>Evaluation by Guide</td><td>20 Marks</td></tr> </table> d. SEE for Mini Project Mini project work will be jointly evaluated by one internal and one external examiner appointed by the Chairman BoE. The breakup of marks is shown in the table (below). <table border="1"> <tr> <td>Project Report, Presentation, Demonstration and Quality of work</td><td>40 Marks</td><td rowspan="2">SEE: Total 50 Marks (Semester End Examination)</td></tr> <tr> <td>Viva-Voce</td><td>10 Marks</td></tr> </table>			Evaluation at the beginning of VI Semester (Phase-I)	10 Marks	CIE: Total 50 Marks (Continuous Internal Evaluation)	Evaluation at the end of VI Semester (Phase-II)	20 Marks	Evaluation by Guide	20 Marks	Project Report, Presentation, Demonstration and Quality of work	40 Marks	SEE: Total 50 Marks (Semester End Examination)	Viva-Voce	10 Marks
Evaluation at the beginning of VI Semester (Phase-I)	10 Marks	CIE: Total 50 Marks (Continuous Internal Evaluation)												
Evaluation at the end of VI Semester (Phase-II)	20 Marks													
Evaluation by Guide	20 Marks													
Project Report, Presentation, Demonstration and Quality of work	40 Marks	SEE: Total 50 Marks (Semester End Examination)												
Viva-Voce	10 Marks													

Course Outcomes: After completing the course the students will be able to	
CO1	Identify the electronic solutions for day to day societal problems with available tools (L2)
CO2	Develop the system according to the problem stated in project work (L3)
CO3	Implement and Test the performance of the system (L4)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 6

Subject Name: ADVANCED COMMUNICATION LAB

Subject Code: EC6LB1

L-T-P-C: 0-0-3-1.5

Course Objectives: This course will enable students to:	
1	Understand Sampling theorem and basic digital modulation techniques.
2	Study the characteristics of different microwave components.
3	Measure Antenna parameters such directivity, gain and radiation pattern.

A.LISTOFEXPERIMENTSUSING MATLAB

1.	Verification of sampling theorem using Flat-Top Sampling.
2.	Study the digital modulation and demodulation using Amplitude Shift Keying technique
3.	Study the digital modulation and demodulation using Frequency Shift Keying technique
4.	Study the pre-emphasis and de-emphasis circuit and draw the characteristics
5.	Measurement of Frequency of Operation, Operating wavelength, Guide wavelength, VSWR and Cutoff wavelength of a given component using microwave test bench.
6.	Measurement of resonance characteristics of microstrip ring resonator and determination of dielectric constant of the substrate.
7.	Measurement of Directivity and Gain of Microstrip antennas.
8.	Study of mode curves of Reflex Klystron oscillator and determine a) Electronic tuning range b) Electronic tuning sensitivity
9.	Measurement of impedance of a microwave Component using Microwave Bench.
10.	Measurement of S-parameters and characteristics of E-plane Tee, H-plane Tee and Magic Tee.

Course Outcomes: After completing the course the students will be able to

CO1	Verify the S-parameters of Microwave components and Draw the characteristics of antennas and microwave components (L2)
CO2	Develop the model and implement the various digital modulation techniques (L3)
CO3	Verify, Interpret and Record the experimental data, analyze the results and prepare a formal laboratory report (L3)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: ECE

Semester: 6

Subject Name: CCNLAB

Subject Code: EC6LB2

L-T-P-C:0-0-3-1.5

Course Objectives: This course will enable students to:	
1	Students understand and analyze the Protocols of different layers by Implementing it in C Codes.
2	Learn concept of Simulation of Transport layer Protocols and analyze QOS parameter.
3	Study the port addressing by Python Programming.

Description	
PART-A: Implement the following in C/ python Programming:	
1.	Write a program to bit stuff and Destuff the frame.
2.	Write a program to Character stuff and Destuff the frame
3.	To Simulate Data Encryption and Decryption using Substitution Method
PART-B: Simulation Experiments using Network simulator tools: NS2/ NS3/ OPNET Riverbed/ Cisco Packet Tracer	
4.	Simulate a four-node point to point network with duplex links between them and set the queue size to vary bandwidth and to find the number of packets dropped.
5.	Simulate different types of internet traffic such as FTP and TELNET over a network to analyze the throughput.
6.	Simulate Ethernet LAN using n nodes and set multiple traffic nodes to determine collision across different node.
7.	Implement point to point network with links between nodes and apply UDP agent by changing the parameter to determine the number of packets sent by UDP. Study and analyze the QOS (throughput, delay etc.).
8.	Implement point to point network with links between nodes and apply TCP agent by changing the parameter to determine the number of packets sent by TCP. Study and analyze the QOS (throughput, delay etc.).
9.	Create and simulate the Star topology using 7 nodes using OPNET Riverbed.
10.	Performing an initial Switch configuration Cisco Packet Tracer.
11.	Performing an initial Router configuration Cisco Packet Tracer.
12.	Performing OSPF configuration using Cisco Packet Tracer.

Course Outcomes: After completing the course the students will be able to	
CO1	Construct the codes in C/Python language to realize and interpret the protocols of different layers in OSI Model (L2)
CO2	Design a suitable network and simulate using a Network simulator tool NS2/NS3/OPNET Riverbed (or any other Electrical Engineering) and analyze the results (L3)
CO3	Verify, Interpret and Record the experimental data, analyze the results and prepare a formal laboratory report (L3)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
 (A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



V Semester

V Semester B.E. (Common to all UG programs: EE (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.- Jan. 2018))						Examination				
SI No.	Course Code		Course Title	Teaching dept.	Board of Exam.	Credits	Duration in Hrs.	CIE	SEE	Total Marks
01	PC	EE5TH1	PLC and SCADA	EEE	EEE	3	3	50	50	100
02	PC	EE5TH2	Signals and Systems	EEE	EEE	3	3	50	50	100
03	PC	EE5TH3	Electrical Machine Design	EEE	EEE	3	3	50	50	100
04	PC	EE5TH4	Microcontroller and its Applications	EEE	EEE	3	3	50	50	100
05	PE	EE5PE5x	Professional Elective-I	EEE	EEE	3	3	50	50	100
06	OE	EE5OE6x	Open Elective-I	EEE	EEE	3	3	50	50	100
07	PC	EE5MP1	Mini Project-I	EEE	EEE	2				
08	PC	EE5LB1	PLC Lab	EEE	EEE	1.5	3	50	50	100
09	PC	EE5LB2	Microcontroller Lab	EEE	EEE	1.5	3	50	50	100
10	HS	SK5DP3	Skill Development-III	HS	HS	1	3	50	50	100
Total						24	27	450	450	900

Professional Elective I:	Open Elective I:
EE5PE51: Advanced Control Systems	EE5OE61: Energy Conversion Techniques
EE5PE52: Illumination Engineering	EE5OE62: Fundamentals of Illumination Engineering
EE5PE53: Linear Integrated Circuits	



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Note: Open Elective : The strength should be Min of 25 and Max of 55 to 60. In Place of Open Elective at V Sem , the students are encouraged to take Online course (Swayam/Mooc / Nptel /MIT – Coursera). The same is approved by concerned HEAD and DEAN (Academics) .



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



VI Semester

VI Semester B.E. (Common to all UG programs: EE/ EC/TC/ML/CS/IS/ ME/IM/CV) (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.- Jan. 2018)						Examination				
Sl No.	Course Code		Course Title	Teaching dept.	Board of Exam.	Credits	Duration in Hrs.	CIE	SEE	Total Marks
01	PC	EE6TH1	Power System-1	EEE	EEE	3	3	50	50	100
02	PC	EE6TH2	Digital Signal Processing	EEE	EEE	3	3	50	50	100
03	PC	EE6TH3	Switchgear and High Voltage Engineering	EEE	EEE	3	3	50	50	100
04	PE	EE6PE4x	Professional Elective-II	EEE	EEE	3	3	50	50	100
05	OE	EE6OE5x	Open Elective-II	EEE	EEE	3	3	50	50	100
06	PC	EE6MP1	Mini Project-II	EEE	EEE	3	3	50	50	100
07	PC	EE6LB1	Computer Aided Electrical Drawing Lab	EEE	EEE	1.5	3	50	50	100
08	PC	EE6LB2	Relay and High Voltage Lab	EEE	EEE	1.5	3	50	50	100
09	HS	SK6DP4	Skill Development-IV	HS	HS	1	3	50	50	100
Total						22	27	450	450	900

Professional Elective II:	Open Elective II:
EE6PE41: Advanced Power Electronics	EE6OE51: Programmable Logic Controller
EE6PE42: Solar and Wind Energy Systems	EE6OE52: Fundamentals of Renewable Energy Sources
EE6PE43: Python Application Programming	



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Note: Open Elective : The strength should be Min of 25 and Max of 55 to 60. In Place of Open Elective at VI Sem , the students are encouraged to take Online course (Swayam/Mooc / Nptel /MIT – Coursera). The same is approved by concerned HEAD and DEAN(Academics).



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: V

Subject Name: PROGRAMMABLE LOGIC CONTROLLER & SCADA

Subject Code: EE5TH1

L-P-C: 3-0-3

Course Objectives:

- To understand PLC system, standards, I/O devices and SCADA
- To analyze PLC applications and data processing
- To apply the knowledge of ladder programming, functional blocks, sequential function chart, structured text.
- To design the concept of timer, counter in PLC systems.

UNIT	Description	Hours
I	INTRODUCTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses.	08
II	PROGRAMMING: Ladder programming-ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme examples like location of stop and emergency switches	08
III	PROGRAMMING LANGUAGES: Instruction list, sequential functions charts & structured text, jump and call subroutines. INTERNAL RELAYS: ladder programmes, battery- backed relays, one - shot operation, set and reset, master control relay.	08
IV	TIMERS AND COUNTERS: Types of timers, programming timers, ON and OFF-delay timers, pulse timers, forms of counter, programming, up and down counting, timers with counters, sequencer.	08
V	SCADA: Introduction, definition and history of supervisory control and data acquisition, typical SCADA system, architecture, communication requirements, desirable properties of SCADA system, features, advantages, disadvantages and applications of SCADA. SCADA architecture (first generation-monolithic, second generation-distributed, third generation-networked architecture).	07

Course Outcomes:

After completion of course, student will be able to:

1. Understand PLC system, standards, I/O devices and SCADA
2. Analyze PLC applications and data processing
3. Apply the knowledge of ladder programming, functional blocks, sequential function chart, structured text.
4. Design timer, counter in PLC systems.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Textbooks:

1. Programmable Logic controllers” W Bolton, 4th edition, 2006.
2. SCADA Supervisory Control and Data Acquisition, Stuart A Boyer, ISA, 3rd edition, 2004

Reference Books:

- Programmable logic controllers - principles and applications, John W Webb, Ronald A Reis ,5th edition, 2007
- Programmable Controller Theory and Applications, L. A Bryan, E. A Bryan, 2nd edition, 1997

NPTEL: <https://nptel.ac.in/courses/108/105/108105063>



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: V

Course Name: SIGNALS & SYSTEMS

Course Code: PC-EE5TH2

L-P-C: 3-0-3

Course Objectives:

1. To understand signals and systems in terms of both the time and frequency domains.
2. To apply Fourier analysis to continuous time and discrete time signals, Z-Transform to time domain signals.
3. To analyze system properties based on impulse response, Fourier analysis and Z Transform.
4. To design linear time-invariant (LTI) systems and compute its response.

UNIT	Description	Hours
I	Introduction: Definition of Signals and Systems, Classification of Signals, Basic operation on Signals, Elementary signals, Properties of Systems.	8
II	Continuous Time LTI system: Convolution integral for CT LTI system, properties of convolution, Differential equation representation for CT LTI system, Block diagram representation.	8
III	Discrete Time LTI system: Convolution sum. Differential equation representation for DT LTI system, Block diagram representation.	7
IV	Fourier Representation of Signals: Continuous-time periodic signal (Fourier Series), Discrete-time periodic signal (Discrete Time Fourier Series) and their properties.	8
V	Z-Transform: Z-transform, Properties of ROC, inverse Z-transform. Unilateral Z-Transform and its applications, Solution of Difference Equations.	8

Course Outcomes:

At the end of the course, the student will be able to:

1. Understand signals and systems in terms of both the time and frequency domains.
2. Apply Fourier analysis tools like Fourier Series continuous time and discrete time signals, Z-Transform to time domain signals.
3. Analyze system properties based on impulse response, Fourier analysis and Z Transform.
4. Design linear time-invariant (LTI) systems and compute its response.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Book:

1. Signals and Systems, Simon Haykin and Barry Van Veen John Wiley & sons, 2001.Reprint 2002.

Reference Books:

1. Signals and Systems, Ganesh Rao and Satish Tunga, Sanguine Technical Publishers, 2004.
2. Signals and Systems, Alan V Oppenheim, Alan S, Wilsky and A Hamid Nawab, 2nd edition, 1997. Indian Reprint 2002.

NPTEL: <https://nptel.ac.in/courses/117/101/117101055>
<https://nptel.ac.in/courses/108/104/108104100>



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering
Course Name: ELECTRICAL MACHINE DESIGN
Course Code: PC-EE5TH3

Semester: V

L-P-C: 3-0-3

Course Objectives:

1. To understand the fundamentals of electrical machine design.
2. To apply the design aspects in Electrical machines.
3. To analyze the number of slots in AC & DC machines.
4. To design the overall dimension of Electrical machines.

UNIT	Description	Hours
I	Fundamentals of Design: Introduction, considerations for the design of electrical machines, limitations. Different types of materials and insulators used in electrical machines. Design of DC Machines: Output equation, choice of specific loadings, choice of number of poles, design of main dimensions, design of armature & slot dimensions. Dimensions of the pole body & estimation of number of turns in the field winding. (Excluding problems on field winding)	09
II	Design of Single Phase Transformers: Output equation, choice of specific loadings, expression for volts / turn, determination of main dimensions of the core, estimation of number of turns and cross sectional area of primary and secondary coil, estimation of no load current.	07
III	Design of Three Phase Transformers: Output Equation, choice of specific loadings. Determination of main dimensions of the core, estimation of number of turns and cross sectional area of primary and secondary coil, tank design, number of tubes.	08
IV	Design of Three Phase Induction Motor: Output equation, choice of specific loading, main dimensions of 3-phase induction motor, stator winding design, choice of length of the airgap, estimation of number of slots for the squirrel cage rotor, design of rotor bars & end ring, design of slip ring induction motor.	08
V	Design of Synchronous Machines: Output equations, choice of specific loadings, short circuit ratio, number of slots for the stator, design of main dimensions, armature winding, slot details for the stator of salient & non salient pole, synchronous machines design, design of rotor of salient pole synchronous machines. Problems only on main dimension & number of slots.	07

Course Outcomes:

At the end of the course, the student will be able to:

1. Understand the fundamentals of electrical machine design.
2. Apply the design aspects in Electrical machines.
3. Analyze the number of slots in AC & DC machines.
4. Design the overall dimension of Electrical machines.

Department of Electrical & Electronics Engineering.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Book:

A Course in Electrical Machine Design, A K Sawhney, 6th edition, 2014, Dhanpat Rai & Sons.

Reference Books:

1. A Simplified Text in Electrical Machine Design, A NagoorKani, RBA Publications, 2nd edition.
2. Design of Electrical Machines, V N Mittle, Standard Publishers, 4th edition.

NPTEL: <https://www.nptel.ac.in/courses/108/106/108106023>



Syllabus for the Academic Year 2022 – 2023

Department: Electrical & Electronics Engineering

Semester: V

Course Name: MICROCONTROLLER & ITS APPLICATIONS

Course Code: PC-EE5TH4

L-P-C: 3-0-3

Course Objectives:

1. To understand the basics of Microprocessor, 8051 Microcontroller with architecture, hardware and programming
2. To apply Assembly language & C language programming skills for real time applications
3. To analyze programmable interfacing modules with Microcontrollers
4. To design interfacing circuits for various applications of 8051 Microcontroller

UNIT	Description	Hours
I	8051 Microcontroller: Microprocessor Vs Microcontroller, RISC and CISC CPU architectures, Harvard and Von-Neumann CPU architecture, 8051 Architecture-Registers, Pin diagram, I/O port functions, Internal memory organization, External memory (ROM & RAM) interfacing.	07
II	Instruction Set: Addressing modes-Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Indexed addressing, Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions, Illustrative Assembly language programs (without loops).	08
III	Stack, I/O Port Interfacing and Programming: Stack and Subroutine instructions, Illustrative Assembly language programs on Stack operations and Subroutine (involving loops). Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.	08
IV	Timers and Serial Port: Timers and Counters operations, Illustrative Assembly language programming, 8051 Serial Communication-Basics of Serial Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit the data and receive the data serially.	08
V	Interrupts and Interfacing Applications: 8051 Interrupts, Programming timer interrupts, Programming external hardware interrupts, Interrupt priority in the 8051 (Excluding programs), Interfacing and programming of 8051 to LCD, ADC, DAC, Stepper motor and DC motor.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

At the end of the course, the student will be able to:

1. Understand the basics of Microprocessor, 8051 Microcontroller with architecture, hardware and programming.
2. Apply Assembly language & C language programming skills for real time applications.
3. Analyze programmable interfacing modules with Microcontrollers
4. Design interfacing circuits for various applications of 8051 Microcontroller.

Text Book:

The 8051 Microcontroller and Embedded Systems using assembly and C, Muhammad Ali Mazidi, and Janice Gillespie, Mazidi and Rollin D, McKinlay, PHI, 2nd edition, 2016.

Reference Books:

1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J Ayala, 2nd edition, Penram, International, 1996/Thomson, Learning, 2005.
2. The 8051 Microcontroller, V Udayashankar and Mallikarjuna Swamy, Tata Mc Graw-Hill, New Delhi, 2009.
3. Microcontrollers: Architecture, Programming, Interfacing and System Design, Raj Kamal, Pearson Education, 2005

NPTEL: <https://nptel.ac.in/courses/108/105/108105102>



Syllabus for the Academic Year 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: V

Course Name: ADVANCED CONTROL SYSTEMS

Course Code: PE-EE5PE51

L-P-C: 3-0-3

Course Objectives:

1. To understand the concept of state variable analysis, state equations and nonlinear system.
2. To apply the concept of matrix fundamentals and compute Eigen values, Eigen vectors and state transition matrix.
3. To analyze the system controllability and observability.
4. To design State feedback controller and state observer.

UNIT	Description	Hours
I	Controllers: P, PI, PD and PID. State Variable analysis & Design: Introduction, concept of state, state variables and state model of linear systems.	08
II	State space representation: Physical variables, phase variables and canonical variables. Derivation of transfer function from state model, Eigen values, Eigen vectors, generalized Eigen vectors, diagonalization/linear transformation.	08
III	Solution of state equation: state transition matrix & its properties, computation using Laplace transformation, power series method, Cayley-Hamilton method, concept of controllability & observability-Methods.	08
IV	Non-Linear System: Introduction, behavior of non-linear system, common physical non-linearities, saturation, friction, backlash, dead zone, relay, Phase-Plane method (Basic concepts), nodal point, saddle point, focus point singular points, Stability of non-linear systems, limit cycles. (Construction of phase-trajectories- excluded)	07
V	Pole placement techniques: State feedback controller design-direct substitution method and by using Ackramann's formula, full order state observer design- direct substitution method and by using Ackramann's formula.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

At the end of the course, student will be able to:

1. Understand the concept of state variable analysis, state equations and nonlinear system.
2. Apply the concept of matrix fundamentals and compute Eigen values, Eigen vectors and state transition matrix.
3. Analyze the system controllability and observability.
4. Design State feedback controller and state observer.

Text Books:

1. Digital Control & State Variable Methods, M Gopal, TMH, 2nd edition, 2003
2. State Space Analysis of Control systems, Katsuhiko Ogata, PHI, 2007.

Reference Books:

1. Control Systems Engineering, J. Nagrath, M. Gopal, New Age International Publishers, 6th Multi Color Edition, 2017
2. Advanced Control Theory, A Nagoor Kani, RBA Publications, 2nd edition, 2003.
3. Modern Control Theory, M.V Bakshi, UA Bakshi, Technical Publication, 2nd edition, 2003.

NPTEL: <https://nptel.ac.in/courses/108/103/108103008>



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: V

Course Name: ILLUMINATION ENGINEERING

Course Code: PE-EE5PE52

L-P-C: 3-0-3

Course Objectives:

1. To understand the concepts of Illumination.
2. To apply the concepts and various factors considered for illumination.
3. To analyze illumination schemes for various applications.
4. To design different lighting systems as per the requirement of customers.

UNIT	Description	Hours
I	Introduction to lighting system: Eye and Vision, Electromagnetic Spectrum, Visible Spectrum, Components of Eye and functions of each, Vision functions, accommodation, adaptation and convergence, luminance contrast and color contrast.	8
II	Illumination systems, Light sources: EN 12464-1,2(illumination standards), Day light, Incandescent, electric discharge, fluorescent, arc lamps.	7
III	Laws of Illumination: Illumination from point, line and surface sources, Photometry, spectro photometry, photocells, environment and glare. General Illumination design, Interior lighting, residential lighting, office departmental sources, theatre, hospitals.	8
IV	Interior Lighting Design: lighting design objectives, safety and health performance appearance and comfort lighting design flow chart, lighting for commercial buildings and public buildings such as offices, hotels, teaching establishments, theaters and hospital lighting.	8
V	Exterior Lighting Design: Flood lighting, street lighting, Aviation and Transport lighting, Lighting for displays and signaling neon signs, LED-LCD displays and lighting for surveillance.	8

Course Outcomes:

At the end of the course, student will be able to:

1. Understand the concepts of Illumination.
2. Apply the concepts and various factors considered for illumination.
3. Analyze the illumination schemes for various applications.
4. Design different lighting systems as per the requirement of customers.

Text Books:

2. M A Cayless and A M Marsden, "Lamps and Lighting", Oxford and IBH Publishing, 4th Edition, 1996
3. J B Gupta, "Utilization of Electrical Power", Dhanpat Rai and Sons, New Delhi.

Department of Electrical & Electronics Engineering.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Books:

5. Ronald N Helms, "Illumination Engineering for Energy Efficiency Luminous Environment", PHI, 1980.
6. Brain Fitt and Joe Thornily, "Lighting by Design" - A Technical Guide, Focal Press, Boston, 1992..

NPTEL: <https://nptel.ac.in/courses/108/105/108105061>

*** Visit to industry is mandatory and subsequent submission of report carries 10% of the CIE marks.**



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 – 2023

Department: Electrical & Electronics Engineering

Semester: V

Course Name: Linear Integrated Circuits.

Course Code: PE-EE5PE53

L-P-C: 3-0-3

Course Objectives:

3. To understand the basic concepts of op-amps and as AC and DC amplifiers.
4. To analyze frequency response and compensation techniques of op-amps.
5. To evaluate the performance of op-amps as signal generation and signal processing circuits.
6. To design linear and nonlinear circuits using op-amps.

UNIT	Description	Hours
I	Operational Amplifier Fundamentals: Introduction to operational amplifiers, Op-amp parameters – Input and output voltage, CMRR and PSRR, offset voltages and currents, Input and output impedances, Slew rate and Frequency limitations; Op-amps as DC Amplifiers- Biasing Op-amps, Direct coupled -Voltage Followers, Non-inverting Amplifiers, Inverting amplifiers, Summing amplifiers, Difference amplifier. Op-amps as AC Amplifiers: Capacitor coupled voltage follower, Capacitor coupled Non-inverting amplifier, High Zin capacitor coupled Non-inverting amplifier, Capacitor coupled inverting amplifier, setting upper cutoff frequency.	08
II	Op-amps frequency Response and Compensation: Op-amp circuit stability, frequency and phase response, frequency compensating methods, op-amp circuit bandwidth, Slew rate effects, Stray capacitance effects, Load capacitance effects, circuit stability precautions	08
III	Signal Processing circuits: Current amplifiers, instrumentation amplifier, Precision half wave and full wave rectifiers, limiting circuits, clamping circuits, peak detectors, sample-and-Hold circuit.	08
IV	Op-amps and nonlinear circuits: Op-amps in switching circuits, zero crossing detectors, Inverting and non-inverting Schmitt trigger circuits, Astable and Monostable multi vibrator. V to I and I to V converters, Log and antilog amplifiers, Multiplier and divider.	08
V	Signal generator: Active Filters –First and second order Low pass & High pass filters. Triangular/Rectangular wave generator, waveform generator design, Phase shift oscillator, oscillator amplitude stabilization, Wein bridge oscillator, Signal generator.	07



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

At the end of the course, student will be able to:

1. Understand the basic concepts of op-amps as AC and DC amplifiers.
2. Analyze frequency response and compensation techniques of op-amps.
3. Evaluate the performance of op-amps as signal generation and signal processing circuits.
4. Design linear and nonlinear circuits using op-amps.

Text Books:

1. Operation Amplifiers and Linear IC's, David A. Bell, 2nd Edition, PHI/Pearson, 2004
2. Linear Integrated Circuits, D. Roy Choudhury and Shail B. Jain. 2nd Edition, New Age International, 2006

Reference Books:

1. Op Amps and Linear Integrated Circuits-Concepts and Applications, James M. Fiore Cengage Learning, 2009.
2. Operational amplifiers and linear IC's, Stanley William D, 4th edition, Pearson Education

NPTEL: <https://nptel.ac.in/courses/108/108/108108111>



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: V

Course Name: ENERGY CONVERSION TECHNIQUES

Course Code: OE-EE5OE61

L-P-C: 3-0-3

Course Objectives:

1. To understand the concepts of energy conversion from one form to another.
2. To apply energy conversion techniques for different energy conversion systems.
3. To analyze the concept of energy conversion techniques in energy conversion systems.
4. To evaluate conversion techniques in energy conversion systems.

UNIT	Description	Hours
I	Energy Conversion in Machines: History of energy conversion, Energy resources and environment. Conversion of mechanical energy to Electrical Energy: DC generator principle, types, applications. Conversion of Electrical to Mechanical Energy: DC motor, Principle, types and applications. Energy conversion techniques in AC machines: 3-phase induction motor, principle, types and applications.	8
II	Non-Conventional Energy Sources: Solar energy: Principle of solar energy, beam and diffuse radiation, solar electric power generation, solar water heating, solar pump, solar pond, applications. Wind energy: Principles of WECS, basic components of WECS, wind energy collectors applications. Bio-gas plants: Principle, classification, conversion techniques, KVIC digester applications.	8
III	Nuclear energy: Nuclear energy conversion techniques, principle, types, working of nuclear reactor, applications. Battery energy: Battery energy conversion techniques, Principle, working, types and applications.	8
IV	Hybrid Electric Vehicles: Introduction to electric vehicles, hybrid electric vehicles, series hybrid vehicles, parallel hybrid vehicles, applications. Traction motors: Types and construction, classification, dc and ac series motors, linear induction motor, applications.	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



V	Special Machines: Construction, working and applications of Universal motor, Stepper motor, BLDC motor and Reluctance motor. Transducers : Classification, characteristics and applications of transducers-Strain gauge, LVDT, Thermocouples.	7

Course Outcomes:

At the end of the course, student will be able to:

1. Understand the concepts of energy conversion from one form to another.
2. Apply energy conversion techniques for different energy conversion systems.
3. Analyze the concept of energy conversion techniques in energy conversion systems.
4. Evaluate the conversion techniques in energy conversion systems.

Text Books:

1. Principles of Electric Machines, V. K. Mehta, and Rohith Mehta, S Chand, 2nd Edition, 2009
2. Non-conventional Energy Sources, G. D. Rai, Khanna, 5th edition, 2014

Reference Books:

1. Special Electrical Machines, E. G. Janardhan, PHI, I Edition, 2014
2. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press, E Book- PDF, 2nd Edition, 2011.
3. Transducers and Instrumentation, D V S Murthy, PHI, E Book- PDF 2nd Edition.
4. Fundamentals of Advanced Energy Conversion (Nuclear) Prof. Jefferson W. Tester
Open Course Ware

NPTEL: <https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf>

***Visit to manufacturing plant is mandatory and subsequent submission of report carries 10% of the CIE marks.**



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: V

Course Name: FUNDAMENTALS OF ILLUMINATION ENGINEERING

Course Code: OE-EE5OE62

L-P-C: 3-0-3

Course Objectives:

1. To understand the concepts of Illumination.
2. To apply the concept and various factors considered for illumination.
3. To analyze illumination schemes for various applications.
4. To design different lighting systems as per the requirement of customers.

UNIT	Description	Hours
I	Introduction to lighting system: Electromagnetic Spectrum, Components of Eye and functions of each, Vision functions, accommodation, adaptation and convergence.	8
II	Illumination systems, Light sources: Incandescent lamp, CFL, fluorescent, arc lamps, sodium vapour lamp, mercury vapour lamp	7
III	Laws of Illumination: Laws of Illumination, Illumination at a point due to source of light, important definitions, definitions of utilization factor, maintenance factor, Beam factor, Waste light factor, Absorption factor.	8
IV	Interior Lighting Design: lighting design objectives, comfort lighting design flow chart, lighting of public buildings such as offices, hotels, teaching establishments (Class room and Seminar halls).	8
V	Exterior Lighting Design: Flood lighting, street lighting, LED-LCD displays, lighting of swimming pool, lighting of tennis court.	8

Course Outcomes:

At the end of the course, student will be able to:

1. Understand the concepts of Illumination.
2. Apply the concept and various factors considered for illumination.
3. Analyze the illumination schemes for various applications.
4. Design different lighting systems as per the requirement of customers.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

1. M A Cayless and A M Marsden, "Lamps and Lighting", Oxford and IBH Publishing, 4th Edition, 1996
2. J B Gupta, "Utilization of Electrical Power", Dhanpat Rai and Sons, New Delhi.

Reference Books:

1. Ronald N Helms, "Illumination Engineering for Energy Efficiency Luminous Environment", PHI, 1980.
2. Brain Fitt and Joe Thornily, "Lighting by Design"- A Technical Guide, Focal Press, Boston, 1992..

NPTEL: <https://nptel.ac.in/courses/108/105/108105061>

*** Visit to industry is mandatory and subsequent submission of report carries 10% of the CIE marks.**



Syllabus for the Academic Year 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: V

Course Name: PROGRAMMABLE LOGIC CONTROLLER LABORATORY

Course Code: PC-EE5LB1

L-P-C: 0-3-1.5

Course Objectives:

1. To understand the use software tools for simulation of lamps and motor
2. To develop and conduct experiments to study the performance of motors and infer appropriate conclusions from the results of the experiments
3. To develop code to automate the simulation process and accumulate the simulation results

SL.	Description
I	Realization of basic logic gates.
II	Construct and develop PLC ladder diagram to control lamp.
III	Construct and develop PLC ladder diagram to control motor.
IV	Develop and test ladder diagram to control lamp with Timer
V	Develop and test ladder diagram to control motor with counters
VI	Develop and simulate application to control lift
VII	Develop and simulate application of conveyor control.
VIII	Develop and test ladder diagram for Star and Delta connection.
IX	Develop and test ladder diagram for DOL type motor with PLC
X	Demonstration of water bottle filler and elevator using PLC.

Course Outcomes:

After completion of course, student will be able to:

1. Understand the use software tools for simulation of lamps and motor
2. Develop and conduct experiments to study the performance of motors and infer appropriate conclusions from the results of the experiments
3. Develop code to automate the simulation process and accumulate the simulation results



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year 2022 - 2023

Department: Electrical & Electronics Engineering
Course Name: MICROCONTROLLER LABORATORY
Course Code: PC-EE5LB2

Semester: V
L-P-C: 0-3-1.5

Course Objectives:

- 1 To analyze assembly language program for 8051 microcontroller
- 2 To execute assembly language programme using 8051 microcontroller addressing modes and instructions set
- 3 To interface the different applications of 8051 microcontroller using interfacing devices

SL. NO.	Description
	PART-A: PROGRAMMING
I	Data Transfer - Block movement, Exchange, Sorting, Finding largest element in an array.
II	Arithmetic Instructions - Addition/subtraction, multiplication/division, square and cube of a number (16 bits Arithmetic operations bit addressable).
III	Counters.
IV	Boolean & Logical Instructions (Bit manipulations).
V	Conditional CALL & RETURN.
VI	Code conversion: BCD ASCII; ASCII Decimal; Decimal - ASCII; HEX - Decimal and Decimal -HEX.
VII	Programs to generate delay, Programs using serial port and on- Chip timer / counter.
	PART-B: INTERFACING
VIII	Alphanumeric LCD panel and Hex keypad input interface to 8051
IX	Generate different waveforms Square, Triangular, using DAC interface to 8051
X	Stepper motor and DC motor control interface to 8051.

Course Outcomes:

At the end of the course, student will be able to:

- 1 Analyze assembly language program for 8051 microcontroller
- 2 Execute assembly language programme using 8051 microcontroller addressing modes and instructions set
- 3 Interface the different applications of 8051 microcontroller using interfacing devices



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



VI Semester

VI Semester B.E. (Common to all UG programs: EE/ EC/TC/ML/CS/IS/ ME/IM/CV) (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.- Jan. 2018)						Examination				
SI No.	Course Code		Course Title	Teaching dept.	Board of Exam.	Credits	Duration in Hrs.	CIE	SEE	Total Marks
01	PC	EE6TH1	Power System-1	EEE	EEE	3	3	50	50	100
02	PC	EE6TH2	Digital Signal Processing	EEE	EEE	3	3	50	50	100
03	PC	EE6TH3	Switchgear and High Voltage Engineering	EEE	EEE	3	3	50	50	100
04	PE	EE6PE4x	Professional Elective-II	EEE	EEE	3	3	50	50	100
05	OE	EE6OE5x	Open Elective-II	EEE	EEE	3	3	50	50	100
06	PC	EE6MP1	Mini Project-II	EEE	EEE	3	3	50	50	100
07	PC	EE6LB1	Computer Aided Electrical Drawing Lab	EEE	EEE	1.5	3	50	50	100
08	PC	EE6LB2	Relay and High Voltage Lab	EEE	EEE	1.5	3	50	50	100
09	HS	SK6DP4	Skill Development-IV	HS	HS	1	3	50	50	100
Total						22	27	450	450	900

Professional Elective II:	Open Elective II:
EE6PE41: Advanced Power Electronics	18EE6OE51: Programmable Logic Controller
EE6PE42: Solar and Wind Energy Systems	18EE6OE52: Fundamentals of Renewable Energy Sources
EE6PE43: Python Application Programming	



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Note: Open Elective : The strength should be Min of 25 and Max of 55 to 60. In Place of Open Elective at VI Sem , the students are encouraged to take Online course (Swayam/Mooc / Nptel /MIT – Coursera). The same is approved by concerned HEAD and DEAN(Academics).



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: VI

Course Name: POWER SYSTEMS-1

Course Code: PC-EE6TH1

L-P-C: 3-0-3

Course Objectives:

1. To understand the concepts of single line diagram, per unit system, types of faults, symmetrical components for a given power system network with all its complex components present.
2. To apply the basic concepts to solve power system problems under normal and abnormal conditions
3. To analyze the given power system for symmetrical and unsymmetrical faults.
4. To evaluate the current and voltage in a power system during normal and abnormal conditions.

UNIT	Description	Hours
I	Representation of Power system Components: Circuit models of Transmission line, Synchronous machines, Transformer and load, one line diagram, Assumptions made to draw impedance and reactance diagram. Per unit system, Per unit impedance diagram, Illustrative examples.	09
II	Symmetrical three phase faults: Transients on an unloaded transmission line for a fault, Short - Circuit currents and the reactance of synchronous machine on No load & On load, Selection of circuit breakers, Illustrative examples.	07
III	Symmetrical components: Analysis of unbalanced load against balanced three phase supply, Resolution of unbalanced phasors into their symmetrical components, Illustrative examples.	07
IV	Symmetrical components: Phase shift of symmetrical components in star-delta transformer bank, Power in terms of symmetrical components, Analysis of balanced and unbalanced loads against unbalanced three phase supply, Sequence impedances and sequence networks, Sequence impedance of power system elements (alternator, transformer and transmission line), positive, negative and zero sequence networks of power system elements, Illustrative examples.	08
V	Unsymmetrical faults: L-G, L-L, L-L-G faults on an unloaded alternator with and without fault impedance, Unsymmetrical faults on a power system with and without fault impedance, Open conductor faults in power systems, Illustrative examples.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

At the end of course, student will be able to:

1. Understand the concepts of single line diagram, per unit system, types of faults, symmetrical components for a given power system network with all its complex components present.
2. Apply the basic concepts to solve power system problems under normal and abnormal conditions
3. Analyze the given power system for symmetrical and unsymmetrical faults.
4. Evaluate the current and voltage in a power system during normal and abnormal conditions.

Text Books:

1. Elements of Power System Analysis, W D Stevenson, First edition, 1994, Mc Graw Hill
2. Modern Power System Analysis, I J Nagrath and D P Kothari, Fourth edition, 2011, TMH.

Reference Books:

1. Power system analysis, Hadi Saadat, Second edition, 2002, TMH
2. Power system analysis, Bergen Arthur, Second edition, Pearson Education

NPTEL: <https://nptel.ac.in/courses/108/105/108105067>



Syllabus for the Academic Year – 2022 – 2023

Department: Electrical & Electronics Engineering

Semester: VI

Course Name: Digital Signal Processing

Course Code: PC-EE6TH2

L-P-C: 3-0-3

Course Objectives:

1. To understand the concept of Discrete Fourier Transforms, Fast Fourier Transforms and digital filters.
2. To apply DFT and inverse DFT to find the convolution of the given sequence.
3. To analyze different methods of realizing a digital IIR and FIR filter.
4. To design digital filters using impulse invariant, bilinear transformation and window techniques

UNIT	Description	Hours
1.	Discrete Fourier transforms: Definitions of DFT and IDFT, properties-Periodicity, linearity, Circular time and frequency shift, symmetry for real sequences.(Problems only on 4 point) Circular convolution and linear convolution, Overlap odd and save method.	08
2.	Fast Fourier transforms algorithms: Introduction, decimation in time algorithm, decimation in frequency algorithm, number of computations, Inverse DIT and DIF (Illustrative examples only). Convolutions, (Problems only on 4 point)	08
3.	Realization of digital systems: Introduction, realization of IIR systems-direct form, cascade form, parallel form, realization of FIR systems-direct form, cascade form, linear phase realizations.	08
4.	Design of IIR Digital filters: Introduction, Impulse Invariant & Bilinear Transformations, design of digital Butterworth & Chebyshev filters.	08
5.	Design of FIR Digital filters: Introduction, windowing, rectangular, Hamming, frequency sampling technique	07

Course Outcomes:

After completion of course, student will be able to:

1. Understand the concept of Discrete Fourier Transforms, Fast Fourier Transforms and digital filters.
2. Apply DFT and inverse DFT to find the convolution of the given sequence.
3. Analyze different methods of realizing a digital IIR and FIR filter.
4. Design digital filters using impulse invariant, bilinear transformation and window techniques



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Book:

Digital signal processing Principle, Algorithms and Applications, John D Proakis, 3rd edition, PHI, 2004.

Reference Books:

1. Introduction to digital signal processing, Johnny R Johnson, 3rd edition, PHI, 2003.
2. Digital signal processing, Sanjith K. Mithra, 3rd edition, TMH, 2005

NPTEL: <https://nptel.ac.in/courses/117/104/117104070>



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year 2022 – 2023

Department: Electrical & Electronics Engineering

Semester: VI

Subject Name: SWITCHGEAR AND HIGH VOLTAGE ENGINEERING

Subject Code: PC-EE6TH3

L-P-C: 3-0-3

Course Objectives:

1. To understand the basic Protection schemes in power systems and need for High voltage study
2. To apply the knowledge of circuit breakers and protective relays in their operation.
3. To analyze the generation of high voltages AC and DC
4. To evaluate the techniques for measurement of high voltages.

UNIT	Description	Hours
I	Circuit breakers: Arcing phenomenon and arc interruption, DC and AC circuit breaking, Re- striking voltage and Recovery voltage, Rate of rise of re-striking voltage, Resistance switching, Current chopping, Interruption of capacitive current, Types of circuit breaker: Air blast, SF6 and circuit breakers.	08
II	Relays: Introduction, types, essential qualities of relay: sensitivity, selectivity, speed and time, reliability & dependability, principles of power system protection, zones of protection. Thermal relay, Over current relays, Impedance relay, Differential protection: Percentagedifferential relay.	08
III	INTRODUCTION: Introduction to HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory. Important applications of high voltage. BREAKDOWN PHENOMENA: Classification of HV insulating media. Gaseous dielectrics: Ionizations: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory. Limitations of Townsend's theory. Streamer's theory breakdown in non-uniform fields. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic, avalanche, thermal, and electro mechanic breakdown. Breakdown of liquids dielectric dielectrics: Suspended particle theory, electronic, cavity (bubble's theory) and electro convection breakdown.	09
IV	GENERATION OF HVAC AND HVDC VOLTAGE: HVAC-High Voltage transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HVDC- voltage doubler circuit, Cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop	07



V	MEASUREMENT OF HIGH VOLTAGES: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HVAC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HVDC measurements. Standard sphere gap measurements of HVAC, HVDC, and impulse voltages; Factors affecting the measurements.	07

Course Outcomes:

At the end of course, student will be able to:

1. Understand the basic Protection schemes in power systems and need for High voltage study
2. Apply the knowledge of circuit breakers and protective relays in their operation.
3. Analyze the generation of high voltages AC and DC
4. Evaluate the techniques for measurement of high voltages.

Text Books:

1. Switchgear & Protection, Sunil S. Rao, Khanna Publication. 11th Edition, 1998
2. High Voltage Engineering-M.S.Naidu and Kamaraju, 3rd Edition, THM, 2007.

Reference Books:

1. Power System Protection & Switchgear, Badriram&Vishwa Karma, 2nd Edition, TMH,2011
2. Power System Protection & Switchgear, Ravindranath&Chander, New Age Publications,1st Edition, 2018.
3. High Voltage Engineering, C.L.Wadhwa, New Age International Private limited 1995.
4. High Voltage Engineering Fundamentals, E. Kuffel and W.S. Zaengl, 2nd edition,Elsevier, press, 2005.

NPTEL: <https://nptel.ac.in/courses/108/104/108104048>



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering
Subject Name: ADVANCED POWER ELECTRONICS
Subject Code: PE-EE6PE41

Semester: VI

L-P-C: 3-0-3

Course Objectives:

1. To understand the design and working of Switch mode power supplies and UPS.
2. To apply the concept of design procedure of high frequency inductor and transformers for SMPS.
3. To analyze the operation of switched mode DC-DC converter, multilevel inverters
4. To design resonant converters, SMPS, Multilevel inverters for various applications.

UNIT	Description	Hours
I	D.C-D.C Switched mode converter topologies: Buck, boost, buck-boost, Cuk D.C-D.C converter-Detail theory and working principles. (Operation of the above converters is CCM-mode only).	08
II	Derived converters: Forward, flyback, push-pull converters, full bridge and half-bridge DC-DC converter.	08
III	Classification of resonant converters, Series and parallel loaded resonant converters, Zero voltage and Zero current resonant switch converters-Detail theory and working principle.	08
IV	High frequency Inductor and transformers, on line, off line UPS, reliability of UPS and batteries for UPS.	07
V	Multilevel Inverters: Introduction, types, diode clamped multi-level inverters, cascaded H-bridge inverter, flying capacitor clamped inverter and applications.	08

Course Outcomes:

After completion of course, student will be able to:

1. Understand the design and working of DC-DC converter and UPS.
2. Apply the concept of design procedure for high frequency inductor and transformers for SMPS.
3. Analyze the operation of switched mode DC-DC converter, multilevel inverters
4. Design and analyze resonant converters, DC-DC converters and applications



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

1. Power Electronics, M H Rashid, 3rd Edition, PHI publishers
2. Power Electronics, M D Singh, K B, Khanchandani, TMH.

Reference Books:

1. Power Electronics Converters, Application & Design, Mohan N Undeboud, T M, Robins, W P, John Wiley 1989
2. Power Electronics Control in A C Motors, Murplhy JM D Turnnbull, F.G. Pergamon 1988

NPTEL: <https://nptel.ac.in/courses/108/105/108105066>



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: VI

Subject Name: Solar and Wind Energy Systems

Subject Code: PE-EE6PE42

L-P-C: 3-0-3

Course Objectives:

1. To understand the importance of Wind and Solar Power Generations and the concept of Battery Storage System
2. To apply the concept of Maximum Power Point Tracking
3. To analyze Stand-Alone & Grid-Connected System
4. To design the control and conversion system components of Wind Energy systems

UNIT	Description	Hours
I	Introduction to PV Need for sustainable energy sources, Importance of wind and solar power generations, solar radiations and its measurements, Construction and operation of PV cell, Operational characteristics, Single diode modeling, series and parallel resistances, Efficiency limits, factors affecting performance, PV modules.	08
II	MPPT-Converter-Battery Selection Maximum Power Point Tracking. The Dynamic Optimization Problem, Fractional Open-Circuit Voltage and Short-Circuit Current, Soft Computing Methods, the Perturb and Observe Approach Improvements of the P&O Algorithm, Evolution of the Perturbative Method, PV MPPT via Output Parameters, MPPT Efficiency	08
III	Wind Energy: Basics & Power Analysis, Wind resource assessment, Power Conversion Technologies and applications. Wind Turbine Generators: Induction, Synchronous machine, constant V & F and variable V & F generations, Reactive power compensation.	07
IV	Stand-Alone Systems: PV Stand-Alone, Wind Stand-Alone. Grid-Connected System: Interface Requirements, Synchronizing with Grid, Inrush Current, Synchronous Operation, Load Transient, Safety, Operating Limit, Voltage Regulation, Stability Limit -Grid connection Issues -Grid Integrated PMSG and SCIG Based WECS.	08
V	Battery Storage System: Basic concepts, components of cells and batteries, Classification of cells and batteries, Operation of a cell, Specifications, free energy, theoretical cell voltage, specific capacity, specific energy, energy density, memory effect, cycle life, shelf life, state of charge (SOC) and depth of discharge (DOD), internal resistance and coulombic efficiency. lithium batteries, lead-acid batteries.	08



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

After completion of course, student will be able to:

1. Understand the importance of Wind and Solar Power Generations and the concept of Battery Storage System
2. Apply the concept of Maximum Power Point Tracking
3. Analyze Stand-Alone & Grid-Connected System
4. Design the control and conversion system components of Wind Energy systems

Text Books:

1. Solar Photovoltaics: Fundamentals, Technologies and Applications, Chetan Singh Solanki, 2nd Edition, PHI publishers
2. Wind and Solar Power System, Mukund R. Patel, CRC Press; 1 edition (March 30, 1999)

Reference Books:

1. Electricity generation using Wind Power, William Shepherd, Lizhang, WSP, 1st edition, 2010.
2. Power Electronics and Control Techniques for maximum energy harvesting in Photo voltaic system, Nicola femia, Giovanni petrone, CRC press, 1st edition, 2012.
3. Renewable Energy Sources and Emerging Technologies, D.P Kothari, K.C. Singal and Rakesh Ranjan, 2nd Edition, PHI Learning Pvt Ltd.

NPTEL: <https://nptel.ac.in/courses/108/108/108108078/>



Syllabus for the Academic Year – 2022 – 2023

Department: Electrical & Electronics Engineering

Semester: VI

Subject Name: PYTHON PROGRAMMING

Subject Code: PE-EE6PE43

L-P-C: 3-0-3

Course Objectives:

1. To understand lists Dictionaries and Regular expressions in Python.
2. To apply Strings and Files in Python
3. To analyze Syntax and Semantics and create Functions in Python
4. To Implement Object Oriented Programming concepts in Python

UN IT	Description	Hours
1	The Context of Software Development: About Python, Installing Python, The Python Interpreter, Python editors and IDEs, Learning Programming with Python, Writing a Python Program, A Longer Python program. Values and Variables: Integer Values, Variables and Assignment, Identifiers, Floating-point Numbers, Control Codes within Strings, User Input, Controlling the print Function, String Formatting, Multi line Strings.	07
2	Expressions and Arithmetic: Expressions, Mixed Type Expressions, Operator Precedence and Associativity, Formatting Expressions, Comments, Errors, Syntax Errors, Run-time Errors, Logic Errors, Arithmetic Examples, More Arithmetic Operators	08
3	Conditional Execution: Boolean Expressions, The Simple if Statement The if/else Statement, Compound Boolean Expressions, The pass Statement, Floating-point Equality, Nested Conditionals, Multi-way Decision Statements, Conditional Expressions, Errors in Conditional Statements. Iteration: The while Statement, Definite Loops vs. Indefinite Loops, The for Statement, Nested Loops, Abnormal Loop Termination, while/else and for/else, Infinite Loops, Iteration Examples, Computing Square Root, Drawing a Tree, Printing Prime Numbers, Insisting on the Proper Input	08
4	Lists: Motivation, List Structures, Lists (Sequences) in Python, Iterating Over Lists (Sequences) in Python, More on Python Lists. Objects: Using Objects, String Objects, List Objects.	08
5	Tuples, Dictionaries, and Sets: Tuples, Arbitrary Argument Lists, Dictionaries, Using Dictionaries, Counting with Dictionaries, Grouping with Dictionaries, Keyword Arguments, Sets, Set Quantification with all and any, Enumerating the Elements of a Data Structure	08



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

At the end of the course, the students will be able to:

1. Understand Python syntax and semantics and be fluent in the use of Python flow control and functions
2. Demonstrate proficiency in handling Strings and File Systems Strings and Files in Python
3. Analyze Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Implement exemplary applications related to Network Programming and Web Services

Text Books:

1. Python for Everybody: Exploring Data Using Python 3, Charles R. Severance, 1st Edition, CreateSpace Independent Publishing Platform, 2016.
2. Think Python: How to Think Like a Computer Scientist, Allen B. Downey, 2nd Edition, Green Tea Press, 2015

Reference Books:

1. Introduction to Computer Science Using Python, Charles Dierbach, 1st Edition, Wiley India Pvt Ltd, 2015. , ISBN-13: 978-8126556014
2. Introduction to Python Programming, Gowrishankar S, Veena A, 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372
3. Programming Python, Mark Lutz, ,4th Edition, 2011, ISBN-13: 978-9350232873

http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf

<http://greenteapress.com/thinkpython2/thinkpython2.pdf>

NPTEL links

<https://nptel.ac.in/courses/106106212>

<https://youtu.be/c235EsGFcZs>



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: VI

Subject Name: Programmable Logic Controllers

Subject Code: OE-EE6OE51

L-P-C: 3-0-3

Course Objectives:

1. To understand PLC system, advantages and disadvantages, hardware components, ladderdiagram and its programming.
2. To apply identification of common operating modes found in PLCs, writing and entering the ladder logic programs using FBD, SFC and ST.
3. To analyze the functions of Relays, Motor Starters, Switches, Sensors, Output devices, Timer and counters
4. To design PLC systems using ladder logic and programs for different industrial process

UNIT	Description	Hours
1.	Introduction: Introduction to Programmable Logic Controller (PLC), role in automation, advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, input and output devices, signal conditioning, remote connections, networks.	08
2.	Programming: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme on location of fail safe and limit switches.	08
3.	Programming Statement: Instruction list, sequential functions charts & structured text, jump and call subroutines.	08
4.	Internal Relays: Battery- backed relays, one - shot operation, set-reset, master control relay.	07
5.	Timers and Counters: ON and OFF- delay timers, pulse timers, up, down, up-down counting, timers with counters, sequencer.	08

Course Outcomes:

After completion of course, student will be able to:

1. Understand history of PLC, its sequence of operation, advantages and disadvantages, mainparts and their functions
2. Apply ladder logic, FBD, SFC and ST concept for the systems
3. Analyze Relays, Motor Starters, Switches, Sensors, Output devices, timer and counters
4. Design PLC systems using ladder logic and programs for different industrial process



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Text Book:

Programmable Logic controllers, W Bolton, Elsevier- Newness, 4th edition, 2006

Reference Books:

1. Programmable Logic Controllers - principles and applications, John W Webb, Ronald A, 2nd impression, Pearson education, 2007, 5th edition.
2. Programmable Controller Theory and Applications, L. A Bryan, E. A BryanAn industrial text company publication, 1997, 2nd edition.

NPTEL: <https://nptel.ac.in/courses/108/105/108105063>



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Electrical & Electronics Engineering

Semester: VI

Subject Name: Fundamental of Renewable Energy Sources

Subject Code: OE-EE6OE52

L-P-C: 3-0-3

Course Objectives:

1. To understand the processing and limitations of fossil fuels. (coal, petroleum and natural gas.)
2. To demonstrate the concept of energy conversion techniques in Non-Conventional Energy Sources.
3. To analyze the effective utilization techniques in Non-Conventional Energy Sources.
4. To acquire the knowledge of modern energy conversion techniques

UNIT	Description	Hours
1.	Introduction to Energy Sources: Energy consumption as a measure of prosperity, World energy futures- brief discussion of conventional energy sources and their availability, Non-conventional energy sources.	8
2.	Solar Energy: Solar radiation, Beam and Diffuse radiation, types of collectors, advantages and disadvantages, solar electric power generation. Application of Solar Energy: Solar water heating, solar distillation, solar cooking, solar green house, solar furnace.	8
3.	Wind Energy: Principle of wind energy conversion system (WECS), components of WECS, classification of WECS, Types of wind energy collectors, site selection, advantages and disadvantages of WECS.	8
4.	Energy from Biomass: Different types of biomass fuels, biomass conversion technologies, classification of biogas plants, KVIC digester.	8
5.	Energy from Oceans: Principle of ocean thermal energy conversion (OTEC), open cycle, closed cycle & hybrid cycle, OTEC. Energy from Tides: Tidal power, components of tidal power plants, single basin arrangement, double basin arrangement, advantages and limitation of tidal power.	7

Course Outcomes:

After completion of course, student will be able to:

1. Understand the processing and limitations of fossil fuels. (Coal, petroleum and natural gas.)
2. Demonstrate the concept of energy conversion techniques in Non-Conventional Energy Sources.
3. To analyze the effective utilization techniques in Non-Conventional Energy Sources.
4. To acquire the knowledge of modern energy conversion techniques

Text book:

G. D. Rai, “Non conventional energy sources” , Khanna Publication, 1st Edition, 2011



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference books:

1. Sukhatme, "solar energy", TMH Publication, 2nd Edition
2. William C Dickinson , "Solar Energy Hand Book".
3. Twiddleelbs, Renewable Energy Sources

NPTEL: <https://nptel.ac.in/courses/108/108/108108078>

*** Visit to Power Plant is mandatory and subsequent submission of report carries 10% of the CIE marks.**



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 – 2023

Department: Electrical & Electronics Engineering

Semester: VI

Subject Name: COMPUTER AIDED ELECTRICAL DRAWING

Subject Code: PC-EE6LB1

L-P-C: 0-3-1.5

Course Objectives:

1. To understand the concept of single line diagram and Electrical machines
2. To apply winding concept and assembly of DC and AC machines
3. To analyze and design the assembly of AC and DC machines.

	SYLLABUS CONTENT
	PART – A
	Single line diagrams of power generating plants and receiving substations.
	PART –B
	Winding Diagrams: (a) Developed winding diagrams of D.C. machines 1. Simplex double layer Lap and Wave windings. 2. Duplex double layer Lap and Wave windings. (b) Developed winding diagrams of A.C. machines 1. Full patched Double layer Lap and Wave windings. 2. Short control single layer Lap and Wave windings.
	PART -C
	Electrical machine assembly drawing. 1. Transformers - sectional views of single and three phase core and shell type transformers. 2. D.C. machine - sectional views of yoke, field system, armature and commutator dealt Separately. 3. Induction motor and synchronous generator – sectional views of stator and rotor dealt separately.

Course Outcomes:

At the end of course, student will be able to:

1. Understand the concept of single line diagram and Electrical machines
2. Apply winding concept and assembly of DC and AC machines
3. Analyze and design the assembly of AC and DC machines.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 – 2023

Department: Electrical & Electronics Engineering

Semester: VI

Subject Name: Relay and High Voltage lab

Subject Code: PC-EE6LB2

L-P-C: 0-3-1.5

Course Objectives:

1. To understand the concept of field mapping and operating characteristics of solid state and Numerical Relays
2. To analyze the spark over characteristics of Air insulation subjected to HVAC/HVDC and breakdown strength for different electrodes.
3. To evaluate breakdown strength of air and oil.

UNIT	Description
1.	I-T Characteristics of Inverse over current relay.
2.	IDMT Characteristics of Over / Under Voltage Relay.
3.	Operating Characteristics of Over Voltage / Under Voltage Relay.
4.	Operation of Negative Sequence Relay.
5.	Current-Time Characteristics of Fuse.
6.	Operating Characteristics of Microprocessor Based (Numeric) Over Current Relay.
7.	Operating Characteristics of Microprocessor Based (Numeric) Over/Under Voltage Relay.
8.	Spark over Characteristics of Air Insulation Subjected to High Voltage AC/DC with Spark Over Voltage Corrected to STP.
9.	Measurement of High Voltage AC/DC using Sphere gap arrangements.
10.	Breakdown Strength of Transformer Oil Using Oil-Testing Unit.
11.	IDMT Characteristics of Over/Under Current Relay

DEMONSTRATION EXPERIMENTS

1.	Generation of Impulse Voltage
2.	Motor Protection Scheme – Fault studies

Course Outcomes:

At the end of course, student will be able to:

1. Understand the concept of field mapping and operating characteristics of solid state and Numerical Relays
2. Analyze the spark over characteristics of Air insulation subjected to HVAC/HVDC and breakdown strength for different electrodes.
3. Evaluate breakdown strength of air and oil.

Department of Electrical & Electronics Engineering.



ELECTRONICS AND TELECOMMUNICATION ENGINEERING

V Semester B.E. (Common to all UG programs) (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)							Examination			
<i>SI No</i>	<i>Course and Course Code</i>		<i>Course Title</i>	<i>Teaching dept.</i>	<i>Board of Exam</i>	<i>Credits</i>	<i>CIE</i>	<i>SEE</i>	<i>Total Marks</i>	<i>Exam Hrs.</i>
01	PC	ET5TH1	Information Theory and Error control coding	ET	ET	3	50	50	100	3
02	PC	ET5TH2	Digital Signal Processing & its application	ET	ET	3	50	50	100	3
03	PC	ET5TH3	Microwaves and Antennas	ET	ET	3	50	50	100	3
04	PC	ET5TH4	Management and Entrepreneurship	ET	ET	3	50	50	100	3
05	PE	ET5PE5x	Professional Elective-I	ET	ET	3	50	50	100	3
06	OE	ET5OE61	Open Elective-I	ET	ET	3	50	50	100	3
07	PC	ET5MP1	Mini Project-I	ET	ET	2	50	50	100	3
08	PC	ET5LB1	Microwave and Antenna Lab	ET	ET	1.5	50	50	100	3
09	PC	ET 5LB2	Digital Signal Processing Lab	ET	ET	1.5	50	50	100	3
10	HS	SK5DP3	Skill Development-III	HS	HS	1	50	-	50	-
Total						24	500	450	950	
CIE-Continuous Internal Evaluation, SEE-Semester End Examination										

There is no SEE for Skill Development-IV Course.

However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.

Professional Elective I:	Open Elective I:
ET5PE51: Digital Switching Systems ET5PE52: Micro Electro Mechanical Systems	ET5OE61: Principles of Communication Systems



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: V

Subject Name: Information Theory and Error Control Coding

Subject Code: ET5TH1

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Analyze the advantages and application of digital communication with source coding and channel coding techniques.
2	Evaluate different types of source codes and its properties.
3	Evaluate different types of discrete channels and measure channel capacity.
4	Analyze various Error control coding techniques.

UNIT	Description	Hours
I	Introduction to Information Theory: Introduction, Measure of information, Average information content of symbols in long independent. (TEXT 1: 4.1,4.2 to 4.2.2) Source Coding: Shannon's encoding algorithm, Shannon Fano coding, Huffman Coding. (TEXT 1:4.3, 4.3)	8
II	Communication Channels: Communication channel, Discrete communication channels, Discrete channels with memory, Capacity of a discrete memory less channels, Rate of information transmission over a discrete channel. (TEXT 1: 4.4, 4.5.1,4.5.2)	7
III	Linear Block Codes: Introduction, Examples of error control codes, Types of errors, Types of codes, Methods of controlling error, Introduction to linear block codes, Matrix description of linear block codes, Error detection and Correction, Capabilities of linear block codes, Look up table and Standard array for decoding. (TEXT1: 9.1, 9.2.1, 9.2.2, 9.2.4)	8
IV	Cyclic and BCH Codes: Algebraic structure of cyclic codes, Properties of cyclic codes, encoding using (n-k) bit shift register, BCH Codes. (TEXT 1:9.3,9.3.1,9.3.2,9.3.3) (TEXT 2: 8.4 section 5)	8
V	Convolution Codes: Encoding using time domain approach and transform domain approach, state diagrams. Code tree, trellis and state diagram of convolutional codes. (TEXT 2: 8.5)	8



Course Outcomes

Course Outcome	Descriptions
CO1	Apply knowledge of mathematics to understand concepts of Information theory, communication channel & source codes.
CO2	Analyze different source codes for its efficiency used with communication channels.
CO3	Design coding schemes for a given specifications and evaluate for their error correcting capability.
CO4	Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes and BCH codes.

Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	K. Sam Shanmugam	Digital and Analog Communication systems	John Wiley	-	2012
2	Simon Haykin	Digital communication	John Wiley India Pvt. Ltd	3 rd Edition	2008

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Shu Lin & Daniel J.	Error Control Coding	Pearson Prentice Hall	2 nd Edition	2004
2	Bernard Skylar	Digital Communication fundamentals and applications	Pearson Education	2 nd Edition	2002



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: V

Subject Name: Digital Signal Processing and Its Applications

Subject Code: ET5TH2

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Analyze the time domain and frequency domain representation of discrete-time signals.
2	Apply efficient method for calculating the DFT & IDFT
3	Design and implement IIR and FIR filters
4	Perform frequency transformation in Analog and Digital domain
5	Define the various structures for discrete-time systems & explain the importance of digital signal processor in applications

UNIT	Description	Hours
I	Discrete Fourier Transform: Introduction, Advantages of DSP over ASP, Applications of DSP, Frequency domain Sampling and Reconstruction of discrete time signals, Properties of DFT, Linear Convolution using DFT, Computation of Circular convolution, Filtering of long sequences: Overlap-save and Overlap-add method. (TEXT1: 1.1.2, 7.1.1, 7.1.2, 7.1.3, 7.2, 7.2.1, 7.2.2, 7.3)	08
II	Fast-Fourier Transform (FFT) Algorithms: Radix-2 FFT algorithm for the computation of DFT and IDFT: Decimation-in-time and Decimation-in-frequency FFT algorithms, Inverse FFT. (TEXT1: 8.1, 8.1.1, 8.1.2, 8.1.3, 8.2)	07
III	Analog filter and Digital IIR filter design: Characteristics of Analog filters- Butterworth and Chebyshev filter, Digital IIR filter design from analog filters using Bilinear Transformation, Structure for IIR systems-Direct form I, Direct form II and cascade. (TEXT1: 10.3.4, 10.3, 10.3.3, 9.3, 9.3.1, 9.3.3)	08
IV	Design and Realization of Digital FIR filter: Introduction, FIR filter design using Rectangular, Hamming and Kaiser Window, Basic FIR filters structures, Linear Phase FIR filter Structures. (TEXT1: 9, 9.2.1, 9.2.2, 10.2, 10.2.1, 10.2.2)	08
V	Applications of DSP: ADPCM Speech encoder and decoder using DSP, Musical Sound Processing, Block diagram of Digital Radio, Block diagram of DSP based video signal processing system, DSP in DTMF detection and generation, DSP in Radar (Qualitative discussion). (TEXT 2: 12.1, 12.2.1, 12.3, 12.4, 12.5, 12.6, 12.7)	08



Course Outcomes

Course Outcome	Descriptions
CO1	Understand the fundamental concepts of Digital Signal Processing using DFT, FFT, IIR & FIR filters and its applications.
CO2	Analyze the properties of DFT, FFT, Analog and Digital filters.
CO3	Design analog and digital filters for the required applications.
CO4	Evaluate IIR and FIR filters using Direct form I, II, cascade and interpret the importance of DSP in various applications.

Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	J G Proakis and D G Manolakis	Digital Signal Processing: Principles, Algorithm and Applications	Pearson	4 th Edition	2012 print
2	A NagoorKani	Digital Signal Processing	Mc Graw Hill Education	2 nd Edition	2012

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	A V Oppenheim and R W Shafer	Discrete Time signal Processing	PHI	3 rd Edition	2014
2	S K Mitra	Digital Signal Processing: A computer Based Approach	TMH	4 th Edition	2013



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: V

Subject Name: Microwaves and Antennas

Subject Code: ET5TH3

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Concept of Electromagnetic field theory and network analysis to analyze microwave transmission line and Waveguides
2	Design an impedance matching circuit at microwave frequency and antenna array system
3	Analyze the characteristics of Microwave passive devices, active devices and vacuum tube devices.
4	Important concepts of Antennas and the design of practical antennas

UNIT	Description	Hours
I	Microwave Transmission Lines and Microwave Network Theory: Introduction, Planar Transmission Lines: Strip lines, Micro strip lines, Advantages and Disadvantages of Planar Transmission Lines, Rectangular Waveguides, TE Waves Solution and TM Waves Solution, S-Matrix representation of Multiport Network, Microwave Passive Devices- Rectangular Waveguide Section, Matched Terminations, Attenuators, Phase Shifters, Waveguide Tees, Isolators, Circulators and Directional Couplers. Problems. (Text1:3.9 to 3.11.2, 6.3, 6.3.1, 6.4.3, 6.4.7, 6.4.14, 6.4.15, 6.4.16, 6.4.17, 6.4.18)	8
II	Microwave Generation and Applications of Microwaves: - Introduction, Microwave Vacuum Tube Devices Construction and Operation Reflex Klystron Oscillator, Two Cavity Klystron Amplifier, Travelling Wave Tube Amplifier, Magnetrons Oscillator Microwave Solid State Devices Diodes, Gunn diodes, Tunnel Diode, Varactor Diodes. Applications of Microwaves: Microwave Radar Systems, Industrial Applications of Microwaves. Problems. (Text 1: 9.2.1, 9.2.2, 9.3, 9.5.1, 10.2, 10.3, 10.5, 10.6, 11.2, 11.4)	7
III	Antenna Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Antenna Apertures, Effective Height, Antenna Field Zones. Arrays: Linear Arrays of n Isotropic Point Sources of equal Amplitude and Spacing Linear Broadside array of point sources, End fire array of point sources, Directions of Nulls and Maxima for arrays of n isotropic point sources of equal amplitude and spacing. Problems. (Text 2:1,1.2,6.1 to 6.6)	8
IV	Practical Antennas: Short Electric Dipole, Radiation Resistance of a Short Dipole, Loop Antennas, Helical Antenna, Slot and Micro-strip Antennas, Horn antennas, The Parabolic Reflector and Cassegrain antenna. Log Periodic Antennas, Lens Antennas, TV-Receiving antennas.(Text 2: 3.1,3.3,7.1 to 7.4,	8



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	8.1 to 8.3, 9.1 to 9.3, 9.9 to 9.12, 10.1 to 10.3, 11.3, 11.6, 12.1, 12.3, 12.4, 14.3, 16.6)	
V	Radio Wave Propagation: Transmission ratio in free space, Propagation within line of sight, Surface and Space Wave Plane –Earth, Tropospheric propagation, Ionospheric Propagation, Noise (Text 2: 18.1 to 18.6)	8

Course Outcomes

Course Outcome	Descriptions
CO1	Understand the basic terminology in microwave-transmission lines, microwaves components and antennas.
CO2	Analyze wave propagation through waveguides, operation of microwave active & passive devices and antennas.
CO3	Design array of antennas and antennas for practical applications.
CO4	Discuss the applications of microwaves and antennas.

Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Annapurna Das, Sisir K das	Microwave Engineering	Tata McGraw-Hill	18 th Reprint	2007
2	Rajeswari Chatarjee	Antenna Theory and Practice	New Age International (P)Limited Publishers	2 nd Edition	2004

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	David M Pozar	Microwave Engineering	John Wiley	2 nd Edition	2009
2	John D Kraus and Ronald J Marhefka	Antennas	Tata McGraw-Hill	3 rd Edition	2004



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: V

Subject Name: Management and Entrepreneurship

Subject Code: ET5TH4

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Acquire necessary knowledge and skills required for organizing and carryout entrepreneurial activities.
2	Develop the ability of analyzing and understanding business situations in which entrepreneurs act.
3	To master the knowledge necessary to plan entrepreneurial activities.
4	To make the students understand acquiring patents and copyrights

UNIT	Description	Hours
I	BASICS OF MANAGEMENT: Introduction - Meaning - nature and characteristics of Management, Scope and functional areas of management - Management as a science, art or profession Management & Administration - Roles of Management, Levels of Management, Development of Management Thought early management approaches - Modern management approaches. (Text 1: Chapters 1 and 2)	7
II	PLANNING, ORGANIZING AND STAFFING: Nature, importance and purpose of planning process Objectives - Types of plans (Meaning only) - Decision making – Importance of planning - steps in planning & planning premises - Hierarchy of plans.: Nature and purpose of organization Principles of organization Types of organization - Departmentation Committees – Centralization Vs Decentralization of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of Staffing - Process of Selection & Recruitment (in brief) (Text 1: Chapters 4, 7, 11)	9
III	DIRECTING & CONTROLLING: Meaning and nature of directing -Leadership styles, Motivation Theories, Communication - Meaning and importance – Coordination, meaning and importance and Techniques of Co - ordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control (in brief). (Text 1: Chapters 9, 16 and 18)	8
IV	ENTREPRENEURSHIP: Meaning of Entrepreneur, Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur. Concept of Entrepreneurship - Development of Entrepreneurship, Stages in entrepreneurial process, Role of entrepreneurs in Economic Development; Entrepreneurship in India. (Text 2: Chapters 1,2,10 and 11)	7



V	SMALL SCALE INDUSTRY:Definition, Characteristics, Need and rationale: Objectives, Scope, role of SSI in Economic Development. Advantages of SSI Steps to start an SSI - Government policy towards SSI. PREPARATION OF PROJECT:Meaning of Project, Project Identification, Project Selection, Project Report, Need and Significance of Report, Contents, formulation, Guidelines by Planning Commission for Project report, Network Analysis, Errors of Project Report, and Project Appraisal. (Text 2: Chapters 12 and 13)	8

Course Outcomes

Course Outcome	Descriptions
CO1	Describe the basic principles and concepts of management.
CO2	Distinguish different plans and list steps in planning.
CO3	Demonstrate the meaning, functions, types and roles of an entrepreneurial describe various institutional support.
CO4	Explain in detail about the small scale industries, preparation of project report and intellectual property rights.

Text Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	P.C. Tripathi, P.N. Reddy	Principles of Management	Tata McGraw Hill	-	2007
2	S S Khanka	Entrepreneurship Development	S Chand & Co	-	2007

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Robert Lusier, ThomsonEshraghian	Management Fundamentals - Concepts, Application, Skill Development	-	-	2007



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: V

Subject Name: Digital Switching Systems

Subject Code: ET5PE51

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	To study the importance of switching over wired and wireless channels
2	Layout the foundation for switching, signaling, traffic and standards in telecommunication networks
3	Analyze how a telecommunication network handles traffic
4	Understand important telecommunication networks

UNIT	Description	Hours
I	Introduction: Evolution of Telecommunications. Simple Telephone Communication. Basics of a Switching System, Manual Switching System. Signaling Tones, Strowger Switching Components, Step-by-step Switching, Design parameters 100 line switching system Design1, Design2, Design 3, Design 4 Crossbar Switching: Principles of Common Control. Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configuration, Cross point Technology, Crossbar Exchange Organization. Message switching, circuit switching. (Text1:3.2, 3.3) (Text2:1.1, 1.2, 1.3, 1.4, 2.2, 2.3, 2.4, 2.5, 2.6, 2.6.1, 2.6.2, 2.6.3, 2.6.4, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6)	8
II	Telecommunication traffic: Introduction, the unit of traffic, congestion. Traffic measurement, A mathematical model, Lost-call systems, queuing systems, simulation, Switching networks, Single-stage networks, principle of grading, Design of progressive grading, Other forms of grading, Traffic capacity of gradings, Applications of gradings, Link systems, Two stage networks, Three stage networks, four stage networks, Discussion. (Text1:4.1 to 4.8, 5.1 to 5.4)	8
III	Switching networks: Grades of service of link systems, Application of graph theory to link systems, use of expansion. Call packing, Re arrangible networks, Strict-sense non locking networks sectionalized switching networks, Time division switching: Space & time switching. General, Space switches Time switches. Time-divisions switching networks, Basic networks. Bi-directional paths, More Complex switching network. Concentrators, PBX switchers. Digital cross connect units. Grades of services of Time-division switching networks. Non-blocking networks, Synchronization. (Text1:5.5 to 5.11, 6.1 to 6.6)	8
IV	Control of Switching Systems: Introduction, Call-processing functions. Sequence of operations, Signal exchanges. State transition diagrams. Common controls, reliability. Availability and security. Stored program control, Processor	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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	architecture, distributor processing software over load control. Networks: Analog networks. Integrated digital networks. Integrated services digital networks. (Text1:7.1 to 7.5,10.2,10.3,10.4)	
V	Data networks: Introduction. Data Transmission in PSTN, Data rates in PSTN. Modems. Switching Techniques for Data Transmission. Circuit switching. Store and forward switching. Data Communication Architecture. Link-to-Link Layers, End-to-End Layers. (Text 2:10.1, 10.1.1, 10.1.2, 10.2, 10.2.1, 10.2.2, 10.3, 10.4, 10.5)	7

Course Outcomes

Course Outcome	Descriptions
CO1	Understand different models of Telecommunication Switching Systems
CO2	Design of switching networks.
CO3	Analyze and grade different traffic situations evaluating various parameters
CO4	Understand various concepts of telecommunication and data networks

Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	J.E flood	Telecommunication switching, traffic and networks	Pearson	1 st Impression	2012
2	Thiagarajan visvanathan	Telecommunication switching systems and networks	PHI	2 nd Edition	2004

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	John C Bellamy	Digital telephony	Wiley interscience	3 rd Edition	2000
2	Syed R ali	Digital switching systems	TMH	-	2008
3	Mark J Madou	Fundamentals of Micro-fabrication	CRC Press	2 nd Edition	2001



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: V

Subject Name: Principles of Communication Systems

Subject Code: ET5OE61

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Understand the concepts in Amplitude modulation & Angle modulation for the design of communication systems
2	Analyze sampling techniques, Transmitters & receivers of ASK, FSK and PSK.
3	Study of subsystems associated with a satellite and antennas.
4	Learn radar fundamentals & various radars like MTI, Doppler and tracking radars and their comparison.

UNIT	Description	Hours
I	Amplitude Modulation: Introduction, Amplitude Modulation: Time domain and frequency domain description. Generation of AM wave: Switching modulator, Detection of AM waves: Envelop detector, Application: AM radio. (TEXT 1: 7.1, 7.9)	8
II	Angle Modulation: Basic Definitions, Frequency Modulation: Narrow band FM and Wide band FM, Generation of FM waves: Indirect FM & Direct FM, Demodulation of FM waves using phase locked loop (Quantitative discussion), Comparison of AM and FM, Application: FM radio. (TEXT 1: 7.10, 7.11, 7.12, 7.14.)	8
III	Introduction to Digital Communication: Sampling theorem, PCM block diagram, Digital Modulation techniques: Transmitters & receivers of ASK and FSK. (TEXT 2: 4.1, 5.1, 7.2)	8
IV	Introduction to Radar: Introduction, Block diagram, radar range equation, application of radar, MTI radar. (Ref 1: 1.1, 1.2, 1.3, 4.1)	7
V	Introduction to Satellite Communication: Introduction, Satellite subsystems, altitude and orbit control systems (AOCS), Telemetry tracking, command and monitoring, satellite antennas. (Ref 2: 3.1, 3.2, 3.3, 3.6.)	8



Course Outcomes

Course Outcome	Descriptions
CO1	Define the different types of communication systems.
CO2	Describe the working principle of communication systems.
CO3	Analyze modulation and demodulation techniques in analog and digital communication systems.
CO4	Interpret the applications of communication systems.

Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Simon Haykin	An Introduction to Analog & Digital Communication	John Willey & Sons	-	2009
2	Simon Haykin	Digital Communication	John Willey India Pvt. Ltd	2 nd Edition	2006

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Merrill I Skolnik	Introduction to Radar systems	TMH	3 rd Edition	2001
2	Timothy Pratt, Charles Bostian, Jeremy Allnutt	Satellite Communication	John Willey & Sons	2 nd Edition	-



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: V

Subject Name: Microwave and Antenna Lab

Subject Code: ET5LB1

L-T-P-C: 0-0-3-1.5

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Study the characteristics of reflex-klystron.
2	Understand the working of circulator, isolator, directional coupler and tees
3	Study of antennas and their radiation pattern.

List of Experiments
• Study of Reflex klystron oscillator. • Study of Slotted line carriage. • Study of Tees- E plane Tee, H plane Tee • Study of Magic Tee. • Study of Directional Coupler. • Study of Circulator characteristics. • Study of Isolator characteristics. • Sketch the Radiation pattern of Horn antenna • Sketch the Radiation pattern of parabolic antenna. • Study of micro-strip antennas.

Course Outcomes

Course Outcome	Descriptions
CO1	Study of operation of klystron & slotted line carriage.
CO2	Understand the working of circulator, isolator, directional coupler and tees.
CO3	Determine the impedance of microwave component as well as scattering matrix of circulator, isolator, directional coupler and tees
CO4	Analyze and sketch the radiation pattern of antennas.

Text Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	David M Pozar	Microwave Engineering	John Wiley	2 nd Edition	2009



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: V

Subject Name: Digital Signal Processing Lab

Subject Code: ET5LB2

L-T-P-C: 0-0-3-1.5

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Discrete Fourier Transform in variety of applications including signal analysis, fast convolution
2	Fast Fourier Transform in a variety of applications including signal analysis, fast convolution
3	FIR digital filtering.
4	IIR digital filtering.

Part	Description
A	1. Verification of sampling theorem 2. Linear convolution of two given sequences. 3. Circular convolution of two given sequences 4. Autocorrelation of a given sequence and verification of its properties. 5. Cross correlation of given sequences and verification of its properties. 6. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum. 7. Linear convolution of two given sequences using DFT and IDFT. 8. Circular convolution of two given sequences using DFT and IDFT 9. Design and simulate IIR filter to meet given specifications. 10. Design and simulate FIR filter to meet given specifications.
B	11. To implement linear convolution of two given sequences using TMS320C6713 DSP processor. 12. To implement Circular convolution of two given sequences using TMS320C6713 DSP processor. 13. To implement the Computation of N- Point DFT of a given sequence filters using TMS320C6713 DSP processor. Demonstration: 14. To design and implement IIR (LPF/HPF) filters using TMS320C6713 DSP processor 15. To design and implement FIR (LPF/HPF) filters using TMS320C6713 DSP processor



Course Outcomes

Course Outcome	Descriptions
CO1	Analyze the signals using the Discrete Fourier Transform.
CO2	Apply circular convolution, its relationship to linear convolution, and how linear convolution can be achieved via the discrete Fourier transform.
CO3	Differentiate between autocorrelation and cross correlation for different sequences
CO4	Implement the IIR and FIR filter using the window method using MATLAB

Text Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Sanjeet Mitra	Digital signal processing using MATLAB	TMH	-	2001
2	J.G.Proakis & Ingle	Digital signal processing using MATLAB	MGH	-	2000



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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VI Semester B.E. (Common to all UG programs) (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)							Examination			
SI No.	Course and Course Code		Course Title	Teaching dept.	Board of Exam.	Credits	CIE	SEE	Total Marks	Exam Hrs.
01	PC	ET 6TH1	CMOS VLSI Design	ET	ET	3	50	50	100	3
02	PC	ET 6TH2	Wireless and Mobile Communication	ET	ET	3	50	50	100	3
03	PC	ET 6TH3	OOP with C++	ET	ET	3	50	50	100	3
04	PE	ET 6PE4x	Professional Elective-II	ET	ET	3	50	50	100	3
05	OE	ET 6OE51	Open Elective-II	ET	ET	3	50	50	100	3
06	PC	ET 6MP1	Mini Project-II	ET	ET	3	50	50	100	3
07	PC	ET 6LB1	Communication Systems Lab	ET	ET	1.5	50	50	100	3
08	PC	ET 6LB2	CMOS VLSI Design Lab	ET	ET	1.5	50	50	100	3
09	HS	SK6DP4	Skill Development-IV	HS	HS	1	50	-	50	-
Total						22	450	400	850	
CIE-Continuous Internal Evaluation, SEE-Semester End Examination										

There is no SEE for Skill Development-IV course.

However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.

Professional Elective II:	Open Elective II:
ET6PE41: Radar Systems ET6PE42: Automotive electronics	EC6OE51: Mobile Communication



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: VI

Subject Name: CMOS VLSI Design

Subject Code: ET6TH1

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Review basic MOS transistor and understand VLSI fabrication process.
2	Establish the basic characteristics of MOS transistor and examine various possibilities for configuring inverter circuits.
3	Study basic circuit concepts to set out appropriate circuit parameters and understand scaling models.
4	Understand subsystem design process.

UNIT	Description	Hours
I	INTRODUCTION TO CMOS CIRCUITS: Brief History, MOS transistors, MOS transistor switches, CMOS logic, Circuit and system representations. Basic CMOS Technology: n-well, p-well processes, Twin Tub process Layout design rules-Layer representations, CMOS N-well rules. (Text1) - 1.1, 1.3, 1.4, 1.5, 1.6, 3.2, 3.4	8
II	MOS TRANSISTOR THEORY: Introduction, MOS Device Design Equations, I_{ds} versus voltage V_{DS} relationships, The n-MOS inverter, The Complementary CMOS Inverter – DC Characteristics, static load MOS inverters, The Transmission gate. (Text1) - 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	7
III	CIRCUIT CHARACTERISTICS AND POWER ESTIMATION: Resistance Estimation, Capacitance estimation-MOS Capacitor Characteristics, MOS Device Capacitances, and Standard Capacitance. Switching Characteristics-Analytic delay models, CMOS-Gate transistor sizing, Power dissipation, Sizing routing conductors, Charge sharing, Scaling of MOS Transistor. (Text1) - 4.2, 4.3.1, 4.3.2, 4.5.1, 4.6, 4.7, 4.8, 4.9, 4.13	8
IV	CMOS CIRCUIT AND LOGIC DESIGN: Basic physical design of simple logic gates, CMOS logic structure, Clocked systems, Latches and registers, system timing, setup and hold time, Single-phase memory structures. (Text1) - 5.3, 5.4, 5.5.1, 5.5.2, 5.5.3, 5.5.4, 5.5.5	8
V	CMOS SUBSYSTEM DESIGN: Data path operations-Addition/subtraction, parity generators, comparator, Binary counters, ALU, multiplication and Shifter, Memory elements. CMOS SYSTEM CASE STUDY: Core RISC Microcontroller. (Text1) - 8.2.1.1, 8.2.1.2, 8.2.1.4, 8.2.1.5, 8.2.1.6, 8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.2.8, 8.3, 9.2.	8



Course Outcomes

Course Outcome	Descriptions
CO1	Understand of MOS transistor theory, CMOS fabrication flow and technology scaling.
CO2	Draw the stick diagrams and monochrome layout of MOS technology and CMOS logic structures and subsystems.
CO3	Analyze MOS active devices and CMOS subsystems
CO4	Design the data path and memory elements of CMOS Subsystem design.

Text Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Neil H. E. Weste and K. Eshragian	Principles of CMOS VLSI Design: A Systems Perspective	Addison-Wesley publishing Company	2 nd Edition	13th Impression 2012

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Douglas A. Puck Nell & Kamran Eshraghian	Basic VLSI Design	PHI	3 rd Edition	2001
2	Sung-Mo Kang & Yusuf Leblebici	CMOS Digital Integrated Circuits: Analysis and Design	Tata McGraw-Hill Publishing Company Ltd., New Delhi	3 rd Edition	2007



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: VI

Subject Name: Wireless & Mobile Communication

Subject Code: ET6TH2

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	The course has been introduced to make the students understand the principles and architecture of different wireless communication systems and technologies
2	To enable them to identify the tradeoff between frequency responses, signal to interference ratio, and spectral efficiency, capacity enhancement techniques.
3	The Course aims to expose students to characterize different types of large scale and small scale path losses.
4	To make them understand Mobile cellular Telephony operations.

UNIT	Description	Hours
I	Introduction to Wireless communication System: The History and Evolution of wireless Radio Systems, overview of Existing Network Infrastructure, 1G cellular systems (AMPS), Second Generation (2G), Third Generation (3G), Fourth Generation (4G) . (Text 2: Chapter 1: 1.1, 1.3, 2.1, 2.2, 2.4, 2.5, 2.6)	8
II	The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Improving Coverage & Capacity in cellular Systems, Common cellular network components, Hardware and Software Views of the cellular Network, 3G Cellular Components, cellular Component Identification. (Text 1: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6 Text 2: 3.2, 3.3, 3.4,)	8
III	Wireless network architecture and operations: Call Establishment. Cellular concept, Cell fundamentals, Capacity expansion techniques, Cellular backhaul networks, Mobility management, Radio resources and power management, Wireless network security. Text 2: (3.5 and Chapter 4: 4.1 to 4.7)	8
IV	Mobile Radio Propagation: Large- Scale Path loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, The Three Basic Propagation Mechanisms, Ground Reflection Model, Diffraction (Fresnel Zone Geometry, knife edge diffraction model), Scattering, Outdoor Propagation Models: Longley-Rice, Okumura, Hata, Indoor Propagation Models. Text 1: 4.1, 4.2, 4.4, 4.6, 4.7 (4.7 to 4.7.2), 4.8, 4.10 (4.10.1, 4.10.3, 4.10.4), 4.11 to 4.11.2.	8
V	Equalization: Introduction, Fundamentals of Equalization, classification of equalizers, Equalizers in a communication receiver, linear equalizers, nonlinear equalizers. Diversity: Space diversity, RAKE receiver. Speech coding: Introduction, characteristics of speech signals, quantization techniques, ADPCM, Frequency domain coding of speech, vocoders. (Text 1: Chapter 7: 7.1, 7.2, 7.6, 7.7, 7.1.1, And chapter 8: 8.1, 8.4, 8.5, 8.6, 8.6.1.) Text 2: 8.7	7



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
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Department: Information Science and Engineering

Course Outcomes

Course Outcome	Descriptions
CO1	Understand the wireless cellular system and technical aspects of mobile and wireless propagation.
CO2	Understand Principles of wireless models, equalizers and receivers.
CO3	Acquire the knowledge of cell capacity and radio resource and speech coding.
CO4	Analyze mobile operations and cellular design.

Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Theodore S Rappaport	Wireless Communication	Pearson Education	2 nd Edition	2003
2	Mullet	Introduction to Wireless Telecommunications Systems and networks	Thomson Learning	-	2010

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Jorg E, H J Vogel, Christian B, Christian H	GSM – Architecture, Protocols and Services	Wiley	3 rd Edition	2009
2	Gary J Mullet	Introduction To Wireless Telecommunications Systems and Networks	Cengage Learning	2 nd Edition	-



Department: Information Science and Engineering

Syllabus for the Academic Year -2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: VI

Subject Name: Object Oriented Programming with C++

SubjectCode:ET6TH3

L-T-P-C:3-0-0-4

Course Objectives: Student will be able to learn:

Sl.No.	Course Objectives
1	Learn the syntax and semantics of the C++ programming language, learn how to design C++ classes for code reuse and learn how to implement copy constructors and class member functions.
2	To understand the concept of data abstraction and encapsulation, overload functions and operators in C++.
3	Learn how containment and inheritance promote code reuse in C++.
4	Learn how inheritance and virtual functions implement dynamic binding with polymorphism.

UNIT	Description	Hours
I	C++ basics: Getting Started: general format, data types, variable declaration, operators, miscellaneous topics, keyboard input and screen output Control statements and loops: relational & logical operators, if & switch statements, loops in general, for, while and do while loops (Text1: Chapter 2: 2.2, 2, 5 to 2.9, Text: Chapter 3: 3.1 to 3.9)	8
II	Pointers and Functions: Pointers, addresses & indirection operator: importance of pointers, data variables and memory, address operators, pointers, Functions Basics: functions in C++, basic format, requirement for writing functions, local, static and global variables, pointers & functions (Text1: Chapter 4: 4.1 to 4.4, Chapter5: 5.1 to 5.5)	8
III	Arrays, Classes and Objects: Arrays: using single data variables, array fundamentals, one-dimensional arrays and functions, character strings, Classes and Objects: object oriented principles and definitions, classes and objects, writing member functions, class constructors and destructors, copy constructors, example programs, array of objects, pointer and classes: Pointers to objects, this pointer. (Text 1: Chapter 6: 6.2,6.3,6.4,6.5,6.7Text 2: Chapter 9:9.3,9.4)	8
IV	Friend function and Operator overloading: Friendly functions, Returning objects, Pointers to members, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operator using friends, Manipulation of strings using operators, Rules for overloading operators. (Text 2: Chapter 5 5.15, 5.16, 5.18,Chapter 7 7.1, 7.2, 7.3,7.4,7.5,7.6,7.7)	8
V	Inheritance and virtual functions: Inheritance basics, Virtual base classes, virtual functions, pure virtual functions (Text 2: 8.1,8.2,8.3,8.4,8.5,8.6,8.7,8.8,8.9Chapter 9:9.6,9.7)	7



Course Outcomes

Course Outcome	Descriptions
CO1	Understand the basic concepts of C++, pointers, functions, arrays.
CO2	Demonstrate a thorough understanding of the object-oriented programming
CO3	Implementing classes by the use of overloaded functions, constructors and friend functions.
CO4	Implement dynamic binding with polymorphism and understand the concept of virtual functions.

Text Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Barbara Johnston	C++ Programming Today	Pearson Education	2 nd Edition	2011
2	E. Balaguruswamy	Object Oriented Programming with C++	TMH	6 th Edition	2013

Reference Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Robert Lafore	Object Oriented Programming using C++	Galgotia publication	4 th Edition	2010



Department: Information Science and Engineering

Syllabus for the Academic Year – 2022 - 2023

Department: Telecommunication Engineering

Semester: VI

Subject Name: Radar Systems

Subject Code: ET6PE41

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Understand the Radar fundamentals and analyze the radar signals.
2	Understand various technologies involved in the design of radar transmitters and receivers.
3	Learn various radars like MTI, Doppler and tracking radars and their comparison
4	Understand the Radar fundamentals and analyze the radar signals.

UNIT	Description	Hours
I	Basics of Radar: Introduction, Maximum Unambiguous Range, Radar Waveforms, Definitions with respect to pulse waveform - PRF, PRI, Duty Cycle, Peak Transmitter Power, Average transmitter Power. Simple form of the Radar Equation, Radar Block Diagram and Operation, Radar Frequencies, Applications of Radar, The Origins of Radar, Illustrative Problems. (Chapter 1 of Text)	8
II	The Radar Equation: Prediction of Range Performance, Detection of signal in Noise, Minimum Detectable Signal, Receiver Noise, SNR, Modified Radar Range Equation, Envelope Detector — False Alarm Time and Probability, Probability of Detection. Radar Cross Section of Targets: simple targets — sphere, cone-sphere, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems. (Chapter 2 of Text, Except 2.4, 2.6, 2.8 & 2.11)	8
III	MTI and Pulse Doppler Radar: Introduction, Principle, Doppler Frequency Shift, Simple CW Radar, Sweep to Sweep subtraction and Delay Line Canceler, MTI Radar with — Power Amplifier Transmitter, Delay Line Cancelers — Frequency Response of Single Delay- Line Canceler, Blind Speeds, Clutter Attenuation, MTI Improvement Factor, N- Pulse Delay-Line Canceler, Digital MTI Processing — Blind phases, I and Q Channels, Digital MTI Doppler signal processor, Moving Target Detector- Original MTD. (Chapter 3: 3.1, 3.2, 3.5, 3.6 of Text)	8
IV	Tracking with Radar- Types of Tracking Radar Systems, Monopulse Tracking Amplitude Comparison Monopulse (one-and two-coordinates Tracking Radar), Phase Comparison Monopulse. Sequential Lobing, Conical Scan Tracking, Block Diagram of Conical Scan L1, L2, L3 156 Tracking Radar, Tracking in Range, Comparison of Trackers. (Chapter 4: 4.1, 4.2, 4.3 of Text)	7
V	The Radar Antenna: Functions of The Radar Antenna, Antenna Parameters, Reflector Antennas and Electronically Steered Phased array Antennas. (Chapter 9: 9.1, 9.2 9.4, 9.5 of Text) The Radar Receiver, Receiver Noise Figure, Super Radar Receiver: Heterodyne Receiver, Duplexers and Receivers Protectors, Radar Displays. (Chapter 11 of Text)	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Information Science and Engineering

Course Outcomes

Course Outcome	Descriptions
CO1	Understand the radar fundamentals, principles of MTI radar, concept of tracking, function of radar antennas and receivers
CO2	Analyze working principle of simple radar, pulse Doppler radars, sequential lobing, duplexes and displays.
CO3	Determine ambiguous ranges, minimum detectable signal range using radar range equation tracking in range
CO4	Describe the applications of radar, types of tracking, delay line cancellers, function of antennas and receivers, range parameters of pulse radar system which affect the system performance.

Text Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Merrill I Skolink	Introduction to Radar Systems	TMH	3 rd Edition	2001

Reference Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Byron Edde	Radar Principles, Technology, Applications	Pearson Education	-	2004
2	Peebles. Jr	Radar Principles	P.Z. Wiley	-	1998



Syllabus for the Academic Year – 2022-2023

Department: Electronics and Telecommunication Engineering **Semester:** VI

Subject Name: Automotive Electronics

Subject Code: ET6PE42

L-T-P-S-C: 3-0-0-3

Course Objectives: Student will be able to:

Sl. No	Course Objectives
1	Understand the basics of automobile dynamics and design electronics to complement those features.
2	Design and implement the electronics that attribute the reliability, safety, and smartness to the automobiles, providing add-on comforts.

UNIT	Description	Hours
I	Automotive Fundamentals Overview –Evolution of Automotive Electronics, Automobile Physical Configuration, Survey of Major Automotive Systems, The Engine – Engine Block, Cylinder Head, Four Stroke Cycle, Engine Control, Ignition System - Spark plug, High voltage circuit and distribution, Spark pulse generation, Ignition Timing, Diesel Engine, Drive Train - Transmission, Drive Shaft, Differential, Suspension, Brakes, Steering System (Text 1: Chapter1), Starter Battery –Operating principle: (Text 2: Pg. 407-410) The Basics of Electronic Engine Control –Motivation for Electronic Engine Control – Exhaust Emissions, Fuel Economy, Concept of an Electronic Engine control system, Definition of General terms, Definition of Engine performance terms, Engine mapping, Effect of Air/Fuel ratio, spark timing and EGR on performance, Control Strategy, Electronic Fuel control system, Analysis of intake manifold pressure, Electronic Ignition. (Text 1: Chapter 5) L1, L2	8
II	Automotive Control System applications of Sensors and Actuators – Typical Electronic Engine Control System, Variables to be measured (Text 1: Chapter 6) Automotive Sensors – Airflow rate sensor, Strain Gauge MAP sensor, Engine Crankshaft Angular Position Sensor, Magnetic Reluctance Position Sensor, Hall effect Position Sensor, Shielded Field Sensor, Optical Crankshaft Position Sensor, Throttle Angle Sensor (TAS), Engine Coolant Temperature (ECT) Sensor, Exhaust Gas Oxygen (O ₂ /EGO) Lambda Sensors, Piezoelectric Knock Sensor. (Text 1: Chapter 6) Automotive Actuators –Solenoid, Fuel Injector, EGR Actuator, Ignition System (Text 1: Chapter 6) L1, L2	8
III	Digital Engine Control Systems –Digital Engine control features, Control modes for fuel Control (Seven Modes), EGR Control, Electronic Ignition Control - Closed loop Ignition timing, Spark Advance Correction Scheme, Integrated Engine Control System - Secondary Air Management, Evaporative Emissions Canister Purge, Automatic System Adjustment, System Diagnostics.	8



	(Text 1: Chapter 7) Control Units –Operating conditions, Design, Data processing, Programming, Digital modules in the Control unit, Control unit software. (Text 2: Pg. 196-207) L1, L2	
IV	Automotive Networking – Bus Systems – Classification, Applications in the vehicle, Coupling of networks, Examples of networked vehicles (Text 2: Pg. 85-91), Buses - CAN Bus, LIN Bus, MOST Bus, Bluetooth, Flex Ray, Diagnostic Interfaces. (Text 2: Pg. 92- 151) Vehicle Motion Control – Typical Cruise Control System, Digital Cruise Control System, Digital Speed Sensor, Throttle Actuator, Digital Cruise Control configuration, Cruise Control Electronics (Digital only), Antilock Brake System (ABS) (Text 1: Chapter 8) L1, L2	8
V	Automotive Diagnostics – Timing Light, Engine Analyzer, On-board diagnostics, Offboard diagnostics, Expert Systems, Occupant Protection Systems – Accelerometer based Air Bag systems. (Text 1: Chapter 10) Future Automotive Electronic Systems – Alternative Fuel Engines, Electric and Hybrid vehicles, Fuel cell powered cars, Collision Avoidance Radar Warning Systems, Low tire pressure warning system, Heads Up display, Speech Synthesis, Navigation – Navigation Sensors - Radio Navigation, Signpost navigation, dead reckoning navigation, Voice Recognition Cell Phone dialing, Advanced Cruise Control, Stability Augmentation, Automatic driving Control (Text 1: Chapter 11) L1, L2, L3	7

Question paper Pattern:

Each unit consists of two questions with a choice

Course Outcomes: At the end of the course the student will be to:

Course outcome	Descriptions
C01	Acquire an overview of automotive components, subsystems, and basics of Electronic Engine Control in today's automotive industry.
C02	Use available automotive sensors and actuators while interfacing with microcontrollers / microprocessors during automotive system design.
C03	Discuss the networking of various modules in automotive systems, communication protocols and diagnostics of the sub systems.
C04	Design and implement the electronics that attribute the reliability, safety, and smartness to the automobiles, providing add-on comforts and get fair idea on future Automotive Electronic Systems.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Information Science and Engineering

Text Books:

Sl. No.	Text Book title	Author	Publisher	Volume / Issue	Year of Edition
1	Understanding Automotive Electronics	William B. Ribbens	Elsevier Publishing, 6th Edition	-	-
2	Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive	Robert Bosch GmbH (Ed.)	John Wiley & Sons Inc., 5th edition	-	2007



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: VI

Subject Name: Mobile Communication

Subject Code: ET6OE52

L-T-P-C: 3-0-0-3

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Use the concepts of cells, Learn the applications of wireless Communication and Understand different types of mobile generations 1G, 2G, 3G, 4G
2	Learn the wireless network architecture and Multiple Access Techniques.
3	Study the Advanced Wireless Technologies.

UNIT	Description	Hours
I	Evolution and development of cellular systems: History and Evolution of Modern Telecommunication Infrastructure- The Public Data Network, Broadband Cable Systems, Internet, Cellular Telephone Systems, The OSI Model, Introduction of generations of wireless cellular networks 1G, 2G, 3G, 4G networks. (Text 1: Sections 1.2, 1.4, 2.2, 2.3, 2.4, 2.5, 2.6)	7
II	Common Cellular System components. Common cellular networks components, Hardware and software views of cellular networks, 3G cellular systems components and Cellular component identification Call establishment. (Text 1: Sections 3.1, 3.2, 3.3, 3.4, 3.5)	8
III	Wireless Network Architecture and operation. Cellular concept, Cell fundamentals, Capacity expansion techniques, Mobility management, Radio resources and power management. (Text 1: Sections 4.1, 4.2, 4.3, 4.5, 4.6)	8
IV	Multiple Access Techniques for Wireless Communications. Introduction, FDMA, TDMA, SDMA, Packet Radio, Traffic Routing in Wireless Networks, GSM (Text 2: Sections 9.1, 9.2, 9.3, 9.5, 9.6, 9.6.3, 11.3 to 11.3.2, 11.3.4, 10.5, to 5.2,	8
V	Advanced Technologies for Wireless Communication. Diversity techniques, Fundamentals of Satellite Systems, Cognitive radio technology, multiple input and multiple output wireless systems, wireless sensor networks (Text 1: Section 8.2, 8.6, 8.7, 12.3, 13.2)	8



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Information Science and Engineering

Course Outcomes

Course Outcome	Descriptions
CO1	Understand evolution and development of different generations of wireless Telecommunication systems.
CO2	Acquire knowledge of cellular components, system architecture, channels and resource management techniques.
CO3	Acquire knowledge of and basic operations for call establishment, mobility management and handoff.
CO4	Acquire knowledge of channel access and its capacity expansion, Cellular emerging technologies.

Text Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Mullet	Wireless Telecom Systems and networks	Thomson Learning	-	2006
2	Theodore S Rappaport	Wireless Communications Principles and Practice	Prentice-Hall, India	2 nd Edition	2002

Reference Books:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Lee W.C.Y	Mobile Cellular Telecommunication	MGH	-	2002
2	D P Agrawal	Wireless communication	Thomson learning	2 nd Edition	2007
3	David Tse, Pramod Viswanath	Fundamentals of Wireless Communication	Cambridge	-	2005



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering

Semester: VI

Subject Name: Communication Systems Lab

Subject Code: ET6LB1

L-T-P-C: 0-0-3-1.5

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	Study the modulation and demodulation of different digital modulation techniques.
2	Understand the simulation of FM, Free Space Propagation, and outdoor propagation.
3	Study of OFDM and performances.

List of Experiments
Kit Experiments Demonstration 1. Conduct an experiment to demonstrate modulation and demodulation of TDM. 2. Conduct an experiment to demonstrate modulation and demodulation of DPSK. 3. Conduct an experiment to demonstrate modulation and demodulation of QPSK. Simulation Experiments using MATLAB 1. Simulate FM transmission and Reception. 2. Simulate the Free Space Propagation- Path loss Model indoor out door 3. Simulate the free space propagation for different focus 4. Simulate the outdoor propagation- okumura Model. 5. Simulate the outdoor propagation- Hata Model. 6. Simulate OFDM Transmission and Reception. 7. Simulate radiation pattern of an antenna 8. Simulate Q AM Modulation and Demodulation



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Information Science and Engineering

Course Outcomes

Course Outcome	Descriptions
CO1	Study of Digital modulation technique experiments.
CO2	Understand the working of FM, Free Space Propagation, outdoor propagation
CO3	Implement the OFDM System.
CO4	Analyze and sketch the BER performances of different Equalizers.

Text Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Theodore S Rappaport	Wireless Communication	Pearson Education	2 nd Edition	2003
2	Simon Haykin	Digital Communication	Wiley India Edition	-	2010



Syllabus for the Academic Year – 2022 - 2023

Department: Electronics and Telecommunication Engineering **Semester:** VI

Subject Name: CMOS VLSI Design Lab

Subject Code: ET6LB2

L-T-P-C: 0-0-3-1.5

Course Objectives: Student will be able to learn:

Sl.No	Course Objectives
1	To acquire knowledge on schematic and physical design tool.
2	Able to design and verify the functionality of combinational and sequential circuits using CMOS logic.
3	To make the students perform AC and DC analysis using physical design tool.

List of Experiments
1. Design & FPGA Implementation of 16-bit ALU
2. Design & FPGA Implementation of 8-bit Adders (Simple Adder & Ripple Carry Adder)
3. Design & FPGA Implementation of 4 bit Multiplier (Simple Multiplier & Array Multiplier)
4. Design & FPGA Implementation of Up and Down Counters
5. Draw a circuit for an Inverter using schematic and for the same draw the layout using a specified technology. Also calculate Noise Margin.
6. Draw a circuit for buffer using schematic and for the same draw the layout using a specified technology.
7. Realize a two input NAND and NOR gate using CMOS logic and verify its truth table in both schematic and in the layout for specified technology.
8. Implement a two input XOR Gate with transmission gates and verify its timing diagram
9. Implement Full Adder circuit in CMOS logic. Make Verilog file of the schematic and generate the layout. Verify its timing diagram in both schematic and layout.
10. Implement a 4-Bit Parallel adder circuit. Make Verilog file of the schematic and generate the layout. Verify its timing diagram in both schematic and layout.
11. Implement transmission gate in CMOS logic and verify its truth table in both schematic and in the layout. Create the symbol of the same.
12. Implement a 4:1 Multiplexer using Transmission Gate symbol. Verify the truth table in the schematic editor. Make a Verilog file



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Information Science and Engineering

Course Outcomes

Course Outcome	Descriptions
CO1	Design and simulate CMOS schematics and layouts for Basic Gates, Universal Gates, and Combinational circuits.
CO2	Able to Check and verify the design rules.
CO3	Analyze the timing diagrams in schematic editor and layout Tool.

Text Book:

Sl. No.	Author	Text Book title	Publisher	Volume / Issue	Year of Edition
1	Neil H. E. Weste and K. Eshragian	Principles of CMOS VLSI Design: A Systems Perspective	Addison Wesley publishing Company	2 nd Edition	-
2	R. Jacob Baker, Harry W.LI., David E.Boyee,	CMOS Circuit Design, Layout and Simulation	Prentice Hall of India	-	2005



CHOICE BASED CREDIT SYSTEM (CBCS)

SCHEME OF TEACHING AND EXAMINATION FOR B.E. DEGREE COURSE (Effective from the academic year 2020-21) Academic Year 2022-23

V Semester B.E. Information Science and Engineering (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.- Jan. 2018)						Teaching Hrs/Week		Examination				
<i>Sl No.</i>	<i>Course and Course Code</i>		<i>Course Title</i>	<i>Teaching Department</i>	<i>Board of Exam</i>	<i>Credits</i>	<i>L</i>	<i>P</i>	<i>CIE</i>	<i>SEE</i>	<i>Total Marks</i>	<i>Exam Hrs</i>
01	PC	IS5TH1	Computer Network-II	ISE	ISE	3	3	-	50	50	100	3
02	PC	IS5TH2	Advanced Java and J2EE	ISE	ISE	3	3	-	50	50	100	3
03	PC	IS5TH3	Database Management Systems	ISE	ISE	3	3	-	50	50	100	3
04	PC	IS5TH4	Introduction to Automata Theory and Computation	ISE	ISE	3	3	-	50	50	100	3
05	PE	IS5PE5x	Professional Elective-I	ISE	ISE	3	3	-	50	50	100	3
06	OE	IS5OE6x	Open Elective-I	ISE	ISE	3	3	-	50	50	100	3
07	PC	IS5MP1	Mini Project-I	ISE	ISE	2	-	3	50	50	100	3
08	PC	IS5LB1	Computer Networks Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
09	PC	IS5LB2	Database Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
10	HS	SK5DP3	Skill Development-III	HS	HS	1	-	2	50	-	50	-
Total						24	18	11	500	450	950	-
L-Lecture Hours, P-Practical Hours, CIE-Continuous Internal Evaluation, SEE-Semester End Examination												

Note:

There is no SEE for Skill Development-III course. However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.

Professional Elective-I	Open Elective-I
IS5PE51: Cloud Computing IS5PE52: Internet of Things IS5PE53: Research Methodology and Intellectual Property Rights	IS5OE61: Software Engineering IS5OE62: Fundamentals of Algorithms IS5OE63: Introduction to UNIX



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Computer Networks-II

Subject Code: IS5TH1

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Gain the knowledge of routing principles and routing algorithms in network layer.
2	Discuss transport layer services and protocols.
3	Acquire the knowledge of application layer protocols and basic concepts of Network Security.
4	Appreciate scalability between network, transport and application layers.

UNIT	Description	Hours
I	Network Layer: Network Layer Design Issues: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks. Routing Algorithms: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Congestion Control Algorithms: Approaches to Congestion Control, Traffic-aware routing, Admission control, Traffic throttling, Load Shedding.	08
II	Network Layer continued: Quality of Service: Application requirements, Traffic shaping, Packet scheduling, Admission control, Internetworking: How networks differ, How networks can be connected, Tunneling, Packet fragmentation. The Network Layer in the Internet: The IP version 4 protocol, IP addresses, IP version 6.	08
III	Transport Layer: Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport protocols: Addressing, Connection establishment, Connection release, Error control and Flow control, Multiplexing, Crash recovery, Introduction to UDP, Remote Procedure Call.	08
IV	Transport layer continued: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release. TCP Connection Management Modeling, TCP Sliding window, TCP Timer Management, TCP Congestion Control.	08
V	Standard Client Server Protocols and Network Security: World wide web, Hypertext transfer protocol, FTP: Two Connections, Control Connection, Data Connection, Security for FTP. Electronic mail: Architecture, Web based mail, E-Mail security. TELNET: Local versus Remote logging. Domain Name System: Name space, DNS in the Internet, Caching, Resource Records, DNS messages, Security of DNS. Introduction: The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms:	08

**Text Book:**

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Computer Networks	Andrew S. Tanenbaum and David J Wetherall.	5th Edition, Pearson Education, 2019, ISBN 978-93-325-1874-2
2	Data Communications and Networking	Behrouz A. Forouzan	5th Edition, Tata McGraw-Hill, 2019 ISBN-13: 978-1-25906475-3
3	Cryptography and Network Security	William Stallings	Seventh Edition, Prentice Hall of India, 2016.

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Computer Networking- A Top- Down approach	James F Kurose and Keith W Ross	6th Edition, Pearson Education, 2017 ISBN-13: 978-0-13-285620-1
2	Data and Computer Communications	William Stallings	10th Edition, Pearson Education, 2013, ISBN-13: 978-0-13-350648-8
3	Communication Networks – Fundamental Concepts and Key architectures	Alberto Leon-Garcia and Indra Widjaja	2nd Edition, 2004, Tata McGraw-Hill, ISBN-13:978-0-07-059501-9

Course Outcomes:

Sl. No.	Description
1	Analyze various routing algorithms in network layer.
2	Interpret network layer and transport layer services.
3	Outline the functionalities of network layer, transport layer and application layer protocols.
4	Distinguish connectivity of Transport layer, Application layer and basic concepts of network security.



Syllabus for the Academic Year – 2022 – 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Advance Java and J2EE

Subject Code: IS5TH2

L-P-C: 3-0-3

Course Objectives:

Sl. No	Description
1	Know the different streamlined approaches to handling common programming tasks.
2	Understand console based, GUI based and web-based applications.
3	To familiarize the Data Base and connectivity through the Java database connectivity (JDBC) and to introduce the basics of J2EE.
4	Learn to create, debug and run multi-tier and enterprise-level applications.

UNIT	Description	Hrs
I	Multithreaded Programming: The Java Thread Model: Thread Priorities, Synchronization, Messaging, The Thread Class and the Runnable Interface; The Main Thread, Creating a Thread: Implementing Runnable, Extending Thread, Choosing an Approach; Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization: Using Synchronized Methods, The synchronized Statement; Interthread Communication: Deadlock; Suspending, Resuming, and Stopping Threads, Obtaining a Thread's State, Using a Factory Method to Create and Start a Thread, Using Multithreading.	08
II	Event Handling: Two Event Handling Mechanisms, The Delegation Event Model: Events, Event Sources, Event Listeners; Event Classes: The ActionEvent Class, The AdjustmentEvent Class, The ComponentEvent Class, The ContainerEvent Class, The FocusEvent Class, The InputEvent Class, The ItemEvent Class; The KeyEvent Class: The MouseEvent Class, The MouseWheelEvent Class, The TextEvent Class, The WindowEvent Class; Sources of Events, Event Listener Interfaces: The ActionListener Interface, The AdjustmentListener Interface, The ComponentListener Interface, The ContainerListener Interface, The FocusListener Interface, The ItemListener Interface, The KeyListener Interface, The MouseListener Interface, The MouseMotionListener Interface, The MouseWheelListener Interface, The TextListener Interface, The WindowFocusListener Interface, The WindowListener Interface; Using the Delegation Event Model: Some Key AWT GUI Concepts, Handling Mouse Events, Handling Keyboard Events; Adapter Classes, Inner Classes: Anonymous Inner Classes.	08
III	Introducing Swing: The Origins of Swing, Swing Is Built on the AWT, Two Key Swing Features: Swing Components Are Lightweight, Swing Supports a Pluggable Look and Feel; The MVC Connection, Components and Containers: Components, Containers, The Top-Level Container Panes, The Swing Packages, A Simple Swing Application, Event Handling, Painting in Swing: Painting Fundamentals, Compute the Paintable Area, A Paint Example. Exploring Swing: JLabel and ImageIcon, JTextField, The Swing Buttons: JButton, JToggleButton, Check Boxes, Radio Buttons; JTabbedPane, JScrollPane, JList, JComboBox, Trees, JTable.	08



IV	JDBC: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC / ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.	08
V	Introducing Servlets: Introducing Servlets, Background, The Life Cycle of a Servlet, Servlet Development Options, Using Tomcat, A Simple Servlet: Create and Compile the Servlet Source Code, Start Tomcat, Start a Web Browser and Request the Servlet; The Servlet API, The javax.servlet Package: The Servlet Interface, The ServletConfig Interface, The ServletContext Interface, The ServletRequest Interface, The ServletResponse Interface, The GenericServlet Class, The ServletInputStream Class, The ServletOutputStream Class, The Servlet Exception Classes; Reading Servlet Parameters, The javax.servlet.http Package: The HttpServletRequest Interface, The HttpServletResponse Interface, The HttpSession Interface, The Cookie Class, The HttpServlet Class; Handling HTTP Requests and Responses: Handling HTTP GET Requests, Handling HTTP POST Requests; Using Cookies, Session Tracking. Java Beans: What Is a Java Bean?, Advantages of Beans, Introspection: Design Patterns for Properties, Design Patterns for Events, Methods and Design Patterns, Using the BeanInfo Interface; Bound and Constrained Properties, Persistence, Customizer.	08

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Java – The Complete Reference	Herbert Schildt	11th Edition, Tata McGraw Hill, 2019, ISBN: 978-1-26-044024-9 MHID: 1-26-044024-9
2	J2EE - The Complete Reference	Jim Keogh	23rd Reprint and 2008, Tata McGraw Hill, ISBN-13:978-0- 07—52912-0.

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to JAVA Programming	Y. Daniel Liang	10th Edition, Pearson Education, 2015, ISBN-13:9780133761313

Course Outcomes:

Sl. No	Description
1	Apply Javas' built-in libraries to solve real world problems.
2	Design a reusable component for Graphical User Interface applications
3	Implement three-tier architecture applications.
4	Invoke and develop server side objects.



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Database Management Systems

Subject Code: IS5TH3

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Knowledge of the architecture and functioning of Database Management Systems.
2	Understand and apply the principles of data modeling using Entity Relationship and develop a good database design.
3	Understand the use of Structured Query Language (SQL) and NoSQL.
4	Apply normalization techniques to normalize a database and understand the need of database transaction.

UNIT	Description	Hours
I	Introduction: Introduction with an example, Characteristics of Database approach, Actors on the scene, Workers behind the scene, Advantages of using DBMS approach, when not to use a DBMS. Data models, schemas and instances, Three schema architecture and data independence, Database languages and interfaces, The database system environment, Centralized and client-server architectures.	08
II	Data Modeling using the Entity-Relationship (ER) Model: Using High-Level Conceptual, Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship types of degree higher than two. Relational Database Design, Using ER- to-Relational Mapping. Relational Model: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and dealing with constraint violations.	08
III	SQL : Data Definition and Data Types, Specifying constraints in SQL, Basic queries in SQL, Insert, Delete and Update statements in SQL, More complex SQL Queries, Views (Virtual Tables) in SQL, Schema change statements in SQL.	08
IV	Database Design: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys. Introduction to transaction processing, transaction and system concept, desirable properties of transactions.	08
V	Introduction to NoSQL(Not Only SQL): Where is it used? , what is it?, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, What we miss with NoSQL?, use of NoSQL in industry, NoSQL vendors, SQL versus NoSQL, NewSQL Introduction, Comparison of SQL, NoSQL and NewSQL.	08



Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Fundamentals of Database Systems	Elmasri and Navathe	7th Edition, Pearson Education, 2017, ISBN-13: 978-9332582705.
2	Bigdata And Analytics	Seema Acharya, Subhashini Chellappan, Infosys Limited	Publication: Wiley India Private Limited, 1st Edition 2015. ISBN:978- 81-265-5478-2

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	3rd Edition, McGraw-Hill, 2014, ISBN-13:978-9339213114.
2	An Introduction to Database Systems	C.J. Date, A. Kannan, S. Swamynatham	8th Edition, Pearson education, 2017, ISBN-13:978-817585568.

Course Outcomes:

Sl. No.	Description
1	Explain the concepts of database management system.
2	Design database using conceptual and relational model.
3	Illustrate various DBMS commands using SQL and NoSQL.
4	Apply normalization for Relational schema and Design a database for various applications.



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Introduction to Automata Theory and Computation

Subject Code: IS5TH4

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Understand core concepts in Automata and Theory of Computation.
2	Identify different Formal Language Classes and their Relationships.
3	Prove or disprove theorems in Automata Theory using their properties.
4	Compare finite automata, Push Down Automata and Turing Machines as Mathematical models of computation.

UNIT	Description	Hours
I	Introduction to Finite Automata: Why study Automata Theory? The Central Concepts of automata theory: Definition of Deterministic Finite Automata, How a DFA processes strings, Simpler notations for DFA's, Extending the transition function to strings, The language of a DFA, Nondeterministic Finite Automata (NFA): Definition of NFA, An Extended Transition Function, The language of NFA, Equivalence of DFA and NFA, Finite Automata with Epsilon-transitions.	08
II	Regular Expressions and Languages: Regular Expression, Converting DFA's to Regular Expressions by eliminating states, Converting Regular Expressions to Automata, Applications of Regular Expressions, and Algebraic laws of Regular Expressions. Properties of Regular Languages: Proving Languages Not to be Regular, Closure properties of Regular Languages. Equivalence and Minimization of Automata (4.4.1 – 4.4.3).	08
III	Context-Free Grammars: Context-Free Grammars, An informal example, Definition of Context-Free Grammars, Derivations using a Grammar, The language of a grammar, Sentential forms, Parse Trees, Constructing Parse Trees, The yield of a Parse tree, Applications of Context-Free Grammars. Properties of Context-Free Languages: Normal Forms for CFG's, Eliminating Useless Symbols, Computing the Generating and Reachable Symbols, Eliminating ϵ - Productions, Eliminating Unit Productions, Chomsky Normal Form.	08
IV	Pushdown Automata: Definition of the Pushdown Automata, Informal Definition, Formal Definition, A Graphical Notation for PDA's, Instantaneous Descriptions of a PDA, The Languages of a PDA, Acceptance by Final State, Acceptance by Empty Stack, Definition of Deterministic PDA.	08
V	Introduction to Turing Machines: Problems those computers cannot solve, The Turing Machine: Notation for the Turing Machine, Instantaneous Descriptions for Turing Machines, Transition Diagrams for Turing Machines, The Language of a Turing Machine, Turing machines and Halting, Extensions to the basic Turing machines.	08



Text Book:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to Automata Theory, Languages and Computation	John E Hopcroft, Rajeev Motwani, Jeffery D Ullman	3 rd Edition, Pearson Education Limited 2014 ISBN 13:978-1-292-03905-3

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to Languages and Theory of Computation	John C Martin	3 rd Edition, Tata McGraw –Hill Education, 2013 ISBN. 978-0-07-066048-9.
2	An Introduction to Formal Languages and Automata	Peter Linz	6 th Edition, Narosa Publishing House, 2016 ISBN: 9781284077254

Course Outcomes:

Sl. No.	Description
1	Explain the concepts of automata theory and its applications.
2	Design computational models to accept a given language and vice versa.
3	Demonstrate the equivalence among different automata models.
4	Design and simulate automata models to accept a given language.



Syllabus for the Academic Year – 2022 – 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Cloud Computing

Subject Code: IS5PE51

L-P-C: 3-0-3

Course Objectives:

Sl. No	Description
1	Provide comprehensive view to different aspects of cloud computing like; service models, Deployment models and challenges.
2	Introduce to cloud virtualization, with different type of virtualization and capacity planning metrics to clouds.
3	Know the concrete concepts of cloud security and their standards.
4	Contrast how Service oriented Architecture principles is helpful in Cloud Computing.

UNIT	Description	Hours
I	Examining the value proposition: Cloud Types, The NIST model, The Cloud Cube Model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, Paradigm shift, Benefits of cloud computing, Disadvantages of cloud computing; Assessing the value proposition: Early adopters and new applications, the laws of clouconomics, cloud computing obstacles, behavioral factors relating to cloud adoption, measuring cloud computing costs, specifying SLAs.	08
II	Continuation of Examining, the value Proposition: Understanding Cloud Architecture: Exploring the Cloud Computing Stack, Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols; Understanding Services and Applications by Type: Defining IaaS, Defining PaaS, Defining SaaS, Defining IDaaS.	08
III	Understanding Platform: Using Virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors; Capacity Planning: Defining Baseline and Metrics, Baseline measurements, System metrics, Load testing, Resource ceilings, Server and instance types, Network Capacity, Scaling, Exploring the Google Toolkit, Working with the Google App Engine, Amazon Web Service Components and Services, The Windows Azure service.	08
IV	Exploring Cloud Infrastructure: Securing the Cloud, The security boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance, Establishing Identity and Presence, Identity protocol standards, Windows Azure identity standards.	08
V	Understanding Services and Applications: Understanding Service Oriented Architecture: Introducing Service Oriented Architecture, Event-driven SOA or SOA 2.0, The Enterprise Service Bus, Service catalogs, Defining SOA Communications, Business Process Execution Language, Business process modeling, Managing and Monitoring, SOA, SOA management tools, SOA security, The Open Cloud Consortium, Relating SOA and Cloud Computing.	08

Text Books:



Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Cloud Computing Bible	Barrie Sosinsky	Wiley Publishing Inc. 2011 (free ebook available).

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Cloud Computing and SOA Convergence in Your Enterprise	David S. Linthicum	A Step-by-Step Guide (free-book available)
2	Cloud Computing, A Practical Approach	Toby Velte, Anthony Velte, Robert Elsen peter	McGraw Hill Professional, 2009 ISBN: 0071626956, 9780071626958

Course Outcomes:

Sl. No	Description
1	Define Cloud computing and characteristics and various types of cloud services.
2	Describe benefits and drawbacks of Cloud computing.
3	Explain various types of virtualization, capacity planning metrics and services.
4	Discuss Cloud Security and various challenges, SOA and various issues.



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Internet of Things

Subject Code: IS5PE52

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Understand the genesis, impact of IoT applications and architectures of IoT.
2	Illustrate diverse methods of deploying smart objects and connect them to network.
3	Infer the role of Data Analytics and Security in IoT.
4	Identify sensor technologies and understand the role of IoT in various domains of Industry.

UNIT	Description	Hours
I	What is IoT?: , Genesis of IoT, IoT Impact, IoT Challenges. IoT Network Architecture and Design: Drivers Behind New Network Architectures, The oneM2M IoT Standardized architecture.The IoT World Forum (IoTWF) Standardized Architecture. IoT Data Management and Compute Stack (Cloud, Fog and Edge Computing).	08
II	Smart Objects- The “Things” in IoT: Sensors, Actuators, and Smart Objects. Connecting Smart Objects: IoT Access Technologies- IEEE 802.15.4, LoRaWAN, NB-IoT and Other LTE Variations.	08
III	IP as the IoT Network Layer: The Business Case for IP, The need for Optimization,Optimizing IP for IoT-From 6LowPAN to 6Lo. Application Protocols for IoT: The Transport Layer, IoT Application Layer Protocols- CoAP, MQTT.	08
IV	Data and Analytics for IoT: An Introduction to Data Analytics for IoT, BigData Analytics Tools and Technology. Smart and Connected Cities: An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Use-Case Examples.	08
V	IoT Physical Devices and Endpoints Arduino UNO: Introduction to Arduino, Exploring the ArduinoUNO Learning board, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints RaspberryPi: Introduction to RaspberryPi, Exploring the RaspberryPi Learning Board, RaspberryPi Operating Systems, Programming RaspberryPi with Python.	08

**Text Book:**

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)
2	Internet of Things	Srinivasa K G	CENGAGE Learning India, 2017

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Internet of Things (A Hands-on-Approach)	Vijay Madiseti and Arshdeep Bahga	1st Edition, VPT, 2014. (ISBN: 978-8173719547)
2	Internet of Things with Arduino Cookbook	Marco Schwartz	Packt Publications, (ISBN: 978-1-78528-6582)
3	The Internet of Things: Key Applications and Protocols	Olivier Hersent, David Boswarthick, Omar Elloumi	Wiley publications, (ISBN: 978-81-265-57653)

Course Outcomes:

Sl. No.	Description
1	Explain the various concepts and architecture of IoT and the technologies behind IoT.
2	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
3	Assess the existing solutions in the implementation of IoT.
4	Implement IoT applications using Arduino UNO and Raspberry Pi.



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Research Methodology and Intellectual Property Rights

Subject Code: IS5PE53

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Understand the need of Research Methodology and Intellectual Property Rights process.
2	Familiar with the various research methodologies and report writing.
3	Gain some idea about legal agreements and kinds of acts available.
4	Learn laws applied on digital product development and unfair competition in business.

UNIT	Description	Hours
I	Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India. Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.	08
II	Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys: Introduction, Sample Design, Sampling and non-sampling errors, sample survey.	08
III	Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection. Interpretation and Report Writing: Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different steps in writing Report, Layout of the Research Report ,Types of Reports, Oral Presentation.	08
IV	Introduction: Introduction to IPRs, Basic concepts and need for Intellectual Property -Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, Technological Research, Inventions and Innovations – Important examples of IPR.	08
V	Registration Of IPRs: Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad.	08

Text Book:



Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Research Methodology Methods and Techniques	C R Kothari Gaurav Garg	3rd Edition New Age International Publishers
2	Managing Intellectual Property	V. Scople Vinod	Prentice Hall of India pvt Ltd, 2012
3	Intellectual Property Rights and Copy Rights	S. V. Satakar	Ess Publications, New Delhi, 2002

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets	Deborah E. Bouchoux	Cengage Learning, Third Edition, 2012.
2	Intellectual Property Rights: Unleashing the Knowledge Economy	Prabuddha Ganguli	McGraw Hill Education, 2011
3	The Management of Intellectual Property	Derek Bosworth and Elizabeth Webster	Edward Elgar Publishing Ltd., 2013.

Course Outcomes:

Sl. No.	Description
1	Explain the basics of Research Methodology and IPR.
2	Analyze various Research Design concepts.
3	Write research reports and layouts.
4	Interpret the IPR registration process and agreements.



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Software Engineering

Subject Code: IS5OE61

L-P-C: 3-0-3

Course Objectives:

Sl. No	Description
1	Understand systematic and disciplined approach for software development.
2	Analyze and Develop different customer requirements and SRS.
3	Compare different software testing strategies and Appreciate Project management activities.

UNIT	Description	Hours
I	Software And Software Engineering: The Nature of Software, the Unique Nature of Web Apps, Software Engineering, the Software Process, Software Engineering Practice. The Software Process: Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models.	08
II	Introduction to agility: What Is Agility?, Agility and the Cost of Change, What Is an Agile Process, Other Agile Process Models, A tool set for the Agile Process. Requirements Engineering And Modeling: Requirements Engineering, Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts.	08
III	Requirements Engineering And Modeling contd.. Class-Based Modeling. Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Requirements Modeling for WebApps – How Much Analysis is Enough, Requirements Modeling Input, Requirements Modeling Output.	08
IV	Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design. Project Management Concepts: The management spectrum, People.	08
V	Project Management Concepts contd.. Product, Process, Project, W5HH principle. Estimation For Software Projects: Observations on estimation, project planning process, software scope and reliability, Resources, Project estimation.	08



Text Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Software Engineering - A Practitioners approach.	Roger .G. Pressman	8th Edition, 2019 Tata McGrawhill. ISBN-13: 978-0073375977

Reference Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	An Integrated Approach to Software Engineering.	PankajJolate	Narosa Publications, 3 rd Edition, 2018 ISBN: 978-1-4684-9312-2
2	Software Engineering.	Ian Sommerville	10th Edition, 2018, Pearson Education Ltd. ISBN-13:978-0137035151

Course Outcomes:

Sl. No.	Description
1	Understand Software Development Life Cycle (SDLC) and Client Requirements using various Requirements Modelling Techniques.
2	Design and develop Software Models, Architecture and Code.
3	Compare the uses of Agile and Web Apps development with traditional software development.
4	Describe project planning, Cost estimation and adopt Management skills and abilities.



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Fundamentals of Algorithms

Subject Code: IS5OE62

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Learn how to design recursive and non-recursive algorithms.
2	Know different Algorithm Design Techniques for effective problem solving.
3	Learn how to analyze the algorithm with respect to space and time complexity.
4	Understand basic efficiency classes and asymptotic notations to express the complexity.

UNIT	Description	Hours
I	Introduction, Fundamentals of the Analysis of Algorithm Efficiency, Brute Force: Algorithm Definition, Fundamentals of algorithmic problem solving, Analysis Framework, Formal Definitions of Asymptotic Notations, Basic efficiency classes, Mathematical analysis of Non-Recursive Algorithms for element uniqueness problem, Maximum element in an array and recursive Algorithms for factorial and element uniqueness problem. Brute Force: Selection Sort, String Matching.	08
II	Divide and Conquer: Merge Sort, Finding the Maximum and Minimum. Decrease and Conquer: Insertion Sort, Topological Sorting.	08
III	Transform and Conquer: Heaps and Heap Sort, AVL Trees. Space and Time Tradeoffs, Hashing: Hash table, Hash functions, Collision handling by open addressing and chaining.	08
IV	Greedy Technique: Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm. Dynamic Programming: Floyd's Algorithms and 0/1 Knapsack Problem.	08
V	Back tracking: n-Queen's Problem, Subset-Sum Problem. Branch and Bound: Assignment Problem, Knapsack Problem, and Traveling Salesman Problem.	08

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to the Design & Analysis of Algorithms	AnanyLevitin	3 rd Edition, Pearson Education, 2012, ISBN-13: 978-0-13-231681-1
2	Computer Algorithms/C++	Ellis Horowitz, Satraj Sahni and Rajasekaran	2 nd Edition, 2014, Universities Press, ISBN-13:978-8173716119



Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Introduction to Algorithms	Cormen T.H, Leiserson C.E. & Rivest R.L	3 rd Edition, PHI, 2009, ISBN-13: 978-0262033848
2	Fundamental of algorithms	Gilles Brassard & Paul Bratley	2 nd Edition, PHI 1999, ISBN-13: 978-120311312

Course Outcomes:

Sl. No.	Description
1	Understand the basic concepts of design and analysis of algorithms.
2	Demonstrate various algorithm design techniques to solve a given problem.
3	Design/Develop an algorithm using algorithm design technique and analyze its complexity to rank order of growth.
4	Apply the appropriate algorithm design technique to solve the given problem instance.



Syllabus for the Academic Year – 2022 – 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Introduction to UNIX

Subject Code: IS5OE63

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Understand the UNIX Operating System architecture and its functionalities.
2	Gain important aspects of file system and file attributes.
3	Familiar with utilities provided by UNIX.
4	Learn how to use UNIX editor environment.

UNIT	Description	Hours
I	UNIX Architecture & Command Usage: The UNIX Operating System, The UNIX Architecture, Features of UNIX, Locating Commands, Internal and External Commands, Command Structure, Flexibility of command usage, Man Browsing and manual pages on-line, Understanding man documentation, Further help with man –k, apropos and what is?	08
II	General-Purpose Utilities: Cal: The Calendar, date: Displaying the System Date, echo: Displaying a message, printf: An alternative to echo, bc: The Calculator, script: Recording your session, email basics, mailx: The Universal Mailer, passwd: changing your password, who: Who are the users? Uname: Knowing your machine characteristics, tty: Knowing your terminal.	08
III	The File System: File System: The File, What's in aFile name? The Parent – Child Relationship, The HOME variable, pwd, cd, mkdir, rmdir, Absolute Pathnames and Relative Pathnames, ls, The UNIX File System. Handling Ordinary Files: Cat, cp, rm, mv, more, The lp subsystem, file, wc, cmp.	08
IV	Basic File Attributes: ls –l: Listing File Attributes, The –d Option, Listing Directory Attributes, File Ownership, File Permissions, chmod: Changing File Permissions, Directory Permissions, Changing File Ownership.	08
V	The vi Editor: Vi basics, Input mode, Saving text and quitting, Navigation, Editing text, Undoing last editing instructions, Repeating the last command, Searching for a pattern, Substitution.	08

Text Book:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Unix Concepts and Applications	Sumitabha Das	4th Edition, Tata McGraw Hill, 2012.

Reference Books: Nil



Course Outcomes:

Sl. No.	Description
1	Describe the architecture and features of UNIX Operating System.
2	Use File system and basic file system commands.
3	Interpret various UNIX utilities to manage file processing operations.
4	Explain how to use various commands available in editor environment.



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Mini Project-I

Subject Code: IS5MP1

L-P-C: 0-4-2

Course Objectives:

Sl. No	Description
1	Apply the knowledge and techniques learnt in theoretical classes for software development to solve real world problems.
2	Gives an insight to various tools and technology frameworks.
3	Gaining deeper understanding in specific functional areas.
4	Helps in exploring career opportunities in their areas of interest.

Guidelines for the Mini Project:

- A group of two students are required to carry out Mini Project work under the supervision of Project Guide.
- The guide shall monitor progress of the student continuously.
- Each group is required to present the progress of the Mini Project work during the semester as per the schedule given by the department.
- A presentation shall be made by the group as per the schedule announced by the department.
- A report shall be submitted by the candidates to the department.

Evaluation Scheme:

- Continuous evaluation will be assessed by respective Project Guides based on the Regularity, Technical Knowledge and Competence, Programming Skills, Communication Skills and Documentation Skills of the students.
- Students are evaluated by the team of faculty members based on the Presentation, Technical Competence, Slides Preparation, Team Working Abilities and viva voce.

Course Outcomes:

Sl. No.	Descriptions
1	Identify and formulate acquired knowledge within the chosen area of technology for project development for specific problems to be solved.
2	Analyze, discuss and design the technical aspects of the chosen project with a comprehensive and systematic approach.
3	Able to understand and apply knowledge of <i>communication</i> and language to communicate effectively orally and in writing.
4	Work adequately as an individual or in a team in developing technical projects in given timeline.



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 5

Subject Name: Computer Networks Laboratory

Subject Code: IS5LB1

L-P-C: 0-3-1.5

Course Objectives:

Sl. No.	Description
1	Understand the working of different concepts of networking.
2	Understand the different routing strategies and congestion control algorithms.
3	Simulate and demonstrate the performance of the TCP, UDP, FTP and TELNET.
4	Implement the data link layer and transport layer protocols.

Lab Cycles	Description
I	1. Write a program for error detecting code using CRC-CCITT (16-bits). 2. Write a program for frame sorting technique used in buffers. 3. Write a program for bellman-ford algorithm to find shortest path between vertices 4. Write a program for distance vector algorithm to find suitable path for transmission. 5. Simulate a three nodes point-to-point network with duplex links between them. Set the queue size vary the bandwidth and find the number of packets dropped.
II	6. Write a program for spanning tree algorithm (Kruskal s/Prims) to find loop less path. 7. Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present. 8. Write a program on datagram socket for client/server to display the messages on client side, typed at the server side. 9. Write a program to demonstrate HDLC frame to perform bit stuffing. 10. Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets by TCP/UDP.
III	11. Write a program to demonstrate hamming code for error correction. 12. Write a program for congestion control using Leaky buck algorithm. 13. Simulate the different types of Internet traffic such as FTP a TELNET over a network and analyze the throughput. 14. Simulate an Ethernet LAN using N-nodes (6-10), change error rate and data rate and compare the throughput.



Note: The following experiments shall be conducted using C, C++, Java, NS2, NS3 or any other simulators.

Pattern for practical exam conduction: In the examination each student picks one question out of 10 questions selected by examiner from the above question bank.

Course Outcomes:

Sl. No.	Description
1	Implement the basic Routing and Congestion control Algorithms.
2	Implement Error Detection, Correction techniques with functionalities of Data link layer.
3	Establish Communication between Computers using Client Server approach.
4	Design and Simulate different types of networks and benchmark the performance.

**Syllabus for the Academic Year – 2022 - 2023****Department: Information Science and Engineering****Semester: 5****Subject Name: Database Laboratory****Subject Code: IS5LB2****L-P-C: 0-3-1.5****Course Objectives:**

Sl. No.	Description
1	To understand how a real world problem can be mapped to schemas.
2	To solve different industry level problems & to learn its applications.

Lab Cycles	Description
I	A. Consider the following schema for Insurance database: PERSON (driver_id , name, address) CAR (regno, model, year) ACCIDENT (reportno, accd_date, location) OWNS (driver_id , regno) PARTICIPATED (driver_id, regno, reportno, damage_amt) B. Consider the following database schema for student database: STUDENT (usn, name, major, bdate) COURSE (courseno, cname, dept) TEXT (book_ISBN, book_title, publisher, author) ENROLL (usn,courseno, sem, marks) BOOK _ ADOPTION (courseno, sem, book_ISBN) C. Consider the following schema for a Library Database: BOOK (Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS (Book_id, Author_Name) PUBLISHER (Name, Address, Phone) BOOK_COPIES (Book_id, Branch_id, No-of_Copies) CARD(Card_No) BOOK_LENDING (Book_id,Branch_id,Card_No, Date_Out, Due_Date) LIBRARY_BRANCH (Branch_id, Branch_Name, Address)
II	D. Consider the following schema for Order Database: SALESMAN (Salesman_id, Name, City, Commission) CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) E. Consider the schema for Movie Database: ACTOR (Act_id, Act_Name, Act_Gender) DIRECTOR (Dir_id, Dir_Name, Dir_Phone) MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST (Act_id,Mov_id, Role) RATING (Mov_id, Rev_Stars) F. Consider the schema for Company Database: DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate) EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DLOCATION (DNo,DLoc) PROJECT (PNo, PName, PLocation, DNo) WORKS_ON (SSN,PNo, Hours) Instructions: Using given schema 1. Draw an Entity-Relationship(ER) Model. 2. Implement SQL Queries using DDL and DML Statements. 3. Implement SQL Nested queries and Views.



Course Outcomes:

Sl. No.	Description
1	Design database schema for a given problem-domain and enforce different constraints on a database using RDBMS.
2	Populate and query a database using SQL DML/DDL commands.
3	Interpret, test and debug the program.
4	Comprehend and write effective reports.



CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION FOR B.E. DEGREE COURSE
(Effective from the academic year 2020-21)
Academic Year 2022-23

VI Semester B.E. Information Science and Engineering (Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Engg. & Tech.- Jan. 2018)							Teaching Hrs/Week		Examination			
Sl No .	Course and Course Code		Course Title	Teaching Department	Board of Exam	Credits	L	P	CIE	SEE	Total Marks	Exam Hrs
01	P C	IS6TH1	Web Technologies	ISE	ISE	3	3	-	50	50	100	3
02	P C	IS6TH2	Software Engineering and Software Testing	ISE	ISE	3	3	-	50	50	100	3
03	P C	IS6TH3	Machine Learning Techniques	ISE	ISE	3	3	-	50	50	100	3
04	PE	IS6PE4x	Professional Elective-II	ISE	ISE	3	3	-	50	50	100	3
05	O E	IS6OE5x	Open Elective-II	ISE	ISE	3	3	-	50	50	100	3
06	P C	IS6MP2	Mini Project-II	ISE	ISE	3	-	3	50	50	100	3
07	P C	IS6LB1	Web Technology Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
08	P C	IS6LB2	Machine Learning Laboratory	ISE	ISE	1.5	-	3	50	50	100	3
09	H S	SK6DP4	Skill Development-IV	HS	HS	1	-	2	50	-	50	-
Total						22	15	11	450	450	850	-
L-Lecture Hours, P-Practical Hours, CIE-Continuous Internal Evaluation, SEE-Semester End Examination												

Note:

There is no SEE for Skill Development-III course. However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.

Professional Elective-II	Open Elective-II
IS6PE41: Information Storage and Management IS6PE42: Artificial Neural Networks IS6PE43: Data Science and Analytics	IS6OE51: Artificial Intelligence IS6OE52: Software Testing IS6OE53: Human Computer Interaction



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Web Technologies

Subject Code: IS6TH1

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Illustrate the Syntax and Semantic Structure of XHTML tags with CSS.
2	Define and use user-defined tags in XML and JSON documents.
3	Design Client-Side and Server Side programs using JavaScript and PHP and to infer PHP's capabilities to access database.
4	Describe framework for creating responsive, mobile first website.

UNIT	Description	Hours
I	Introduction to HTML/XHTML: Origins and Evolution of HTML and XHTML: HTML v/s XHTML, Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images: The Image Element, Hypertext Links, Lists, Tables, Forms, Syntactic Differences between HTML and XHTML.	08
II	The Basics of JavaScript: Overview of JavaScript: JavaScript and Java, Uses of JavaScript, Browsers and HTML-JavaScript Documents, Object Orientation and JavaScript, General Syntactic Characteristics, Primitives, Operations, and Expressions: Primitive Types, Numeric and String Literals, Other Primitive Types, Declaring Variables, The Math Object, The Number Object, The Date Object, Screen Output and Keyboard Input, Control Statements: Examples, Object Creation and Modification, Arrays, Functions, Examples, Constructors, Pattern Matching Using Regular Expressions, Another Examples.	08
III	JavaScript and HTML Document, Introducing CSS, XML, JSON and AJAX: The Document Object Model (DOM), Element Access in JavaScript, Handling Events from Text Box and Password Elements. CSS: Level of Style Sheets, Style Specification formats, Selector forms, Property-Value Forms, XML: Uses of XML, The Syntax of XML, XML Document Structure, JSON: JSON format, What is JSON? Array literals, Object literals, Mixing literals, JSON syntax, JSON encoding and decoding, JSON versus XML. What Is Ajax?: Ajax Is Born, The Evolution of the Web 2, The Real Ajax, Ajax Principles Technologies behind Ajax, Who Is Using Ajax?	08



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IV	Introduction to Bootstrap 5: Getting started: Introduction, Download, Contents, Browsers & devices, JavaScript, Webpack, Parcel, Accessibility, RFS, RTL, Contribute. Customize: Sass, Color, Components, CSS variables. Layout: Breakpoints, Containers, Grid, Columns. Content: Typography, Images, Tables. Forms: Overview, Form control, Select, Checks & radios, Input group, Layout, Validation. Components: Buttons, Collapse, Modal, Navbar, Navs & tabs.	08
V	Introduction to PHP: Origins and Uses of PHP, Overview of PHP, General Syntactic Characteristics, Primitives, Operations, and Expressions: Variables, Scalar Type Conversions, Output, Control Statements: Examples, Arrays, Functions, Constructors, Pattern Matching, Form Handling, Cookies, Session Tracking, Database Access with PHP and MySQL.	08

Text Book:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Programming the World Wide Web	Robert W. Sebesta	8th Edition, 2015, Pearson Education. ISBN13: 9780133775983
2	Professional AJAX	Nicholas C. Zakas, Jeremy McPeak and Joe Fawcett	2nd Edition, 2007, Wiley Publishing, Inc., ISBN: 978-0-470-10949-6
3	https://getbootstrap.com/		

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Professional JavaScript for Web Developers	Nicholas C Zakas	3rd Edition, Wrox / Wiley India, 2012. ISBN: 978-8126535088
2	Fundamentals of Web Development	Randy Connolly, Mount Royal University and Ricardo Hoar	3rd Edition, Pearson, 2022, Print ISBN: 9780135863336, 0135863333, eText ISBN: 9780137453719, 013745371X
3	PHP and MySQL web development	Luke Weelling, Laura Thomson,	5th Edition, Pearson Education, Inc., 2016. ISBN: 978-9332582736



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Sl. No.	Descriptions
1	Gain Knowledge in fundamental concepts of Web Technologies.
2	Design and develop responsive Websites using a framework which composed of HTML, CSS and JavaScript.
3	Implement Event Handling, Validating forms, exchange data and deploying web applications.
4	Develop Client side and Server side scripting to generate and display the content dynamically.

Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Software Engineering and Software Testing

Subject Code: IS6TH2

L-P-C: 3-0-3

Course Objectives:

Sl. No	Description
1	Understand systematic and disciplined approach for software development.
2	Analyze and develop different customer requirements and SRS.
3	Describe strategies for generating system test cases.
4	Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.

UNIT	Description	Hours
I	Software And Software Engineering: The Nature of Software, the Unique Nature of Web Apps, Software Engineering, the Software Process, Software Engineering Practice. The Software Process: Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models.	08



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



II	Introduction to agility: What Is Agility?, Agility and the Cost of Change, What Is an Agile Process, Other Agile Process Models, A tool set for the Agile Process. Requirements Engineering And Modeling: Requirements Engineering, Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling. Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Requirements Modeling for WebApps – How Much Analysis is Enough, Requirements Modeling Input, Requirements Modeling Output, Functional Model for WebApps.	08
III	Design Concepts: Design within the Context of Software Engineering, the Design Process, Design Concepts, The Design Model. Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design.	08
IV	A Perspective on Testing and Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing.(1.1 to 1.6) Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter (2.1 to 2.6). (Book 2)	08
V	Equivalence Class Testing: Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations (6.4 to 6.8). (Book 2). Decision Table-Based Testing: Decision tables, Test cases for the triangle problem, Next Date function, and the commission problem, Guidelines and observations. (Book 2). System Testing: Threads, Basis Concepts for Requirements Specification, Model-Based Threads, Use Case-Based Threads, long versus Short Use Cases (14.1 to 14.5). (Book 2).	08

Text Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Software Engineering - A Practitioners approach.	Roger .G. Pressman	8th Edition, 2019 Tata McGrawhill. ISBN-13: 978-0073375977
2	Software Testing, A Craftsman's Approach	Paul C. Jorgensen	4th Edition, Auerbach Publications, 2014. ISBN: 978-1- 4665-6068-0

Reference Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



1	An Integrated Approach to Software Engineering.	Pankaj Jolate	Narosa Publications, 3 rd Edition, 2018 ISBN: 978-1-4684-9312-2
2	Software Engineering.	Ian Sommerville	10th Edition, 2018, Pearson Education Ltd. ISBN-13:978-0137035151
3	Foundations of Software Testing	Aditya P Mathur	Pearson Education, 2013.

Course Outcomes:

Sl. No	Description
1	Understand Software Development Life Cycle (SDLC) and Client Requirements using various Requirements Modeling Techniques.
2	Design and develop Software Models and Architecture.
3	Apply the knowledge of the foundations, techniques in the area of software testing and its practice in the industry.
4	Design test cases, conduct testing operations, manage software problems and defects.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Machine Learning Techniques

Subject Code: IS6TH3

L-P-C: 3-0-3

Course Objectives:

Sl. No	Description
1	Understand the fundamentals of Machine Learning concepts.
2	Learn a variety of Machine Learning algorithms, theoretical results, and applications.
3	Differentiate the working of supervised and unsupervised learning algorithms.
4	Familiar with Machine Learning techniques and apply the suitable technique for the given data set.

UNIT	Description	Hours
I	Introduction to Machine Learning: What is Machine Learning?, What kind of problems can be tackled using Machine Learning, A Simple Machine-Learning Task: Training Sets and Classifiers, Minor Digression: Hill-Climbing Search, Hill Climbing in Machine Learning, Some Difficulties with Available Data. Bayesian Classifiers: The Single-Attribute Case, Vectors of Discrete Attributes, Probabilities of Rare Events: Exploiting the Expert's Intuition.	08
II	Bayesian Classifiers contd... How to Handle Continuous Attributes, Gaussian "Bell" Function: A Standard pdf, Approximating PDFs with Sets of Gaussians. Nearest-Neighbor Classifiers: The k-Nearest-Neighbor Rule, Measuring Similarity, Irrelevant Attributes and Scaling Problems, Performance Considerations, Weighted Nearest Neighbors, Removing Dangerous Examples, Removing Redundant Examples.	08
III	Similarities: Linear and Polynomial Classifiers: The Essence, The Additive Rule: Perceptron Learning, The Multiplicative Rule: WINNOWN, Domains with More Than Two Classes, Polynomial Classifiers, Specific Aspects of Polynomial Classifiers. Artificial Neural Networks: Multilayer Perceptrons as Classifiers, Neural Network's Error.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



IV	Artificial Neural Networks contd... Backpropagation of Error, Special Aspects of Multilayer Perceptrons, Architectural Issues. Performance Evaluation: Basic Performance Criteria, Precision and Recall, Other Ways to Measure Performance, Learning Curves and Computational Costs.	08
V	Performance Evaluation contd... Methodologies of Experimental Evaluation. Unsupervised Learning: Cluster Analysis, A Simple Algorithm: k-Means, More Advanced Versions of k-Means, Hierarchical Aggregation, Self-Organizing Feature Maps: Introduction, Why Feature Maps?	08

Text Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	An Introduction to Machine Learning	Miroslav Kubat	Second Edition, Springer, ISBN 978-3-319-63913-0 (eBook) ISBN 978-3-319-63912-3

Reference Books:

Sl. No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Machine Learning	Tom M. Mitchell	India Edition 2013, McGraw Hill Education, ISBN: 13:9780070428072, 10:0070428077.
2	Machine Learning – An Algorithmic Perspective	Stephen Marsland	Chapman and Hall/CRC; 2 edition (17 November 2014) ISBN-10:1466583282 ISBN-13:978-1466583283

Course Outcomes:

Sl. No	Descriptions
1	Interpret the ideas and facts of Machine Learning algorithms applied in specific domain.
2	Illustrate the working of supervised and unsupervised Machine Learning Techniques.
3	Make use of a suitable Machine Learning algorithm to solve the real world problems.
4	Analyze and compare the performance of various Machine Learning Techniques.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Information Storage and Management

Subject Code: IS6PE41

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Learn about the various storage infrastructure components in data center environments.
2	Familiarize in making decisions on storage-related technologies in an increasingly complex IT environment.
3	Understand the storage technologies, architectures, features, and benefits of intelligent storage systems.
4	Exposed to block-based, file-based, object-based, unified storage and software-defined storage.

UNIT	Description	Hours
I	Introduction to Information Storage, Data center Environment: Information Storage, Evolution of Storage Architecture Data Center Infrastructure, Virtualization and Cloud computing(1.1 to 1.4), Application, Database Management systems, Host, Connectivity(2.1 to 2.4).	08
II	Data Protection: RAID, Intelligent Storage System:\RAID implementation methods, RAID array components, RAID Techniques, RAID, Levels, RAID impact on Disk Performance, RAID comparison, Hot spares(3.1 to 3.7), Components of an Intelligent Storage System, Storage Provisioning, Types of Intelligent Storage Systems(4.1 to 4.3).	08
III	Fibre Channel Storage Area Networks: Fibre Channel overview, The SAN and its evolution, Components of SAN, FC connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies, Virtualization and SAN(5.1 to 5.11).	08
IV	IP SAN, FCoE and NAS: Network Attached Storage iSCSI (internet Small Computer System Interface), FCIP (Fibre Channel over Internet Protocol), FCoE (Fibre Channel over Ethernet)(6.1 to 6.3), General purpose servers versus NAS devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File Sharing Protocols, Factors Affecting NAS Performance, File Level Virtualization(7.1 to 7.9).	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



V	Introduction to Business Continuity and Backup and archive: Information Availability, BC Terminology, BC Planning Life Cycle, failure Analysis, Business Impact Analysis, BC Technology Solutions (9.1 to 9.6), backup Purpose, backup Considerations, backup Granularity, recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments.(10.1 to 10.9).	08

Text Book:

Sl. No.	Title	Author	Volume and Year of Edition
1	Information Storage and Management	G.Somasundaram, AlokShrivastava	EMC Education Services, Wiley- India, Second Edition.2012

Reference Books:

Sl. No.	Title	Author	Volume and Year of Edition
1	Storage Networks Explained	Ulf Troppens, RainerErkes and Wolfgang Muller	Wiley India, 2009.
2	Storage Networks, The Complete Reference.	Rebert Spalding	Tata McGraw Hill, 2008.
3	Storage Area Networks Essentials A Complete Guide to Understanding and Implementing SANs	Richard Barker and Paul Massiglia	Wiley India, 2002

Course Outcomes:

Sl. No.	Description
1	Understand Storage Area Networks characteristics and Architectures.
2	Explain Storage Network Technologies and Virtualization.
3	Analyze the Securing and Managing of Storage Infrastructure.
4	Configure and Simulate Storage Area Network Technologies.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Artificial Neural Networks

Subject Code: IS6PE42

L-P-C: 3-0-3

Course Objectives:

Sl. No	Description
1	Perceive the basic concepts of ANN, applications and learning techniques.
2	Explain the working of perceptron and multilayer perceptron and related learning algorithms.
3	Gain essential knowledge on convolution neural networks and applications.
4	Explore structured probabilistic models for deep learning.

UNIT	Description	Hours
I	Artificial Neural Networks – Introduction and Learning Process-I: What is a Neural Network? Human Brain, Models of a Neuron, Neural Networks Viewed as DG, Feedback, Network Architectures, Error-correction learning, Memory-based learning, Hebbian Learning, Competitive learning, Boltzmann Learning.	08
II	Learning Process-II and Perceptron: Learning with a teacher, learning without a teacher, Learning tasks, Memory and adaptation. Statistical Learning Theory, VC dimension, Probably approximately correct model of learning, Single-Layer Perceptrons: Adaptive filtering problem, Unconstrained optimization techniques: Steepest Descent, Newton's, Gauss-Newton; Linear Least-Squares Filter, LMS algorithm, Learning curves, Learning rate annealing techniques, Perceptron and Convergence theorem.	08
III	Multilayer Perceptron and Generalization: BP algorithm, Two passes of computation, Sequential and Batch Modes of training, Stopping Criteria, XOR problem, Heuristics for BP algorithm to perform better, Output representation and Decision rule, Generalization, Universal approximation theorem, Cross-validation.	08
IV	Convolution Networks: Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the basic convolution function, Structured Outputs, Data types, Efficient Convolution Algorithms, Random or Unsupervised features, The Neuroscientific basis for convolutional networks.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



V	Structured Probabilistic Models for Deep Learning: The challenge of unstructured modeling, Using graphs to describe model structure: Directed, Undirected, Partition function, Energy-based models, Factor graphs; Sampling from graphical models, Advantages of structured modeling, learning about dependencies, Inference and approximate inference, The deep learning approach to structured probabilistic models.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books: Nil

Reference Books:

Sl. No	Title	Author	Volume and Year of Edition
1	Neural Networks – A Comprehensive Foundation	Simon Haykin	2nd Edition, 2005. PHI, (Units I to III).
2	Deep Learning (Adaptive Computation and Machine Learning Series)	Ian Good fellow, Yoshua Bengio and Aaron Courville	(3 January 2017), MIT Press, ISBN-13: 978- 0262035613.
3	Introduction to Artificial Neural Networks	Gunjan Goswami	2012 Edition, S.K. Kataria & Sons ; ISBN-13: 978-9350142967.
4	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms	Nikhil Buduma	2016 Edition, by O'Reilly Publications, ISBN-13: 9781491925614.

Course Outcomes:

Sl. No.	Descriptions
1	Describe basic concepts of neural network, its applications and various learning models.
2	Analyze different Network Architectures, learning tasks, convolutional networks, and deep learning models.
3	Investigate and apply neural networks model and learning techniques to solve problems related to society and industry.
4	Demonstrate a prototype application developed using any NN tools and APIs.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 23

Department: Information Science and Engineering

Semester: 6

Subject Name: Data Science and Analytics

Subject Code: IS6PE43

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Learn the fundamentals of data science and big data.
2	Gain in-depth knowledge on descriptive data analytical techniques.
3	Develop programming skills using required libraries and packages to perform data analysis in Python.
4	Understand and perform data visualization, web scraping, machine learning and Natural Language Processing using various Data Science tools.

UNIT	Description	Hours
I	Introduction To Data Science And Big Data: Data Science – Fundamentals and Components – Data Scientist – Terminologies Used in Big Data Environments – Types of Digital Data – Classification of Digital Data – Introduction to Big Data – Characteristics of Data – Evolution of Big Data – Big Data Analytics – Classification of Analytics – Top Challenges Facing Big Data – Importance of Big Data Analytics – Data Analytics Tools.	08
II	Descriptive Analytics Using Statistics: Types of Data – Mean, Median and Mode – Standard Deviation and Variance – Probability – Probability Density Function – Types of Data Distribution – Percentiles and Moments – Correlation and Covariance – Conditional Probability – Bayes' Theorem – Introduction to Univariate, Bivariate and Multivariate Analysis – Dimensionality Reduction using Principal Component Analysis and LDA – Dimensionality Reduction using Principal Component Analysis and Linear Discriminant Analysis (LDA) – Principal Component Analysis (PCA) example with Iris Data Set from UCI repository.	08
III	Predictive Modeling And Machine Learning: Linear Regression – Polynomial Regression – Multivariate Regression – Multi Level Models – Data Warehousing Overview – Bias/Variance Trade Off – K Fold Cross Validation – Data Cleaning and Normalization – Cleaning Web Log Data – Normalizing Numerical Data – Detecting Outliers – Introduction to Supervised And Unsupervised Learning – Reinforcement Learning – Dealing with Real World Data.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



IV	Data Analytical Frameworks: Introducing Hadoop –Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Introduction to NoSQL: CAP theorem – MongoDB: RDBMS Vs MongoDB – Mongo DB Database Model – Data Types and Sharding – Introduction to Hive – Hive Architecture – Hive Query Language (HQL).	08
V	Data Science Using Python: Introduction to Essential Data Science Packages: Numpy, Scipy, Jupyter, Statsmodels and Pandas Package – Data Munging: Introduction to Data Munging, Data Pipeline and Machine Learning in Python – Data Visualization Using Matplotlib – Interactive Visualization with Advanced Data Learning Representation in Python.	08

Text Book:

Sl. No.	Title	Author	Volume and Year of Edition
1	Hands On Data Science and Python Machine Learning,	Frank Pane	Packt Publishers, 2017
2	Big Data and Analytics	Seema Acharya, Subhashini Chellapan	Wiley, 2015.

Reference Books:

Sl. No.	Title	Author	Volume and Year of Edition
1	Python Data Science Essentials	Alberto Boschetti, Luca Massaron	Packt Publications, 2nd Edition, 2016.
2	Big Data, Black Book	DT Editorial Services	Dream Tech Press, 2015.
3	Python Machine Learning	Yuxi (Hayden) Liu	Packt Publication, 2017.

Course Outcomes:

Sl. No.	Description
1	Identify the real world business problems and model with analytical solutions.
2	Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
3	Write and demonstrate simple applications involving analytical tools.
4	Perform data analytics and visualization using Python.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Artificial Intelligence

Subject Code: IS6OE51

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Learn the background of intelligent agents and search mechanisms.
2	Understand the various knowledge representation techniques.
3	Describe the reasoning methods of proposition, predicate and higher order logics.
4	Interpret the learning techniques in artificial agents.

UNIT	Description	Hours
I	Knowledge Representation In Intelligent Agents: Intelligent agents - Classification - Environment - Architecture - Models of knowledge representation - Procedural rules - Semantic representation - Semantic networks - Frames - Conceptual dependency – Ontology.	08
II	Search Strategies: Uninformed search - Informed search strategies: Greedy best first search - A* search algorithm - Constraint Satisfaction Problems: Backtracking search - Local search - Game Playing: Optimal decisions in games - Alpha-Beta Pruning.	08
III	Reasoning With Proposition And Predicate Logic: Proposition Logic - Syntax - Semantics - Horn Clauses - Resolution - First Order Logic - Syntax - Conversion from English Statements to First order logic formula - Semantics - Reasoning methods - Forward chaining - Backward chaining.	08
IV	Reasoning With Higher Order Logics: Modal Logic - Syntax - Semantics - Kripke structures - Temporal Logic - Syntax and Semantics - Reasoning mechanisms using Temporal Logic - Epistemic Logic - Syntax and Semantics - Multiagent reasoning using Epistemic Logic- Case based reasoning.	08
V	Learning: Statistical methods - Bayesian techniques- Supervised learning- Unsupervised learning- Regression methods - Learning under uncertainty - Probability methods - Text processing.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Third Edition, Pearson Education, 2009.

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Artificial Intelligence	Saroj Kaushik	Cengage Learning, 2012.
2	Logic in Action, A new introduction to Logic	Johan van Benthem, Hans van Ditmarsch, Jan van Eijck and Jan Jaspars	Available in http://www.logicinaction.org/ , 2014.

Course Outcomes:

Sl. No.	Description
1	Use the knowledge representation and reasoning techniques for the design of intelligent systems.
2	Apply the reasoning methods of various logics to computer science domains.
3	Create intelligent systems using learning mechanisms.
4	Analyze and compare the various reasoning methods.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Software Testing

Subject Code: IS6OE52

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Describe strategies for generating system test cases.
2	Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
3	Learn to apply software testing techniques in commercial environment.

UNIT	Description	Hours
I	A Perspective on Testing and Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized Pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter.(Book 1).	08
II	Boundary Value Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing. Decision Table-Based Testing: Decision tables, Test cases for the triangle problem, Next Date function, and commission problem, Guidelines and observations.(Book 1).	08
III	Data Flow Testing: Definition-Use testing. Agile Testing. Integration Testing: Decomposition-Based Integration, Call Graph-Based Integration, Path-Based Integration, Example: Integration next date(Book 1).	08
IV	System Testing: Threads, Basis Concepts for Requirements Specification, Model-Based Threads, Use Case-Based Threads, Long versus Short Use Cases (Book 1). Test and Analysis Activities within a Software Process: The quality process, Planning and monitoring, Quality goals, Dependability properties (Book 2).	08
V	Test Execution: Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay (Book 2). System, Acceptance and Regression Testing: Overview, System Testing, Acceptance Testing, Usability, Regression Testing, , Regression Test selection techniques (Book 2).	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Software Testing, A Craftsman's Approach	Paul C. Jorgensen	4th Edition, Auerbach Publications, 2014. ISBN: 978-1- 4665-6068-0
2	Software Testing and Analysis – Process, Principles and Techniques	Mauro Pezze, Michal Young	Wiley India, 2008. ISBN:978-81-265-1773-2

Reference Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Foundations of Software Testing	Aditya P Mathur	Pearson Education, 2013.
2	Software testing Principles and Practices	SrinivasanDesikan, Gopalaswamy Ramesh	2nd Edition, Pearson Education, 2007

Course Outcomes:

Sl. No.	Description
1	Clear understanding and knowledge of the foundations, techniques in the area of software testing and its practice in the industry.
2	Compare and pick out the right type of software testing process for any given real world problem.
3	Able to plan a test project, design test cases, conduct testing operations, manage software problems and defects.
4	Implement various test processes for quality improvement.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Human Computer Interaction

Subject Code: IS6OE53

L-P-C: 3-0-3

Course Objectives:

Sl. No.	Description
1	Learn the foundations of Human Computer Interaction.
2	Familiar with the design technologies for individuals and persons with disabilities.
3	Aware of mobile HCI.
4	Learn the guidelines for user interface.

UNIT	Description	Hours
I	Foundations Of HCI: The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices-Memory – processing and networks; Interaction: Models-frameworks – Ergonomics – styles –elements – interactivity-Paradigms.	08
II	Design & Software Process: Interactive Design: Basics – process – scenarios – navigation – screen design-Iteration and prototyping. HCI in software process: Software life cycle-usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules.	08
III	Models And Theories: HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements-Communication and collaboration models-Hypertext, Multimedia and WWW.	08
IV	Mobile HCI: Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.	08
V	Web Interface Design: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.	08

Text Books:

Sl. No.	Title	Author(s)	Edition, Publisher, Year, ISBN



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



1	Human Computer Interaction	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale	3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2	Mobile Design and Development	Brian Fling	First Edition, O'Reilly Media Inc., 2009 (UNIT –IV)
3	Designing Web Interfaces	Bill Scott and Theresa Neil,	1 st Edition, O'Reilly, 2009. (UNIT- V)

Reference Books: NIL

Course Outcomes:

Sl. No.	Description
1	Describe an effective dialog for HCI.
2	Design effective HCI for individuals and persons with disabilities.
3	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
4	Assess the importance of user feedback regarding the Interface.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Mini Project-II

Subject Code: IS6MP2

L-P-C: 0-4-3

Course Objectives:

Sl. No	Course Objectives
1	Apply the knowledge and techniques learnt in theoretical classes for software development to solve real world problems.
2	Gives an insight to various tools and technology frameworks.
3	Gaining deeper understanding in specific functional areas.
4	Helps in exploring career opportunities in their areas of interest.

Guidelines for the Mini Project:

- A group of two students are required to carry out Mini Project work under the supervision of Project Guide.
- The guide shall monitor progress of the student continuously.
- Each group is required to present the progress of the Mini Project work during the semester as per the schedule given by the department.
- A presentation shall be made by the group as per the schedule announced by the department.
- A report shall be submitted by the candidates to the department.

Evaluation Scheme:

- Continuous evaluation will be assessed by respective Project Guides based on the Regularity, Technical Knowledge and Competence, Programming Skills, Communication Skills and Documentation Skills of the students.
- Students are evaluated by the team of faculty members based on the Presentation, Technical Competence, Slides Preparation, Team Working Abilities and vivavoce.



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(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Sl. No.	Descriptions
1	Identify and formulate acquired knowledge within the chosen area of technology for project development for specific problems to be solved.
2	Analyze, discuss and design the technical aspects of the chosen project with a comprehensive and systematic approach.
3	Able to understand and apply knowledge of communication and language to communicate effectively orally and in writing.
4	Work adequately as an individual or in a team in developing technical projects in given timeline.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering

Semester: 6

Subject Name: Web Technology Laboratory

Subject Code: IS6LB1

L-P-C: 0-3-1.5

Course Objectives:

Sl. No	Course Objectives
1	Design static and dynamic web pages.
2	Able to write well-formed web document and to appreciate importance of the JSON, an emerging alternative to XML.
3	Familiarize with Client-Side and Server-Side web Programming.
4	Learn Database Connectivity with web applications.

Lab Cycles	Description
I	CYCLE-I [HTML] 1. Create and test an HTML document for: a) Yourself, including your name, address, and electronic mail address. If you are a student, you must include your major and your grade level. If you work, you must include your employer, your employer's address, and your job title. b) Add pictures of yourself and at least one other image (of your friend, spouse, or pet) to the document created. c) Add a second document to the document created that describes part of your background, using background as the link content. This document should have a few paragraphs of your personal or professional history. Note:- This document must use several headings and , , <hr />, <p>, and
 tags. 2. Develop static pages (using only HTML) of an online Book store. The page should resemble: www.amazon.com and the website should contain the following pages. Home page, Registration and User Login, User Profile page, Books Catalog, Shopping Cart, Payment By Credit Card, Order Confirmation.
II	CYCLE-II [CSS &XML] 1. Design an XHTML that uses CSS to test External Style Sheets for the chapters of the text book. 2. Create and test an HTML document that describes nested ordered lists of cars. The outer list must have three entries: compact, midsize, and sports. Inside each of these three lists there must be two sublists of body styles. The compact- and midsize-car sublists are two door and four door; the sports-car sublists are coupe and convertible. Each body-style sublist must have at least three entries, each of which is the make and model of a



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



	particular car that fits the category. The outer list must use uppercase Roman numerals, the middle lists must use uppercase letters, and the inner lists must use Arabic numerals. The background color for the compact-car list must be pink; for the midsize-car list, it must be blue; for the sports-car list, it must be red. All the styles must be in a document style sheet. 3. Design an XHTML that uses CSS to illustrate usage of table, borders, margin and padding. 4. Design an XML document to store information about a student in an engineering college SSIT. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students and produce a display of the raw XML document. Also create a CSS style sheet for the XML document and use it to create a display that document. 5. Write a program to design webpage using frameworks. 6. Write an XML file which will display the book information which includes the following. - Title of the book - Author Name - ISBN number - Edition - Price Display the XML file as follows: The content should be displayed in table. The header of the table should be in color GREY and the author name column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use CSS for the above purpose.
III	CYCLE-III [JavaScript] - Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient. - Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs XHTML text that displays the resulting values in an XHTML table format. - Develop and demonstrate a XHTML file that includes JavaScript script for the following problems: - Output: The first 20 Fibonacci numbers, which are defined as in the sequence 1, 1, 2, 3, where each number in the sequence after the second is the sum of the two previous numbers. - Modify the script to use prompt to input a number n that is the number of



	the Fibonacci number required as output. - Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt. - Develop and demonstrate a XHTML file that includes JavaScript script that uses functions for the following problems: Parameter: A string Output: The position in the string of the left-most vowel. Parameter: A number Output: The number with its digits in the reverse order. Parameter: An array of numbers. Output: The numbers of negative elements, zeros and values greater than zero in the given array.
IV	CYCLE-IV [HTML and JavaScript] - Write an HTML document to provide a form that collects Customer’s name and phone number. - The phone number must be in the form ddd-ddd-dddd - The name should be in the form is last-name, first-name, middle-initial, where the first and last names must begin with upper case letters and have at least one lower case letter. Both must be followed immediately by a comma and possibly, one space. The middle initial must be uppercase and may or may not be followed by a period. There can be no characters before or after the whole name. Write a JavaScript that checks the submitted Telephone number and Name to be sure that it conforms to the required formats and then return a response indicating whether the number and name was correct. - Develop and test an HTML document that has checkboxes for apple (59 cents each), orange (49 cents each), and banana (39 cents each), along with a Submit button. Each of the checkboxes should have its own onclick event handler. These handlers must add the cost of their fruit to a total cost. An event handler for the Submit button must produce an alert window with the message your total cost is\$xxx, where xxx is the total cost of the chosen fruit, including 5 percent sales tax. This handler must return false (to avoid actual submission of the form data). - Develop and demonstrate, using JavaScript script, a XHTML document that collects the USN (The valid format is: A digit from 1 to 4 followed by two Uppercase characters followed by two digits followed by two uppercase characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected. Modify the above



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



	program to get the current semester also (restricted to be a number from 1 to 8).
	CYCLE-V [PHP] - Write the PHP programs to do the following. - Find the transpose of a matrix. - Multiplication of two matrices. - Addition of two matrices. Note: Students has to execute either a & c or b & c - Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings. - Write a PHP program to display a digital clock which displays the current time of the server. - Create a XHTML form with Name, Address Line2 and E-mail text fields. On Submitting, store the values in MYSQL table. Retrieve and display the data based on Name. - Write a PHP program to sort the student records based on USN which are stored in the database.

Pattern for practical exam conduction:

In Semester End Practical Examination, students are allowed to pick one program from the lot of 5 cycles.

Course Outcomes:

Sl. No.	Descriptions
1	Develop static and dynamic web pages with good aesthetic sense of front and back end design techniques.
2	Embed JavaScript and PHP into XHTML web document.
3	Design well-formed web pages in framework environment.
4	Develop the Website and retrieving the data dynamically.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Information Science and Engineering	Semester: 6
Subject Name: Machine Learning Laboratory	
Subject Code: IS6LB2	L-P-C: 0-3-1.5

Course Objectives:

Sl. No	Course Objectives
1	Make use of Data sets in implementing the machine learning algorithms.
2	Implement the machine learning concepts and algorithms in any suitable language of choice.
3	Understand and present the key algorithms and theory that form the core of machine learning.
4	Analyze the performance of Machine Learning techniques which varies with the number of training examples presented.

Lab Cycles	Description
I	1. Write a Python program to load iris data set and apply Naïve-Bayes algorithm for classification of Iris flowers. 2. Write a Python program to extract social_network_ads.csv file. Apply k-Nearest Neighbor technique to identify the users who purchased the item or not. 3. Write a Python program to load whether data set and apply a perceptron learning algorithm to determine whether the rain occurs tomorrow or not.
II	4. Implement the Backpropagation algorithm in Python to classify iris data set. 5. Consider a Mall_Customers data set which is the data of customers who visit the mall and spend there. In the given dataset, we have Customer_Id, Gender, Age, Annual Income (\$), and Spending Score (which is the calculated value of how much a customer has spent in the mall, the more the value, the more he has spent). From this dataset, calculate some patterns using k-Means clustering method. 6. Consider a dataset that has two variables: salary (dependent variable) and experience (Independent variable). Build a simple Linear-Regression model in Python to do the following: • Find out if there is any correlation between these two variables. • Find the best fit line for the dataset. • Show how the dependent variable is changing by changing the independent variable.
III	7. Implement Support Vector Machine algorithm in Python for any suitable data set available. 8. Consider the User Database which contains information about UserID, Gender, Age, EstimatedSalary, and Purchased. Apply Logistic Regression in Python to predict whether a user will purchase the company's newly launched product or not. 9. Implement Polynomial Regression model in Python for any suitable data set available.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Pattern for practical exam conduction:

In the examination each student picks one question out of 10 questions from the above question bank.

Course Outcomes:

Sl. No.	Descriptions
1	Understand the implementation procedures for the machine learning algorithms.
2	Design Python programs for various Learning algorithms.
3	Apply appropriate data sets to the Machine Learning algorithms.
4	Identify and apply Machine Learning algorithms to solve real world problems.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



DEPARTMENT OF MECHANICAL ENGINEERING

PROPOSED CURRICULUM OF V SEMESTER

2020-2021 BATCH

Sl. No	Sub. Code	Subject Title	L	T	P	C
1.	ME5TH1	DESIGN OF MACHINE ELEMENTS – 1	4	0	0	3
2.	ME5TH2	TURBOMACHINES	4	0	0	3
3.	ME5TH3	APPLIED THERMODYNAMICS	4	0	0	3
4.	ME5TH4	DYNAMICS OF MACHINES	4	0	0	3
5.	ME5PE5X	PROFESSIONAL ELECTIVE-1	3	0	0	3
6.	ME5OE6X	OPEN ELECTIVE-1	3	0	0	3
7.	ME5MP1	MINI PROJECT-1	0	0	4	2
7.	ME5LB1	I C ENGINES & FUELS LAB	0	0	3	1.5
8.	ME5LB2	FLUID MECHANICS AND FLUID MACHINERY LAB	0	0	3	1.5
9.	SK5DP3	SKILL DEVELOPMENT-III	-	-	2	1
Total			22	00	12	24

Professional Elective-I	
Sub. Code	Subject Title
ME5PE51	CAD/CAM & CIM
ME5PE52	MEMS & NANO TECHNOLOGY

Open Elective - I	
Sub. Code	Subject Title
ME5OE61	INDUSTRIAL DESIGN AND ERGONOMICS
ME5OE62	ENGINEERING ECONOMICS
ME5OE63	ENTERPRISE RESOURCE PLANNING
ME5OE64	HUMAN RESOURCE MANAGEMENT
ME5OE65	INTRODUCTION TO PROJECT MANAGEMENT



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Syllabus for the Academic Year – 2022 - 2023

Department: Mechanical Engineering

Semester: V

Subject Name: DESIGN OF MACHINE ELEMENTS-I

Subject Code: ME5TH1

L-T-P-C: 4-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To understand & explain the terminology associated with design of machine elements under static & dynamic loading conditions with different support conditions.
2	To understand the concept of uniaxial, biaxial and triaxial state of stress in a loaded machine component and apply them for practical situations.
3	To acquire knowledge of basic concepts of failure theories and use those for designing components subjected to static, impact and fatigue loads.
4	To understand & apply the basic design concepts for designing machine components used for mechanical power transmission and mechanical fastening elements.

Unit	Description	Hours
I	Introduction: Materials and their properties, design considerations, manufacturing considerations, codes and standards, limits, fits and tolerances for manufacture, stress-strain diagrams, mechanical behavior of metals, Stress analysis under bi-axial and tri-axial stress state with combined shear, Principal stresses and related problems, analysis of beams with straight and curved cross section. Design for static strength: Static loads and factor of safety, theories of failure, maximum normal stress theory, Maximum shear stress theory, distortion energy theory, failure of brittle materials, failure of ductile materials, Stress concentration, determination of stress concentration factor, combined stress concentration factor.	9
II	Design for fatigue strength: Introduction, S-N Diagram, low cycle fatigue, high cycle fatigue, and endurance limit. Modifying factors, size effect, surface effect, stress concentration effect, fluctuating stresses, fatigue strength under fluctuating stresses, Goodman and Soderberg relationship for design, stress due to combined loading, cumulative fatigue damage, problems. Impact loading: Derivation of Instantaneous stress due to axial, bending and torsion loading, effect of Inertia, problems.	9
III	Design of Transmission Shafts: Simple torsion equation, design for strength and rigidity under steady loading, ASME & BIS codes for design of transmission shafting, Shafts under fluctuating loads & combined loads, Design of rigid flanged coupling & bushed pin type flexible coupling, design of keys, splined shafts.	9
IV	Power screws: Mechanics of power screws, stresses in power screws, efficiency and self-locking. Cotter and Knuckle joints: Cotter and Knuckle joints.	9



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



V	Fasteners: Bolted joints: Types of Keys, stresses in keys, pins and retainers, Threaded fasteners and their terminology, stresses and effect of initial tension, effect of compression, effect of fatigue loading, impact loading, shear loading, eccentric loading and problems related to the above. Riveted joints: Types rivet materials, Failures of riveted joints, Boiler joints, Tank and Structural joints, Welded joints: Welded joints- types, Strength of butt and fillet welds, eccentrically loaded welds.	9

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Define and explain the terminology associated with material properties and material behavior under the action of static, impact and fatigue loads.[BL1]
CO2	Understand and explain the essential principles of uniaxial, biaxial and tri-axial state of stresses in a loaded machine component and find the resultant stresses.[BL2]
CO3	Apply the concepts of failure theories and carry out analysis of a given machine component for sustaining static, impact and fatigue loads[BL3,BL4]
CO4	Design machine components like transmission-shafts, axles, power-screws, couplings, fastenings like riveted, welded and bolted joints etc.[BL5, BL6]

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Machine Design	V.B. Bhandary,	TATA Mcgraw Hill Publication

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Machine Design	Sharma & Agarwal,	SK Kataria & Sons Publications, New Delhi.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: TURBOMACHINES

Subject Code: ME5TH2

L-T-P-C: 4-0-0-3

Sl.No	Course Objectives
1	Understand and remember the Classifications of turbomachines and positive displacement machines.
2	Demonstrate the significance of dimensionless parameters and to perform dimensional analysis and model studies.
3	Evaluate Euler turbine equation for turbomachines and analyse the degree of reaction and utilization factor.
4	Draw velocity diagram under various conditions and perform analysis of turbomachine.

Unit	Description	Hrs
I	INTRODUCTION TO TURBOMACHINES :Definition of a Turbomachine; parts of a Turbomachine; Comparison with positive displacement machine; Classification; Application of First and Second Laws to Turbomachines; Efficiency of Turbomachines, Dimensional Analysis; Fundamental and derived quantities, Dimensional homogeneity, Geometric, Kinematic and Dynamic variables, Buckingham's π -theorem, physical significance of dimensionless parameters, Effect of Reynolds number; Specific quantities; expression for specific speed of a pump and turbine, significance of specific speed, Model studies; Geometric, Kinematic and Dynamic similarity, Moody's formula, Illustrative examples on dimensional analysis and model studies.	09
II	ENERGY TRANSFER IN TURBOMACHINES : Euler's Turbine Equation, Velocity Diagrams, Alternate form of Euler turbine equation - components of energy transfer; Degree of reaction; Utilization factor; Relation between utilization factor and degree of reaction; Condition for maximum utilization factor, Axial flow turbines: Velocity diagram for turbines with $R = 0$, $R = 0.5$ and $R = 1$, Variation of utilization factor with speed ratio, Variation of maximum utilization factor with nozzle angle, optimum blade speed ratio for different types of turbines, Comparison between Impulse turbine and 50% reaction turbine.	09
III	STEAM TURBINES : Steam turbines: Classification, Compounding - Need for compounding, methods of compounding, Effect of blades and nozzle losses, Impulse staging; Condition for maximum blade efficiency of single stage and multi stage turbine with equiangular blades; effect of blades and nozzle losses, Reaction staging; Degree of reaction, Parson's turbine, Condition for maximum blade efficiency, Numerical problems.	09
IV	HYDRAULIC TURBINES : Classification; Zero-angle turbine, Pelton Turbine-velocity triangles, Design parameters, turbine efficiency, volumetric efficiency; Francis turbine – velocity triangles, runner shapes for different blade speeds, Design of Francis turbine; Function of a Draft tube, types of draft tubes; Kaplan and Propeller turbines – Velocity triangles and design parameters, Numerical problems.	09
V	CENTRIFUGAL PUMPS : Definition of terms used in the design of centrifugal pumps like manometric head, suction head, delivery head, pressure rise, manometric efficiency, hydraulic efficiency, volumetric efficiency, overall efficiency, Theoretical head – capacity relationship; Effect of blade discharge angle on performance; multistage centrifugal pumps, minimum	09



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



	starting speed, slip, priming, cavitation, NPSH, Numerical problems. THERMODYNAMIC ANALYSIS OF COMPRESSION PROCESS: Sonic velocity and Mach number; Classification of fluid flow based on Mach number; Stagnation and static properties and their relations. Compression process: Overall isentropic efficiency of compression; Polytropic efficiency; Preheat factor, Stage efficiency for single and multi-stage compressor; Numerical problems.	

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

CO's	Descriptions
CO1	Define and explain the terminology associated with dimensional analysis, model studies and turbomachinery. [BL1]
CO2	Understand and explain the essential principles of Bunkingham's π - Theorem, similitudes and also thermodynamic principles of turbomachines. [BL2]
CO3	Apply the concepts related to dimensional analysis, model studies, turbomachinery and determine the solutions required. [BL3]
CO4	Analyze the velocity diagrams and predict their performance parameters. [BL4]

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	An Introduction to energy conversion, Volume III – Turbomachinery	V. Kadambi and Manohar Prasad,	New Age International Publishers (P) Ltd.
2	Turbo Machines	Shankar Nag G L & Keerthi Kumar N	Cengage Publications

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Principles of Turbo Machinery	D. G. Shepherd	The Macmillan Company (1964)
2	Fundamentals of Turbomachinery	William W Perg	John Wiley & Sons, Inc. 2008.
3	A text book of Fluid mechanics and hydraulic Machine	R K Bansal	Laxmi Publications
4	Turbo Machine	Dr. N. Krishnamurthy	Sunstar Publisher.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: APPLIED THERMODYNAMICS

Subject Code: ME5TH3

L-T-P-C: 4-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To understand and apply concepts of thermodynamics to various energy conversion processes and systems.
2	To study the various working aspects of internal combustion engines.
3	To study the various aspects of energy conversion in the gas and vapor power cycles, reciprocating compressors, gas turbines and refrigeration systems.
4	To study various psychrometric processes and understand the working of air conditioning systems.

Unit	Description	Hours
I	Gas Power Cycles: Basic considerations in the analysis of Power cycles, the Carnot cycle and its value in engineering, Air standard cycle's assumptions, Otto cycle, Diesel cycle, Dual cycle (Derivation of MEP, air standard efficiency and numerical problems). Gas Turbines: Brayton cycle, derivation of actual gas turbine cycle from Ideal cycles, Methods to improve the thermal efficiency, Numerical problems.	09
II	IC engines: Performance analysis of SI and CI engines, Heat balance sheet, Morse test, numerical problems.	09
III	Vapour Power cycles: Carnot Vapour power cycle, Rankine cycle, Deviation of actual Vapour cycle from Ideal cycle, methods to improve the efficiency of Rankine cycle, numerical problems. Reciprocating Compressors: Working of single stage Reciprocating Compressors with P-V diagrams, multistage compression, Effect of Intercooling, Numerical problems.	09
IV	Refrigeration: Revised Carnot cycle, Air refrigeration system, Vapour compression refrigeration system (Ideal and Actual), selecting the right refrigerant, Vapour absorption refrigeration system, numerical problems.	09
V	Psychometrics: Atmospheric air and Psychrometric properties: DBT, WBT, DPT, partial pressures, Specific and Relative Humidity, Saturation Ratio, Mixing of air streams, Psychrometric chart, analysis of various processes, summer and winter air conditioning, numerical problems.	09

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	Understand and apply the characteristics of standard Thermodynamic Air Cycles and their analysis. [L2, L3]
CO2	Understand and evaluate the essential principles of psychrometry and analyze A/C systems. [L2, L4, L5]
CO3	Apply and analyze the working concepts of IC Engines performance characteristics. [L3, L4]
CO4	Analysis and evaluate the Rankine Cycle and Refrigeration cycles with various configurations to adopt in the design of power plants.[L4, L5]

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Basic and Applied thermodynamics	P.K. Nag	Tata Mc Graw Hill Publications.
2	Applied Thermodynamics	Kestoor Praveen,	1 st Edition, Suggi Publications, Bangalore.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Thermodynamics an engineering approach	Yunus A Cengel and Michael A Boles-	Tata Mc graw hill Publications.
2	Thermal Engineering	R.K. Rajput,	Laxmi Publications, 2007



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: DYNAMICS OF MACHINES

Subject Code: ME5TH4

L-T-P-C: 4-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	Analyze the forces and torques on the mechanism to known magnitude and directions of forces to keep the mechanism static equilibrium.
2	Design the belt drives for the given conditions.
3	Distinguish various turning moment diagrams of the engines and flywheel.
4	Analyze the balancing of the rotating masses along with balancing of I C engines.
5	Analyze the importance and application of Governors in automobiles.
6	Analyze the Gyroscope and Gyroscopic effects along with application

Unit	Description	Hours
I	Static Force Analysis and Belt Drives: Reaction between members without friction. Analysis of engine mechanism, Four bar mechanism (without friction). Definition, Law of solid friction, belt drives, ratio of belt tensions, centrifugal tension, power transmitted, Effect of centrifugal tension on power transmitted and V- belt drives, principle of superposition.	09
II	Dynamics of Engine Mechanism: Turning moment diagrams of single cylinder and multi cylinder IC engines, Design of flywheels for IC engines and punching press.	09
III	Balancing of rotating masses: static and dynamic balancing, balancing of single rotating mass, balancing of masses in same plane and in different planes. Balancing of several rotating masses. Balancing of reciprocating masses: single cylinder engine, balancing of multi cylinder-inline, primary and secondary forces v-type engine, radial engine, direct and reverse crank method.	09
IV	Governors: Types of governors, force analysis on porter governor, force analysis on Hartnell governor. (controlling force, stability, sensitiveness, isochronisms, effort and power) (only definitions).	09
V	Gyroscope: Victoria representation of angular motion, basic definitions, gyroscopic couple, Effect of gyroscopic couple on plane disc. Gyroscopic effect on aero plane, naval vessel, Stability of two wheelers and four wheelers.	09

Question paper Pattern:

Two questions to be set from each unit and student has to answer any one question from each unit. Totally 5Q need to be answered by the students.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	Define and explain the terminology associated with dynamic force analysis, friction and belt drives, balancing of rotating and reciprocating masses, governors, gyroscope.
CO2	Understand and explain the essential principles of dynamics of machine.
CO3	Apply the concepts related to dynamic force analysis, friction and belt drives, balancing of rotating and reciprocating masses, governors, gyroscope and determine the solutions required
CO4	Analyze the dynamic force analysis, friction and belt drives, balancing of rotating and reciprocating masses, governors, gyroscope

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Theory of machines	Rattan S.S	Tata Mc-graw hill edition 2006
2	Theory of machines	R S Khurmi and J K Gupta,	S Chand and Company, New Delhi

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Theory of machines	Sadhu Singh	Pearson edition 2007
2	Theory of machines	Shigley J V and Uickers J J	Tata McGraw-Hill, edition 2005



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: CAD/CAM & CIM

Subject Code: ME5PE51

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To understand the need for CAD/CAM in Manufacturing.
2	To study the automated assembly systems
3	To understand and develop part programming for CNC machines.
4	To understand the fundamentals of robots and its configuration

Unit	Description	Hours
I	INTRODUCTION TO CAD/CAM & CIM: CAD/CAM & CIM Definition, Product Cycle and CAD/CAM, Automation and CAD/CAM, CIM systems: Introduction, Automation, definition, types, of automation, CIM, Processing in manufacturing, production concepts, Mathematical models, manufacturing lead time, production rate, components of operation time, capacity, utilization and availability, work in process, WIP ratio, Problems using mathematical model equations.	8
II	MANUAL ASSEMBLY LINES AND LINE BALANCING: Work station process time, Cycle time, precedence constraints. Precedence diagram, Balance delay methods of line balancing-largest Candidate rule, Westers method, Ranked positional weight method, Numerical problems covering above methods.	8
III	AUTOMATED ASSEMBLY SYSTEMS: Automated assembly systems: Product design for automated assembly, types of automated assembly systems, Part feeding and delivery system-hopper, part feeder, selector, feedback, escapement and placement. Analysis Automated assembly systems, Performance of single station assembly and multi station assembly systems.	8
IV	CNC MACHINING CENTERS: Introduction to CNC, elements of CNC, CNC machining centers, part programming, fundamental steps involved in development of part programming for milling and turning.	7
V	ROBOTICS: Introduction, Robotic Fundamentals, Physical configuration of robot, Robot motions Joints in Robot, Technical features of robots, End effectors, Robot sensors and Robot applications.	8

Question paper Pattern:

Two questions to be set from each unit and student has to answer any one question from each unit. Totally 5Q need to be answered by the students.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	Explain the terminology related to CAD/CAM & CIM, robot configurations, robot motions and robot applications. (L1)
CO2	Understand the various automated flow lines and retrieving line balancing. (L2&L1)
CO3	Describe the various types of automation and production concepts. (L2)
CO4	Analyze and Design appropriate automated assembly systems and CNC part programming. (L3&L5)

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Automation, Production system & Computer Integrated manufacturing,	M. P. Groover	Pearson India, 2007 2nd edition.
2	CAD/CAM	Zeid,	Tata McGraw Hill.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Computer Integrated Manufacturing,	J. A. Rehg& Henry.	W. Kraebber.
2	Principles of Computer Integrated Manufacturing,	S. Kant Vajpayee,	Prentice Hall India



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: MEMS AND NANOTECHNOLOGY

Subject Code: ME5PE52

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To inspire the students to expect to the trends in development and synthesizing of nano systems and measuring systems to nano scale.
2	To expose the students to the evolution of Nano systems, to the various fabrication techniques.
3	Also to impart knowledge to the students about nano materials and various nano measurements techniques.

Unit	Description	Hours
I	INTRODUCTION: Historical background development of microelectronics, evolution of micro sensors, MEMS, emergence of micro machines. Micro sensors: Introduction, thermal sensors, mechanical sensors, flow sensors and Introduction to SAW DEVICES	8
II	MEMS MATERIALS AND PROCESSING: Overview, metals, semiconductors, ceramic, polymeric and composite materials, Micro-stereolithography: Introduction, Scanning Method, Projection Method, Applications. LIGA Process: Introduction, Basic Process and Application.	8
III	MICRO SYSTEM FABRICATION PROCESSES: Photolithography, Chemical Vapor Deposition, Etching, Bulk and Surface Micro Manufacturing.	8
IV	NANO-TECHNOLOGY: Introduction to Nanotechnology, The nanoscale. Consequences of the nanoscale for technology and society. Technologies for the Nanoscale, Top-down versus bottom-up assembly. Visualisation, manipulation and characterisation at the nanoscale, Proximal probe technologies. Self-assembly	8
V	NANO SCALE MANUFACTURING: Nano manipulation, Nanolithography - An introduction to tribology and its industrial applications, Nanoscale Materials and Structure, Nanocomposites, Safety issues with nanoscale powders - Applications, Applications in energy, informatics, medicine, etc	8

Question paper Pattern:

Two questions to be set from each unit and student has to answer any one question from each unit. Totally 5Q need to be answered by the students.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	understand the basic components of MEMS and NEMS
CO2	Ability to design the micro devices, micro systems using the MEMS fabrication process.
CO3	Ability to understand the operation of nano devices, nano systems and their applications.
CO4	To analyze methods involving preparation of nano scale devices

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Nano Technology,	Mark Ratner & Daniel Ratner	Pearson Education, 2003.
2	MEMS & MICROSYSTEMS Design and Manufacturing	Tai – Ran Hsu,	TATA McGRAW-HILL, 2002

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Fundamentals of Micro-fabrication	Marc J. Madou,	II Edition, CRC Press, 2002.
2	The MEMS Handbook	Mohamed Gad-el-Hak	CRC Press, 2002



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: INDUSTRIAL DESIGN AND ERGONOMICS

Subject Code: ME5OE61

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To understand the methods and procedures of designing the industrial products.
2	To study the different procedures of Industrial Design in Practice.
3	To analyze the effective utilization of men and machines.
4	To design the man machine systems ergonomically.

Unit	Description	Hours
I	Introduction: An approach to industrial design, elements of design structure for industrial design in engineering application in modern manufacturing systems. Ergonomics and Industrial Design: Introduction, general approach to the man-machine relationship, workstation design, working position	08
II	Control and Displays: Shapes and sizes of various controls and displays multiple displays and control situations, design of major controls in automobiles, machine tools etc., Applied Anthropometry and Work Space: Anthropometry, Use of anthropometric data, work space and its design, science of seating, work place design	08
III	Visual Effects of Line and Form: The mechanics of seeing- psychology of seeing, general influences of line and form, elements of visual design	08
IV	Colour: Colour and light, colour and objects, colour and the eye, colour consistency, colour terms, reactions to colour and colour continuation, colour on engineering equipment's.	08
V	Aesthetic Concepts: Concept of unity, concept of order with variety, concept of purpose style and environment, Aesthetic expressions. Style components of style-house style, observation style in capital goods. Industrial Design in Practice: General design, specifying design equipment's, rating the importance of industrial design, industrial design in the design process, working with specialists, ways of using IE's	08

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	Describe the concept of industrial design and the ergonomics and the psychology of visuals effects.
CO2	Realize the importance of environmental factors and aesthetics in industrial design.
CO3	Apply the different colour combinations for optimal design of engineering equipment's.
CO4	Design the various controls and displays by knowing the anthropometric data's.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Industrial Design for Engineers	Mayall W.H.	London Hiffie books Ltd. -1988
2	Human Factors in Engineering design.	Sanders & McCormick	McGraw Hill Publications – 6 th Edition, 2012

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Applied Ergonomics Hand Book	Brain Shakel (Edited) - Butterworth	scientific. London - 1988.
2	Work study and ergonomics	S.Dalela and Sourabh-	standard book house.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: ENGINEERING ECONOMICS

Subject Code: ME5OE62

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To perform and evaluate present worth, future worth and annual worth analyses on economic alternatives
2	To evaluate payback period and capitalized cost on economic alternatives
3	To carry out and evaluate benefit/cost, life cycle and breakeven analyses on economic alternatives
4	To learn replacement analysis, depreciation, break even analysis on different alternatives with case studies.

Unit	Description	Hours
I	Introduction: Principles of Engineering Economy, Engineering Decision- Makers, Engineering and Economics, Decision Makers and Decision making, Problems solving, Intuition and Analysis, Tactics and Strategy. Interest and Interest Factors: Interest rate, simple interest, Compound interest, Cash-flow diagrams, Exercises and Discussion	08
II	Present Worth Comparisons: Condition for present worth comparisons, Basic present worth comparisons, present worth equivalence, Net Present worth, Assets with unequal lives, Infinite lives, Future worth comparisons, Pay-back comparisons, Exercises, Discussions and problems.	08
III	Equivalent Annual Worth Comparisons: Equivalent Annual Worth Comparison methods, Situations for Equivalent Annual Worth Comparison, Consideration of asset life, Comparison of asset with equal and unequal lives, Use of shrinking fund method, Annuity contract for guaranteed income, exercises, problems	08
IV	Replacement Analysis: Introduction, Reasons for replacement, Individual Replacement of machinery or equipment with/without value of money, Group Replacement Policies, Problems Break Even Analysis (BEA): Basic concepts, Assumptions of BEA, Graphical methods of reducing BEP, Profit-Volume ratio, Problems on BEP	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



V	Depreciation and Effect of Inflation: Causes of depreciation, basic methods of computing depreciation charges, Causes, consequences and control of inflation. After tax actual cash flow comparisons, Lease/Buy decisions. Estimating and Costing: Components of costs such as Direct Material Cost, Direct Labor Cost, Fixed Over-Heads, Factor Cost, Administrative Over-Heads, First Cost, Marginal Cost, Selling price, Estimation for simple components.	08

Question paper Pattern:

Two questions to be set from each unit and student has to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Understand and explain problem solving & decision-making process in Engineering Economy
CO2	Apply Engineering Economy tools to compare alternative proposals
CO3	Analyze alternative proposals using Engineering Economy tools
CO4	To learn replacement analysis, depreciation, break even analysis on different alternatives with case studies

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Economy	Riggs J.L,	McGraw Hill, 2002
2	Engineering Economy	Thuesen H.G,	PHI, 2002

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Economy	Tara Chand	Nem Chand & brothers' publisher
2	Industrial Engineering and Management	O.P Khanna	Dhanpat rai & sons
3	Financial management,	I M Pandey,	Vikas publishing house
4	Engineering Economy	PAUL DEGARMO,	Macmillan Pub Co, 2001



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: ENTERPRISE RESOURCE PLANNING

Subject Code: ME5OE63

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To understand the basics of ERP
2	To know ERP implementation process
3	To understand the different modules of ERP
4	To implement ERP market Place

Unit	Description	Hours
I	Introduction to ERP: An overview of ERP, advantages, Integrated Management Information, Business modeling, Integrated Data Model, Benefits of ERP. ERP Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management.	08
II	ERP Implementation: Introduction, Evolution of ERP, ERP Implementation, Life Cycle, Different phases of ERP implementation, Implementation methodology, Hidden costs, organizing the implementation, vendors, consultants and users, project management and monitoring.	08
III	ERP Modules: Introduction, Finance module, financial accounting, controlling, investment management, treasury module, business planning and budgeting. Manufacturing module, introduction and subsystems of manufacturing module, introduction and subsystems of human resource module, introduction and subsystems of materials management, introduction and subsystems of sales and distribution module.	08
IV	ERP market place: Market share, vendors, SAPAG, company profile, product and technology, R/3 an overview, R/3 system, R/3 application module, R/3 module SAP application, People soft company profile, business management solution, commercial solution, industry solutions, people tool, people soft implementation tool kit, BAAN company profile, BAAN ERP module, BAAN ERP tools, introductions to GD Edwards.	08
V	ERP - Present and Future: Limitations of ERP systems, Extend the power of ERP systems, ERP and E-commerce, E-commerce work flows, future directions in ERP - new modules and web enabling.	08

Question paper Pattern:



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Two questions to be set from each unit and student has to answer any one question from each unit.
Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Students will be able to describe and explain fundamentals of ERP.
CO2	Students will be able to aware of ERP practices in the industry
CO3	Understand the concepts of different ERP modules
CO4	Able to apply ERP modules in E-commerce.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Enterprise Resource Planning	Alexis Leon	Tata Mc Graw Hill Publishing Company Ltd -1999.
2	Enterprise Resource Planning Concept and Practice	Vinod Kumar Garg and Venkita Krishnan N. K	Prentice Hall, - 2 nd Edition, New Delhi, India, 2004



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: HUMAN RESOURCE MANAGEMENT

Subject Code: ME5OE64

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To educate students on evolution of HRM, and their function
2	To know Man power planning, forecasting, Inventory etc
3	To understand recruitment, selection process and its basic procedure
4	To understand training needs, evaluation and procedure.

Unit	Description	Hours
I	Introduction to HRM: Overview, objectives, environmental influence, competitive advantage and skills required. H.R Policies, need of HRM. Human Resource Planning: HRP at different levels, Methods of HRP, Process of HRP, Control and review mechanism.	08
II	Recruitment: Sources and techniques of recruitment (internal, external) assessment of recruitment program. Selection, Placement and Induction: Meaning, Significance, factors affecting decisions, procedure, concept of testing, Interviews, Placement and induction process	08
III	Motivation: Motivation and Motivators, The hierarchy of needs theory, Theory X and Theory Y, The Motivation Hygiene theory, Immaturity Maturity theory. Leadership: Defining leadership, Ingredients of leadership, Leadership behavior and styles. Communication: The communication function, Communication process, Communication in enterprise, Barriers and break downs in communication, Effective communication. Electronic Media in communication.	08
IV	Performance Appraisal: Meaning, need, purpose, Methods of performance appraisal- traditional, graphic rating scales, ranking, paired comparison, forced distribution, checklist, critical incidence, essay or free form, group confidential reports. Modern Behaviorally Anchored Rating Scales (BARS) and related Modern Scales, Assessment Centre, Characteristics of an Effective Appraisal System and its Uses. Problems of performance Appraisal, Performance Appraisal through Computers.	08
V	Counseling: Characteristics, Need, Function, Types and suggestions for Personnel Development. Compensations Management - Concept and Theories of wage machinery, statutory requirement in compensation Management.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Question paper Pattern:

Two questions to be set from each unit and student has to answer any one question from each unit.
Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Recruit and select the candidates properly to suite the requirements in the organizations.
CO2	Identify the training needs effectively and thus train and develop the employees properly.
CO3	Make communication effective and informative in the organizations.
CO4	Evaluate the performances of employees through proper performance appraisal methods

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Human Resource Management and Industrial Relations	P. Subba Rao,	Himalaya Publishing House
2	Human resource management	K.Aswathappa	

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Counseling in Industry Personnel Psychology	Peter C.Cairo	
2	Management Human Resources	Wayne F Casio,	TATA Mc GrawHill New Delhi
3	Human Resource Management	H.John Bernardino, and Joyce E.A Russel,	McGraw Hill International Editions.
4	Personnel Management	C.B. Memoria	Himalaya Publishing House



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: INTRODUCTION TO PROJECT MANAGEMENT

Subject Code: ME5OE65

L-T-P-C: 3-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	To have an insight about Project Life Cycle, Project Team & Scheduling
2	To understand the applications of tools & techniques of Project Management.
3	To understand Project co-ordination & control methods
4	To know the various performance measures in project management

Unit	Description	Hours
I	Concepts of Project Management: Categories of projects, phases of project life cycle, roles and responsibilities of project leader	08
II	Project Planning and Estimating: Feasibility report, phased planning, project planning steps, objectives and goals of the project, preparation of cost estimates	08
III	Organizing and Staffing the Project Team: Skills/abilities required for project manager, Authorities and responsibilities of project manager. Project organization and accountability in project execution, controls, tendering and selection of contractors.	08
IV	Tools & Techniques of Project Management: Logic diagrams and networks, Programme evaluation and review techniques (PERT), Critical Path Method (CPM), computerized project management	08
V	Performance Measures in Project Management: Performance indicators, performance improvement, CM & DM companies for better project managements, Project management and environment Case Studies on Project Management: Case studies covering project planning, scheduling, use of tools & techniques, performance measurements	08

Question paper Pattern:

Two questions to be set from each unit and student has to answer any one question from each unit. Totally 5Q need to be answered by the students.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	Allocate resources to different activities while planning a project
CO2	Crashing (expedite) certain project activities to speed up a project
CO3	Identify, quantify and mitigate risks
CO4	Do Project performance evaluation

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Project management-A system approach to planning scheduling & controlling	Harlod Kerzner	CBS publishers and distributors.
2	Project management with PERT and CPM	Moder Joseph J and Philips, cerel R	2nd edition, New York V A N Nostrand, Rienhold- 1976

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Project management	Benington Lawrence	Mc Graw Hill-1970.
2	A management guide to PERT and CPM	Wesit & Levy	Eastern economy edition of PHL.
3	Project planning, scheduling & control	James P lewis	Meo publishing company
4	Project execution plan: for project execution interaction	Chaudhury.S.	



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: MINI PROJECT-1

Subject Code: ME5MP1

L-T-P-C: 0-0-4-2

- Students are encouraged to make a study of mini projects and fabricate them with minimum cost
- Using locally available materials for the purpose of demonstration of the concepts involved.
- Mini projects could be selected to be from purely mechanical engineering or interdisciplinary based on electromechanical, microprocessor-based prototype models etc.
- Option is also available for taking up small reconditioning projects pertaining to any of the laboratories of the department (typically adaptive design or development design projects)

Department: Mechanical Engineering

Semester: V

Subject Name: IC ENGINE & FUELS LAB

Subject Code: ME5LB1

L-T-P-C: 0-0-3-1.5

Unit	Description	
PART -A		
	1. Determination of Flash and Fire point of Lubricating and fuel oils. 2. Determination of Calorific value of solid fuels. 3. Determination of viscosity of lubricating oils using Redwood and torsional viscometers. 4. Valve timing diagram of a 4-stroke IC engine. 5. Use of Planimeter to find area under a P-V curve.	
PART-B		
	1. Performance tests on IC engine, calculations of IP, BP, Thermal efficiencies, SFC, FP, Heat balance sheet for a. Four Stroke Diesel engine. (Mechanical loading, Electrical Loading) b. Four Stroke Petrol engine. c. Multi-cylinder Petrol engine. (Morse test). d. Motoring Test 2. Flue gas analysis. (Demonstration only)	

Question paper Pattern:

One Question from part A	- 15 marks (05-write up, 10-calculations & graph)
One Question from part B	- 25 marks (05-write up, 20-calculations & graph)
Viva-Voce	-10 marks



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	Identify and select the equipment to conduct the experiments related to heat engine lab.
CO2	Demonstrate the procedure for conduction of experiments.
CO3	Apply the techniques for data collection.
CO4	Analyze the data collected and interpret the results.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Mechanical Engineering

Semester: V

Subject Name: FLUIDMECHANICS AND MACHINERY LAB

Subject Code: ME5LB2

L-T-P-C: 0-0-3-1.5

Unit	Description
PART A	
I	1. Determination of coefficient of friction of flow in a pipe. 2. Determination of major and minor losses in flow through pipes. 3. Calibration of flow measuring devices. a. Orifice Plate meter b. V-notch c. Rectangular Notch 4. Calibrate and determine the co-efficient of discharge through Venturi -meter 5. Impact of jet on vanes. 6. Determination of Metacentric height.
PART B	
II	1. Performance testing of Turbines. a. Pelton wheel b. Francis Turbine 2. Performance testing of Pumps. a. Single stage / Multi stage centrifugal pumps b. Reciprocating pump (demonstration only) 3. Performance test of a two stage Reciprocating Air Compressor. 4. Performance test on an Air Blower.

Question paper Pattern:

One Question from part A - 15 marks (05-write up, 10-calculations & graph)

One Question from part B - 25 marks (05-write up, 20-calculations & graph)

Viva-Voce -10 marks

Course Outcomes:

Course outcome	Descriptions
CO1	Identify and select the equipment to conduct the experiments related to Fluid mechanics and machinery lab.
CO2	Demonstrate the procedure for conduction of experiments.
CO3	Apply the techniques for data collection.
CO4	Analyze the data collected and interpret the results.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: Placement and Training department

Semester: V

Subject Name: Skill development III (Communication Skills and Professional ethics)

Subject Code: SK5DP3

L-T-P-C: 0-0-2-1

Course Objectives:

Sl.No	Course Objectives
1	Understand their own communication style, the essentials of good communication and develop their confidence to communicate effectively
2	Manage stress by applying stress management skills
3	Ability to give contribution to the planning and coordinate Team work
4	Ability to analyze make problem solving decisions related to ethics

Unit	Description	Hours
I	Communication Skills: Basics, Method, Means, Process and Purpose, Basics of Business Communication, Written & Oral Communication, Listening. Communication with Confidence & Clarity- Interaction with people, the need the uses and the methods, Getting phonetically correct, using politically correct language, Debate & Extempore.	06
II	Assertive Communication- Concept of Assertive communication, Importance and applicability of Assertive communication, Assertive Words, being assertive. Presentation Skills- Discussing the basic concepts of presentation skills, Articulation Skills, IQ & GK, How to make effective presentations, body language & Dress code in presentation, media of presentation.	04
III	Team Work- Team Work and its important elements Clarifying the advantages and challenges of team work Understanding bargains in team building Defining behavior to sync with team work Stages of Team Building Features of successful teams. Body Language & Proxemics - Rapport Building -Gestures, postures, facial expression and body movements in different situations, Importance of <i>Proxemics</i> , <i>Right personal space to maintain with different people</i> .	06
IV	Motivation and Stress Management: Self-motivation, group motivation, leadership abilities, Stress clauses and stress busters to handle stress and de-stress; Understanding stress - Concept of sound body and mind, Dealing with anxiety, tension, and relaxation techniques. Individual Counseling & Guidance, Career Orientation. Balancing Personal & Professional Life	06
V	Professional Practice - Professional Dress Code, Time Sense, Respecting People & their Space, Relevant Behavior at different Hierarchical Levels. Positive Attitude, Self Analysis and Self Management. Professional Ethics - values to be practiced, standards and codes to be adopted as professional engineers in the society for various projects. Balancing Personal & Professional Life	06



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Note: The respective departments should discuss case studies and standards pertaining to their domain

Scheme of Continuous Internal Examination (CIE):

Evaluation will be carried out in TWO Phases.

Phase	Activity	Weightage
I	Test 1 is conducted in V Sem for 50 marks after completion of 2.5 units for 14 hours of training sessions.	50%
II	Test 2 is conducted in VSem for 50 marks after completion of half of III unit and complete of unit IV and V for 14 hours of training sessions.	50%
At the end of the Vsem Marks of Test 1 and Test 2 is consolidated for 50 marks and grading is done.		

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“The 7 Habits of Highly Effective People”	Stephen R Covey	Free Press, 2004 Edition, ISBN: 0743272455
2	“How to win friends and influence people”	Dale Carnegie	General Press, 1 st Edition, 2016, ISBN: 9789380914787
3	“Crucial Conversation: Tools for Talking When Stakes are High”	Kerry Patterson, Joseph Grenny, Ron Mcmillan	McGraw-Hill Publication, 2012 Edition, ISBN: 9780071772204
4	Aptimithra: Best Aptitude Book	Ethnus	Tata McGraw Hill, 2014 Edition, ISBN: 9781259058738



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



DEPARTMENT OF MECHANICAL ENGINEERING

PROPOSED CURRICULUM OF VI SEMESTER

2020-2021 BATCH

Sl. No	Sub. Code	Subject Title	L	T	P	C
1.	ME6TH1	DESIGN OF MACHINE ELEMENTS – 2	4	0	0	3
2.	ME6TH2	AUTOMOTIVE ENGINEERING	4	0	0	3
3.	ME6TH3	HEAT & MASS TRANSFER	4	0	0	3
4.	ME6PE4X	PROFESSIONAL ELECTIVE-II	3	0	0	3
5.	ME6OE5X	OPEN ELECTIVE -II	3	0	0	3
6.	ME6MP1	MINI PROJECT	0	0	6	3
7.	ME6LB1	HEAT & MASS TRANSFER LAB	0	0	3	1.5
8.	ME6LB2	COMPUTER AIDED ENGINEERING LAB	0	0	3	1.5
9.	SK6DP4	SKILL DEVELOPMENT-IV	-	-	2	1
Total			18	00	14	22

Professional Elective-II	
Sub. Code	Subject Title
ME6PE41	FINITE ELEMENT METHODS
ME6PE42	ROBOTICS & ARTIFICIAL INTELLIGENCE

Open Elective - II	
Sub. Code	Subject Title
ME6OE51	PRODUCT DESIGN & DEVELOPMENT
ME6OE52	ELEMENTS OF OPERATION RESEARCH
ME6OE53	BUSINESS PROCESS REENGINEERING
ME6OE54	MIS & E COMMERCE
ME6OE55	ORGANIZATIONAL BEHAVIOR



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: DESIGN OF MACHINE ELEMENTS – 2

Subject Code: ME6TH1

L-T-P-C: 4-0-0-3

Sl.No	Course Objectives
1	To understand and explain the terminology and concepts associated with bearings, flexible machine elements, mechanical transmission elements and power absorbing systems.
2	To select appropriate design parameters for functional design of the above machine components and mechanical systems
3	To evaluate the forces acting on the above elements during power transmission
4	To carry out complete functional design of the above machine components and systems

UNIT	DESCRIPTION	HOURS
I	Hydrodynamic and Hydrostatic Bearings:- Introduction, The Reynolds Equation, Thrust Slider, Journal Slider Bearings, Squeeze Film Bearings, Hydrostatic Bearings Rolling Element Bearings:- Introduction, Historic Overview, Bearing types-Ball bearings- Roller bearings. Static Load Distribution.	09
II	Spur Gear:- Introduction, Types of Gear, Gear Geometry, Gear Ratio, Contact ratio, Tooth thickness, backlash, interference, Gear Materials, Load acting on gear tooth, Bending stresses on gear tooth, gear design based on static beam strength, wear load considerations.	09
III	Helical, Bevel and Worm Gears:- Introduction, Helical gears- Helical gear relationships, Pitches of Helical gears, Equivalent Number of Teeth and Pressure Angle, Helical Tooth Proportions, Loads and Stresses, AGMA design. Bevel Gear- Types of Bevel gears, Bevel Gear Geometry and forces, ASME Design. Worm Gears:- Tooth Geometry, Forces on Worm Gears, ASME Equations. Helical, Worm & Bevel gear design based on static beam strength and wear load considerations.	09
IV	Springs:- Introduction, Spring Materials, Helical Compression Springs, Leaf Springs, Belleville springs. Flexible Machine Elements:- Introduction, Flat belts, Synchronous belts, V-belts, wire ropes, Rolling chains.	09
V	Brakes:- Introduction, Band brake, Block Brakes, internal expanding brake. Clutch:- Introduction, disk clutches, cone clutch. Centrifugal clutch	09



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Recognize and define the terminology involved in the design of m/c components like flexible m/c elements (springs, belts, chains, wire ropes etc.), transmission components like spur gear, helical gears, bevel gears, worm gears etc. & other miscellaneous components like power absorbing machines like clutches, brakes etc., bearings (journal bearing, antifriction bearings)
CO2	Understand and apply the concepts related to the working principles of flexible machine elements, transmission and miscellaneous components
CO3	Analyze and Evaluate the working of transmission gears, flexible drives and support systems, power absorbing machines.
CO4	Design the transmission system and support system required for the same

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Machine Design	V.B. Bhandary,	TATA Mc-Graw Hill Publication

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Machine Design	Sharma & Agarwal,	SK Kataria & Sons Publications, New Delhi.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: AUTOMOTIVE ENGINEERING

Subject Code: ME6TH2

L-T-P-C: 4-0-0-3

Sl.No	Course Objectives
1	To gain the knowledge of components of an IC engine, their basic working principle and the transmission of power from the engine to the driving wheels.
2	To know about the controlling of automobile such as brakes and steering.
3	The latest technology in the area of automotive engineering is also being focused to know about the latest vehicles.
4	Lastly an attempt is being made to know about the emission control techniques that can be used in the present IC engines.

UNIT	DESCRIPTION	HOURS
I	ENGINE COMPONENTS AND COOLING & LUBRICATION SYSTEMS: SI & CI engines, cylinder arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I. Engine and C.I. Engines, Compression ratio, methods of a Swirl generation, choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements.	09
II	FUELS, FUEL SUPPLY SYSTEMS FOR SI AND CI ENGINES: Conventional fuels, alternative fuels, thermodynamic cycles, normal and abnormal combustion, Cetane and octane numbers, Fuel mixture requirements for SI engines, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors. IGNITION SYSTEMS: Battery Ignition systems, magneto Ignition system, Transistor assist contacts. Electronic Ignition, Automatic Ignition advance systems.	09
III	POWER TRAINS: General arrangement of clutch, Principle of friction clutches, Fluid flywheel, Single plate, multiplate and centrifugal clutches. Gear box: Necessity for gear ratios in transmission, synchromesh gear boxes, 3, 4 and 5 speed gear boxes. Free-wheeling mechanism, Epicyclic gear box, over drives, torque converters, principle of automatic transmission. DRIVE TO WHEELS: Propeller shaft and universal joints, Hotchkiss and torque tube drives, differential, rear axle, steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, general arrangements of links and stub axle.	09



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



IV	SUSPENSION, SPRINGS AND BRAKES: Requirements, Torsion bar suspension systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel. Types of brakes, Disk brakes, drum brakes, Antilock Braking systems, purpose and operation of antilock braking system, ABS Hydraulic Unit, Rear-wheel antilock. AUTOMOTIVE EMISSION CONTROL SYSTEMS: Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas recirculation, Treating the exhaust gas, Air-injection system, Air-aspirator system.	09
V	ELECTRICAL VEHICLES: Configurations of EVs, Traction Motor Characteristics, Hybrid Electric Vehicles; Concept of Hybrid Electric Drive Trains, Architectures of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains (Electrical Coupling), Parallel Hybrid Electric Drive Trains (Mechanical Coupling), FUNDAMENTALS OF REGENERATIVE BRAKING: Braking Energy Consumed in Urban Driving, Braking Energy versus Vehicle Speed, Braking Energy versus Braking Power, Braking Power versus Vehicle Speed, Braking Energy versus Vehicle Deceleration Rate, Braking Energy on Front and Rear Axles.	09

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Define and explain the terminology associated with engine components and automotive systems.
CO2	Understand and explain the essential principles associated with automotive systems.
CO3	Analyze the various automotive systems.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Automobile Engineering,	Kirpal Singh.	Vol I and II 2002
2	Modern Electric, Hybrid Electric and Fuel Cell Vehicles.	Mehrdad Ehsani, Yimin Gao, Ali Emadi	CRC Press, Taylor and Francis Group, Second Edition



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Automotive mechanics: Principles and Practices,	Joseph Heitner, D Van	Nostrand Company, Inc
2	Automotive Mechanics	S.Srinivasan,	Tata McGraw Hill 2003.
3	Fundamentals of Automobile Engineering,	K.K.Ramalingam	Scitech Publications (India) Pvt. Ltd.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: HEAT AND MASS TRANSFER

Subject Code: ME6TH3

L-T-P-C: 4-0-0-3

Sl.No	Course Objectives	
1	To understand the fundamentals of heat transfer mechanisms in fluids and solids and their applications in various heat transfer equipment in process industries.	
2	To develop methodologies for solving a wide variety of practical engineering problems.	
UNIT	DESCRIPTION	HOURS
I	Introductory concepts and definitions: Modes of heat transfer, basic laws of governing conduction, convection and radiation heat transfer, Thermal conductivity, convective heat transfer coefficient, radiation heat transfer, combined heat transfer mechanism, boundary conditions of 1st, 2nd, 3rd kind Steady state Conduction Derivation of general three-dimensional conduction equation in Cartesian coordinate, special cases, Derivation for heat flow and temperature distribution for One dimensional conduction equation in rectangular, cylindrical and spherical coordinates for plane and composite walls. contact resistance theory between the two walls, Electrical resistance concept Numerical problems Critical thickness of insulation without heat generation,	09
II	Fins: Heat transfer in extended surfaces of uniform cross section without heat generation, very Long fin and short fin with insulated tip (derivation of short fin without insulated tip and fin between two heat source are EXCLUDED) & Fin efficiency and effectiveness.	09
III	Heat exchangers: classification of heat exchanger, overall heat transfer coefficient, fouling and fouling factor, LMTD, effectiveness NTU methods analysis of heat exchangers, Numerical Problems. Concepts and basic relations in boundary layers: Flow over a body, velocity boundary layer, critical Reynolds number, general expressions for drag coefficient and drag force, Thermal boundary layer, general expression for local heat transfer coefficient, average heat transfer coefficient, Nusselts number.	09



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



IV	Free convection Application of dimensional analysis for free convection-Physical significance of Grasshoff number, Prandtl, Nusselt numbers. Use of correlations free convection to vertical and horizontal plates, vertical & horizontal cylinders, (inclined plates, sphere and enclosed spaces EXCLUDED) Numerical Problems Forced natural convection: Application of dimensional analysis for forced convection, physical significance of Reynolds number, Flow inside a duct, velocity boundary layer, hydrodynamic entrance length and hydro dynamically developed flow, flow through tubes, Numerical Problems.	09
V	Radiation heat transfer: Thermal radiation, definitions of various terms used in radiation heat transfer, Stefan Boltzmann law, Kirchoff's Law, Planck's law and Wien's displacement law, Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces. Simple Numerical problems. Boiling and condensation: Regimes of boiling, Types of condensation, Nusselt theory for laminar condensation on vertical flat surface, simple numerical problems. Mass transfer modes of mass transfer, Fick's law of diffusion, steady state equimolar counter diffusion in gases. (No Numerical)	09

Question paper Pattern:

Two questions to be set from each unit and student must answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the basic laws of heat transfer. Analyze problems and develop solutions for steady state heat conduction in simple geometries.
CO2	Understand the fundamentals of convective heat transfer process. Evaluate heat transfer coefficients for natural convection and forced convection inside ducts.
CO3	Analyze heat exchanger performance by using the method of log mean temperature difference and effectiveness.
CO4	Analyze radiation heat transfer between black body surfaces and gray body surfaces.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Heat and Mass Transfer- A basic Approach,	Ozisik,	Tata Mc Graw Hill-2002

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Heat Transfer, A practical approach,	Yunus and Cengel	Tata Mc Graw Hill
2	Heat and Mass Transfer,	P.K Nag,	3 rd edition Tata Mc Graw Hill.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: FINITE ELEMENT METHODS

Subject Code: ME6PE41

L-T-P-C: 3-0-0-3

Sl.No	Course Objectives
1	To learn the basic principles of finite element procedures to solve problems.
2	To understand different boundary condition methods used in FEM to find the approximate solutions.
3	To determine various solutions like stress, strains, deflections, temperatures, heat fluxes etc for a structural and thermal problem.
4	To Analyze the given Structural & thermal problems by finite element methods to validate the designs.

UNIT	DESCRIPTION	HOURS
I	Introduction: Basic steps in FEM, Boundary value Problems, Applications Basics of theory of elasticity- Stresses and equilibrium, boundary conditions, strain displacement relations, stress- strain relations, potential energy and equilibrium. Determination of approximate solutions using Rayleigh method (few examples on rods and Beams.)	08
II	One Dimensional Finite element analysis: Finite element modeling, Numbering scheme, coordinate system, shape functions, Element stiffness matrix & load vector, Finite element equations- Elimination approach	08
III	One Dimensional Finite element analysis using penalty approach, Temperature effects-Thermal Expansions(only) of 1D bar elements, Quadratic shape functions (both Potential Energy and Lagrangian method)	08
IV	Trusses: Plane trusses, local & global coordinate systems, element stiffness matrix, stress calculations. Beams: Shape function, Derivation of stiffness matrix & load vectors simple problems.	08
V	1-D Steady state heat conduction: Governing equation, boundary conditions, 1-D element, for heat conduction & Convection, 1-D heat transfer in fin & Problems, Problems on composite walls and Heat generating Plates. Convergence criteria, Pascal triangle, Patch Test.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	To equip the students with the Finite Element Analysis fundamentals, Background & Importance.
CO2	Analyze a physical problem; develop experimental procedures for accurately investigating the problem.
CO3	To enable the students to formulate the design and Thermal problems into FEA
CO4	To develop proficiency in the application of the finite element method (modelling, analysis, and interpretation of results) to realistic engineering problems

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Finite Element Methods	Dr. Babu E R Dr. Nagaraja C Reddy	Sunstar Publisher
2	Finite Element Methods	S B Halesh	Sapna Publications

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to Finite Elements in Engineering	T.R. Chandrupatala	Pearson, 4 th Edition, 2015
2	Finite Element Method	J N Reddy	McGraw Hill International Edition
3	Fundamentals of Finite Elements Methods	Dr. S M Murigendrappa	2 nd Edition, Interline Publishing, 2009



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: ROBOTICS AND ARTIFICIAL INTELLIGENCE

Subject Code: ME6PE42

L-T-P-C: 3-0-0-3

Sl.No	Course Objectives
1	The primary objective of this course is to provide an introduction to the basic principles, techniques, and applications of Artificial Intelligence
2	The emphasis of the course is on teaching the fundamentals and not on providing a mastery of specific commercially available software tools or programming environments.
3	Understanding of the basic areas of artificial intelligence search, knowledge representation, learning and their applications in design and implementation of intelligent agents for a variety of tasks in analysis, design, and problem-solving.
4	To address the underlying concepts, methods and application of different Artificial Intelligence and Robotics.

UNIT	DESCRIPTION	HOURS
I	Industrial Robotics: Robotic configuration, robot anatomy and related attributes, robot control systems, end effectors, sensors in robotics, industrial robot applications, robot accuracy and repeatability, different types of robotics, various generations of robots, degrees of freedom – Asimov's laws of robotics dynamic stabilization of robots.	08
II	Spatial descriptions and transformations: Positions, orientations, and frames. Mappings: Changing descriptions from frame to frame. Operators: translations, rotations and transformations, transformation arithmetic transform equations, transformation of free vectors computational considerations, manipulator Kinematics, link description, link-connection description, actuator space joint space and Cartesian space	08
III	Robot programming: Introduction, levels of robot programming, requirements of robot programming language, problems pertaining to robot programming languages, offline programming systems, central issues in OLP systems, automating subtasks in OLP systems, simple programs on robot applications	08
IV	ARTIFICIAL INTELLIGENCE: Introduction, definition, underlying assumption, importance of AI, AI and related fields.	08
V	SPACE REPRESENTATION: Defining a problem. Production systems and its characteristics, Search and Control strategies –	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



	Generate and Test, Hill Climbing, Best – first Search, Problem reduction, Constraint Satisfaction, Means – Ends Analysis.	

Question paper Pattern:

Two questions to be set from each unit and student must answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Explain the fundamentals of robotics and its components
CO2	Illustrate the movement of robotic joints with computers/microcontrollers.
CO3	Identify different areas of Artificial Intelligence and Robotics
CO4	Find the applications of all the areas in industry.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Industrial Robotics-	Groover, Weiss, Nagel,	McGraw Hill International, 2nd edition, 2012
2	Introduction to AI & ES	Dan W. Patterson,	Prentice Hall of India, 1999.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Principles of Artificial Intelligence	Nils J. Nilsson	Morgan Kaufmann Publishers In; Reprint edition (1 January 1993)
2	Robotics for Engineers	YoramKoren,	McGraw Hill International, 1st edition, 1985.
3	A guide to expert systems	Waterman, D.A., Addison	Wesley inc. 1986



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: PRODUCT DESIGN AND DEVELOPMENT

Subject Code: ME6OE51

L-T-P-C: 3-0-0-3

Sl.No	Course Objectives
1	Competence with a set of tools and methods for product design and development.
2	Confidence in your own abilities to create a new product.
3	Awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).
4	Ability to coordinate multiple, interdisciplinary tasks in order to achieve a common objective and enhance team-working skills.

UNIT	DESCRIPTION	HOURS
I	Introduction: Characteristics of successful product development, Design and development of products, duration and cost of product development, the challenges of product development. Development Processes and Organizations, the front-end process, adopting the generic product development process, the AMF development process, product development organizations, the AMF organization.	08
II	Product Planning: The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect all the results and the process. Identifying Customer Needs: Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process.	08
III	Product Specifications: What are specifications, when are specifications established, establishing target specifications, setting the final specifications. Concept Generation: The activity of concept generation, clarifies the problem, search externally, search internally, explore systematically, and reflect on the results and the process. Concept Selection, Overview of methodology, concept screening, and concept scoring,	08
IV	Concept Testing: Define the purpose of concept test, choose a survey population, choose a survey format, communicate the concept, measure customer response, interpret the result, reflect on the results and the process. Industrial Design: Assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



	process and assessing the quality of industrial design	
V	Design for Manufacturing: Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors. Prototyping, Prototyping basics, principles of prototyping, technologies, planning for prototypes.	08

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the product design and development process.
CO2	Apply creative thinking skills for idea generation.
CO3	Translate conceptual ideas into products.
CO4	Present ideas using various types of model.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Product Design and Development	Karl.T.Ulrich, Steven D Eppinger - Irwin	McGrawHill – 2012, Fifth Edition.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Product Design and Manufacturing	A C Chitale and R C Gupta	PH1, - 3rd Edition, 2003.
2	New Product Development -	Timjones Butterworth Heinmann	Oxford. UCI -1997
3	Product Design for Manufacture and Assembly	Geoffery Boothroyd,	Peter Dewhurst and Winston Knight – 2002



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: ELEMENTS OF OPERATIONS RESEARCH

Subject Code: ME6OE52

L-T-P-C: 3-0-0-3

Sl.No	Course Objectives
1	To equip the students with the knowledge based on OR models for problem solving and decision making situations in organizations.
2	To develop mathematical model for interactive decision making situations, where competitors are involved under conditions of conflict.
3	To design & develop OR models for real life situations.
4	To construct the Network activities in an efficient manner

UNIT	DESCRIPTION	HOURS
I	Introduction: Definition & Methodology of OR, Historical development, Phases of OR study, Models of OR, Application to Engineering & Managerial problems, Features and Limitation of OR. Linear programming: Definition, mathematical formulation, standard form, Solution space, Types of solution – feasible, basic feasible, optimal, infeasible, multiple, Redundancy, Degeneracy, Graphical method.	08
II	Simplex Method: Variants of simplex algorithm – Artificial basis techniques, Big-M method.	08
III	Transportation problem: Formulation of transportation model, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel's Approximation Method) Optimality Methods. Unbalanced transportation problem, Applications of Transportation problems.	08
IV	Assignment problem: Formulation of the Assignment problem, unbalanced assignment problem, Variants in assignment problem, Traveling salesman problems. Game theory, Formulations of games, Strategies, Two-person-zero sum game, games with and without saddle point, Dominance property, Graphical solutions (2 x n, m x 2 games)	08
V	Project management using network analysis: Network construction, Rules for drawing network, common errors, CPM, Determination of critical path and duration, Floats. Project Evaluation & Review Technique- Estimation of probability of project duration, variance, Optimum duration and cost of Project.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the various optimization models and their areas of application
CO2	Understand the mathematical tools that are needed to solve optimization problems
CO3	Explain the process of formulating & solving problems using OR methods
CO4	Develop & analyse the models for real life problems using OR techniques

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Operation Research an introduction	Taha H A	PHI 8 th Edition, 2009, ISBN: 0130488089.
2	Introduction to Operation Research	Hiller and Libermann, Nag, Basu	Tata McGraw Hill 9 th edn, 2012

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Operations Research	Kanthi Swarup & others	Sultan chand and Sons. 2002
2	Operations Research	S.D. Sharma	Kedarnath, Ramnath &Co, 1996
3	Operations Research Theory and Application-	J K Sharma	Pearson Education Pvt Ltd ,4 th Edn, 2009
4	Principles of Operations Research	Philips, Ravindram and Soleberg	PHI, 2 nd Edition, 2007



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: BUSINESS PROCESS RE-ENGINEERING

Subject Code: ME6OE53

L-T-P-C: 3-0-0-3

Sl.No	Course Objectives
1	To understand concepts and philosophy of Business process Reengineering.
2	To learn various BRP and alternate methodologies- TQM, workstudy, ISO standards practiced in the industry.
3	To understand and analyse the role of information technology and change management in the implementation of BPR
4	To expose practically BPR implementation and best practices.

UNIT	DESCRIPTION	HOURS
I	Introduction to Business processes: Definition of business processes – definition of business process redesign - Historical background: Nature, significance and rationale of business process reengineering (BPR), Fundamentals of BPR. Conceptual Foundation of Business Process Re-engineering	08
II	BPR Implementation Methodology: Reasons for implementation of BPR, Attributes of BPR, BPR team, characteristics, Key concepts of BPR, BPR methodology. Phases of BPR, BPR Model, BPR Methodology selection guidelines ,Implementation	08
III	Success factors of BPR: Top management sponsorship, Executive leadership, strategic alignment, proven methodology, change management, line & process ownership, success factors of BPR, critical success factors, reasons for failure, managing barriers to BPR success	08
IV	BPR and technologies: Reengineering Vs. other programmers, difference between BPR and process simplification, difference between BPR and continuous improvement, difference between BPR and TQM	08
V	BPR in manufacturing and Information Technology: Introduction, Enablers of BPR in manufacturing, product design and development, Relationship between BPR and information technology, role of information technology in reengineering, role of IT in BPR, criticality of IT in business process, BPR tools and techniques, enablers of process reengineering, tools to support BPR.	08



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Explain the business process re-engineering concept and principles and also its roles (Level-2).
CO2	Apply the BPR methodologies in Business processes (Level-3).
CO3	Analyze the existing process and also re-organize the process (Level-3).
CO4	Differentiate the TQM, continuous improvement summarize and process simplification with reference to BPR. Explain the role of enablers of BPR in manufacturing and service industries (Level-2)

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Business Process Reengineering: Text and cases	R Radhakrishnan& S. Balasubramanian	Easter Economy Edition, PHI Learning, 1st Edition, 2008.
2	Business Process Reengineering & Change management	B.R.Dev	Dream tech Press, 1st Edition, 2004, ISBN: 8177225367.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Re-engineering, Re-engineering: Blueprint for the Future		International Engineering Consortium, 1995.
2	Automating Business Process Re-Engineering	G. Hansen	Prentice-Hall, 2nd Edition, 1997.
3	Business Process Analysis	G. Darnton and M. Darnton	Thomson Learning, Boston, MA, 1997. ISBN: 1861520395.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: MIS & E-COMMERCE

Subject Code: ME6OE54

L-T-P-C: 3-0-0-3

Sl.No	Course Objectives
1	To understand basic concepts and resources of information systems(IS)
2	To describe the development of an IS
3	To understand need for an IS and its applications
4	To understand advances in MIS

UNIT	DESCRIPTION	HOURS
I	Foundation concepts : Foundation of Information systems in Business- Information system and technologies, Business Applications, Developments and Management, Competing with Information Technology Fundamentals of Strategic Advantage, Using information Technology for Strategic advantage.	08
II	Review of Information Technologies: Computer Hardware-Computer Systems, end user and Enterprise computing, Computer Peripherals, Input, Output and storage technologies , computer software , Application Software, End user Application, System software, Computer System Management.	08
III	Data Resource Management: Managing Data Resources, Technical foundations of Database Management, Telecommunications and Networks Overview of Telecommunications & Networks, Technical Telecommunications alternatives. Business Applications : The internet worked E-business Enterprise-The internet, Intranets and Extranets in Business, Enterprise communication and Collaboration, Electronic Business Systems, Cross Functional E-Business Systems, Functional E-business systems.	08
IV	Electronic Commerce: Fundamentals, E-Commerce Applications and Issues, Decision support System in E-Business, Artificial Intelligence Technologies in Business	08
V	Management Challenges: Security, Ethical, Societal, health Challenges of E- Business , Security Management of E-Business Enterprises, Global and political challenges of E-Business	08

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	Students are capable of developing information systems for business
CO2	Students will come to know the importance of MIS in an organization.
CO3	Students will be aware of computer based MIS in an organization.
CO4	Able to manage the challenges in global situations

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Management Information Systems: Managing Information Technology in the Internet Worked Enterprise	James A. O'Brien	Tata McGraw Hill Publishing Company Ltd. 2002, 5th Edition, ISBN 0-07-048637-9.
2	Management Information Systems	W.S. Jawadekar,	Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1998.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Management Information System	Laudon and Laudon	PHI, 1998, Ed., ISBN 81-203-1282-1
2	Management Information Systems	S. Sadagopan	Prentice Hall of India, 1998, Ed. ISBN 81-203-1180-9
3	Information Systems for Modern Management	G.R. Murdick	PHI, 2nd edition 2002.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: ORGANIZATIONAL BEHAVIOUR

Subject Code: ME6OE55

L-T-P-C: 3-0-0-3

Sl.No	Course Objectives
1	To understand the nature of human behavior in corporate and other organizations
2	To learn about the concepts of different styles of motivation, company leadership, power and authority
3	To know about the strategies of organization, organization design and structure and to measure organization effectiveness.
4	To learn and adopt team work and collaboration

UNIT	DESCRIPTION	HOURS
I	Introduction: Definition of Organization, Behavior and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems. The Individual: Foundation of individual behaviour, Ability.	08
II	Learning: Definition, Theories of Learning, Individual Decision Making, classical conditioning, operant conditioning, social Making, learning theory, Continuous and intermittent reinforcement. Perception: Definition, Factors influencing perception, Attribution theory, Selective perception, Projection, Stereotyping, Halo effect	08
III	Values and Attitudes: Definitions values, Attitudes: Types of values, job satisfaction, job involvement, professional Ethics, Organizational commitment, cognitive dissonance. Conflict Management: Definition of conflict, functional and dysfunctional conflict, stages of conflict process	08
IV	Leadership: Definition, Behavioural theories Blake and Mouton managerial grid, Contingency theories Hersey - Blanchard's situational theory, Leadership styles characteristics, Transactional, transformation leaders	08
V	Motivation: Maslow's Hierarchy of Needs, Mc. Gregor's theory X and Y, Herzberg's motivation Hygiene theory, David Mc Clelland three needs theory, Victor vroom's expectancy theory of motivation. Work stress: Meaning and definition, Relationship between stressors and stress, Work stress model, Type A personality, Type B personality, Group level stressors, organizational stressors and extra organizational stressors	08

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Course Outcomes:

Course outcome	Descriptions
CO1	Manage the art of getting work in the corporate and other organization.
CO2	Identify the different motivational factors and leadership styles which can be applied to reach the organization's goal
CO3	Analyse the importance of team work and team building strategies.
CO4	Structure and hierarchy of the organization.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Organizational Behaviour	Stephen P Robbins	9th Education Publications, ISBN 817808561- 5th Edn
2	Organizational Behaviour	Fred Luthans	9 th International Edition, ISBN 007 204121

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Organizational Behavior	Ashwathappa	Himalaya Publishers. 2001
2	Organizational Behaviour	VSP Rao	Konark Publishers 2002
3	Management of Organizational Behaviour	Paul Henry and Kenneth H. Blanchard	Prentice Hall of India, 1996



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: MINI PROJECT-II

Subject Code: ME6MP1

L-T-P-C: 0-0-6-3

- Students are encouraged to make a study of mini projects and fabricate them with minimum cost
- Using locally available materials for the purpose of demonstration of the concepts involved.
- Mini projects could be selected to be from purely mechanical engineering or interdisciplinary based on electromechanical, microprocessor based prototype models etc.
- Option is also available for taking up small reconditioning projects pertaining to any of the laboratories of the department (typically adaptive design or development design projects)



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: HEAT AND MASS TRANSFER LAB

Subject Code: ME6LB1

L-T-P-C: 0-0-3-1.5

Sl.No	Course Objectives
1	To provide students with the necessary skills to conduct experiments on conduction and convection of heat; collect data, perform analysis and interpret results to draw valid conclusions through standard test procedures
2	To determine thermal properties and performance of radiation heat transfer, heat exchanger, vapour compression refrigerator

UNIT	DESCRIPTION
Part A	1. Determination of Thermal conductivity of insulating powder. 2. Determination of Thermal conductivity of Metal Rod. 3. Determination of Thermal conductivity of Composite wall. 4. Determination of Thermal conductivity of Liquid & gases. 5. Determination of Efficiency of Pin-fin in natural & forced convection. 6. Determination of emissivity of test surface. 7. Determination of Stefan Boltzmann constant.
Part B	1. Determination of effectiveness of parallel flow and counter flow heat exchanger. 2. Determination of heat transfer co efficient in natural convection. 3. Determination of heat transfer co efficient in forced convection. 4. Determination of COP of vapour compression refrigerator

Scheme for Examination:

One Question from part A	- 15 Marks	(05-write up, 10-calculations & graph)
One Question from part B	- 25 Marks	(05-write up, 10-calculations & graph)
Viva-Voce	- 10 Marks	
Total	- 50 Marks	

Course Outcomes:

Course outcome	Descriptions
CO1	Identify and select the equipment to conduct the experiments related to heat and mass transfer lab.
CO2	Demonstrate the procedure for conduction of experiments.
CO3	Apply the techniques for data collection.
CO4	Analyze the data collected and interpret the results.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: MECHANICAL ENGINEERING

Semester: VI

Subject Name: COMPUTER AIDED ENGINEERING LAB

Subject Code: ME6LB2

L-T-P-C: 0-0-3-1.5

Sl.No	Course Objectives
1	Learn skills for working with finite element analysis packages like ALGOR-NASTRAN for analysis of stresses and deflections of loaded machine components and mechanical systems.
2	Learn skills for working with CAM packages like Edge-CAM and demonstrate virtual simulation of the computer aided manufacturing process.

UNIT	DESCRIPTION
Part A	COMPUTER AIDED DESIGN: Analysis of simple machine Components, Beams, Plates, Truss structure, Stress Concentration, and Thermal Stress Analysis using ALGOR NASTRAN package.
Part B	COMPUTER AIDED MANUFACTURING: 1. Modeling of simple Machine parts & generating machine codes for CNC Production using Edge-CAM package. 2. Simulation of tool path during cutting/milling operations on a computer using CAM packages.
Part C	PART PROGRAMMING: Writing Manual part programming using ISO codes for machining Simple Machine parts, Use of tool Radius compensation, canned cycles, macros Etc. and simulation of Tool Path.

Scheme for Examination:

One Question from Part A or Part B	- 25 Marks
One Question from Part C	- 15 Marks
Viva-Voce	- 10 Marks
Total	- 50 Marks

Course Outcomes

Course outcome	Descriptions
CO1	Demonstrate a knowledge and understanding of the preprocessor features of the FEA software like ALGOR & CAM software like Edgcam
CO2	Demonstrate a knowledge and understanding of the solver & post processor (NASTRAN) & Edgcam and accurately interpret the results obtained.
CO3	Demonstrate a knowledge and understanding of programming codes for part programs for simulation of tool path during machining operations on a CNC lathe and milling machine.



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Department: TRAINING & PLACEMENT DEPARTMENT

Semester: VI

Subject Name: SKILL DEVELOPMENT IV (Employability skills and professional development of engineers)

Subject Code: SK6DP4

L-T-P-C: 0-0-2-1

Sl.No	Course Objectives
1	Improve qualitative and quantitative problem solving skills
2	Apply critical and logical thinking process to specific problems

UNIT	DESCRIPTION	HOURS
I	Aptitude Test Preparation- Importance of Aptitude tests, Key Components, Quantitative Aptitude – Problem Solving, Data Sufficiency, Data Analysis - Number Systems, Math Vocabulary, fraction decimals, digit places etc. Reasoning and Logical Aptitude - Introduction to puzzle and games organizing information, parts of an argument, common flaws, arguments and assumptions. Analytical Reasoning, Critical Reasoning,	06
II	Verbal Analogies - What are Analogies, How to Solve Verbal Analogies & developing Higher Vocabulary, Grammar, Comprehension and Application, Written Ability. Non- Verbal Reasoning, Brain Teasers. Creativity Aptitude. Group Discussion- Theory &Evaluation : Understanding why and how is the group discussion conducted, The techniques of group discussion, Discuss the FAQs of group discussion, body language during GD	06
III	Resume Writing- Writing Resume, how to write effective resume, Understanding the basic essentials for a resume, Resume writing tips Guidelines for better presentation of facts. Technical Documentation – Introduction to technical writing- Emphasis on language difference between general and technical writing, Contents in a technical document, Report design overview & format Headings, list & special notes, Writing processes, Translating technical information, Power revision techniques, Patterns & elements of sentences, Common grammar, usage & punctuation problems.	06
IV	Interview Skills - a) Personal Interviews , b) Group Interviews , c) Mock Interviews - Questions asked & how to handle them, Body language in interview, Etiquette, Dress code in interview, Behavioral and technical interviews, Mock interviews - Mock interviews with different Panels. Practice on stress interviews, technical interviews, General HR interviews etc	06
V	Interpersonal Relations - Optimal Co-existence, Cultural Sensitivity, Gender sensitivity Adapting to the Corporate Culture- Capability & Maturity Model, Decision Making Analysis, Brain Storm. Adapting to the Corporate Culture	06



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)



Note: The respective departments should discuss case studies and standards pertaining to their domain

Question paper Pattern:

Two questions to be set from each unit and student have to answer any one question from each unit. Totally 5Q need to be answered by the students.

Course Outcomes:

Course outcome	Descriptions
CO1	Develop professional skill to suit the industry requirement
CO2	Analyze problems using quantitative and reasoning skills
CO3	Develop leadership and interpersonal working skills
CO4	Demonstrate verbal communication skills with appropriate body language.

Scheme of Continuous Internal Examination (CIE)

Evaluation will be carried out in TWO Phases.

Phase	Activity	Weightage
I	Test 1 is conducted in VI Sem for 50 marks after completion of 2.5 units for 14 hours of training sessions.	50%
II	Test 2 is conducted in VI Sem for 50 marks after completion of half of III unit and complete of unit IV and V for 14 hours of training sessions.	50%
At the end of the VI sem Marks of Test 1 and Test 2 is consolidated for 50 marks and grading is done.		

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	The 7 Habits of Highly Effective People	Stephen R Covey	Free Press, 2004 Edition, ISBN: 0743272455
2	“How to win friends and influence people”	Dale Carnegie	General Press, 1st Edition, 2016, ISBN: 9789380914787
3	“Crucial Conversation: Tools for Talking When Stakes are High”	Kerry Patterson, Joseph Grenny, Ron Mcmillan	McGraw-Hill Publication, 2012 Edition, ISBN: 9780071772204
4	“Aptimithra: Best Aptitude Book”	Ethnus	Tata McGraw Hill, 2014 Edition, ISBN: 9781259058738



SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)





**SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY-
TUMAKURU**
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION FOR BE DEGREE COURSE



**Department of Medical Electronics
V SEMESTER B.E.**

		(Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)						Examination			
SI No .	Course and Course Code		Course Title	Teaching dept.	Board of Exam.	L-T-P	Credits	CIE	SEE	Total Marks	Exam Hrs.
01	PC	ML5TH1	Patient Monitoring Systems	ML	ML	3-0-0	3	50	50	100	3
02	PC	ML5TH2	Digital Signal Processing	ML	ML	3-0-0	3	50	50	100	3
03	PC	ML5TH3	Bio-optics	ML	ML	3-0-0	3	50	50	100	3
04	PC	ML5TH4	Digital Image Processing	ML	ML	3-0-0	3	50	50	100	3
05	PE	ML5PE5x	Professional Elective-I	ML	ML	3-0-0	3	50	50	100	3
06	OE	ML5OE6x	Open Elective-I	ML	ML	3-0-0	3	50	50	100	3
07	PC	ML5MP1	Mini Project-I	ML	ML	0-0-4	2	50	50	100	3
08	PC	ML5LB1	Python Lab	ML	ML	1-0-2	1.5	50	50	100	3
09	PC	ML5LB2	Digital Signal Processing Lab	ML	ML	0-0-3	1.5	50	50	100	3
10	HS	SK5DP3	Skill Development-III	HS	HS	1-0-0	1	50	-	50	-
Total							24	500	450	950	
CIE-Continuous Internal Evaluation, SEE-Semester End Examination											

Note: There is no SEE for Skill Development-III course.

However, all the students should maintain a minimum 85 % of attendance and 40 % of CIE to get pass in the subject.

Professional Elective I:	Open Elective I:
ML5PE51: Medical Physics ML5PE52: Embedded System Design and ARM Processor ML5PE53: Biostatistics	ML5OE61: Biomedical Instrumentation



**SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY-
TUMAKURU**
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION FOR BE DEGREE COURSE



**Department of Medical Electronics
VI SEMESTER B.E.**

		(Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)						Examination			
<i>SI No</i>	<i>Course and Course Code</i>		<i>Course Title</i>	<i>Teaching dept.</i>	<i>Board of Exam.</i>	<i>L-T-P</i>	<i>Credits</i>	<i>CIE</i>	<i>SEE</i>	<i>Total Marks</i>	<i>Exam Hrs.</i>
01	PC	ML6TH1	Principles of Medical Imaging Modalities	ML	ML	3-0-0	3	50	50	100	3
02	PC	ML6TH2	Medical Image Analysis	ML	ML	3-0-0	3	50	50	100	3
03	PC	ML6TH3	Medical Device Regulations and IPR	ML	ML	3-0-0	3	50	50	100	3
04	PE	ML6PE4x	Professional Elective-II	ML	ML	3-0-0	3	50	50	100	3
05	OE	ML6OE5x	Open Elective-II	ML	ML	3-0-0	3	50	50	100	3
06	PC	ML6MP1	Mini Project-II	ML	ML	0-0-6	3	50	50	100	3
07	PC	ML6LB1	Medical Image Analysis Lab	ML	ML	0-0-3	1.5	50	50	100	3
08	PC	ML6LB2	Advance Biomedical Instrumentation Lab	ML	ML	0-0-3	1.5	50	50	100	3
09	HS	SKDP61	Skill Development-IV	HS	HS	0-0-3	1	50	-	50	-
Total							22	450	400	850	
CIE-Continuous Internal Evaluation, SEE-Semester End Examination											

There is no SEE for Skill Development-IV course.

However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.

Professional Elective II:	Open Elective II:
ML6PE41: Sensors and Transducers ML6PE42: Pattern Recognition in Medicine ML6PE43: Brain Computer Interface	ML6OE51: Image Processing



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Patient Monitoring System

Semester: V

Subject Code: ML5TH1

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To have a quantitative assessment of the important physiological variables of the patients during critical periods of their biological functions.
2.	To understand diagnostic and research requirements.
3.	To be acquainted with the necessity of various critical bedside monitoring systems.
4.	To identify the trends and prospects in the area of PMS.

Unit	Course content	Teaching hrs
Unit I	Patient Monitoring system: System concepts, measurements of heart rate, blood pressure measurements, measurement of temperature, measurement of respiratory rate, apnoea detectors. Arrhythmia and ambulatory monitoring systems: cardiac arrhythmia, ambulatory- monitoring instruments.	08
Unit II	Foetal monitoring instruments: Cardiotachograph, methods of monitoring Foetal heart rate, foetal heart rate measurement, monitoring labour activity, continuous monitoring foetal scalp pH, use of computers for data processing. Blood flow meters: Electromagnetic blood flow meter, ultrasonic blood flow meter, NMR blood flow meter, laser Doppler flowmetry.	08
Unit III	Cardiac output measurements: Indicator dilution method, impedance method, measurement of continuous cardiac output. Pulmonary function analyzers: Pulmonary function measurement, spirometry, pulmonary function analyzers, respiratory gas analyzers.	08
Unit IV	Blood gas Analyzers: Blood pH measurement, measurement of blood pCO ₂ , blood pO ₂ measurement, a complete blood gas analysers.	07
Unit V	Audiometers: Basic Audiometers, pure tone audiometer, speech audiometer, Bekasy audiometer system, Evoked response audiometry system.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	The learners will be in a condition to measure the basic physiological parameters of human body and to display in a meaningful way to the external world, also to analyze and compare the safe range of these parameters like heart rate, temperature, pulse, etc.....
CO2	It is able to design suitable instrument using sensors and transducers to measure accurate fetal heart rate, labor activity, pH etc..... and to give out automatic readouts memory facilities.
CO3	Comfortable to use and apply the techniques of electromagnetic principles for blood flow meters.
CO4	To design basic audiometers like pure tone audiometer, speech audiometer and to draw the audiogram of a person's hearing level and to calibrate the quality of hearing.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Hand Book of Biomedical Instrumentation	R.S.Khandpur	McGraw Hill, 2014, 3 rd edition
2	Biomedical Instrumentation Measurements,	Cromwell Et, AI	2e, PHI/Pearson Education

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Patient-Monitoring Systems	Reed M. Gardner And	Springer Publications
2	Computer-based patient monitoring systems.	Arthur D Little	University of Michigan Library
3	Patient Monitoring Systems.	Richa Guptha	Lambert Publications.
4	IP Based Patient Monitoring Systems	Syed Mohammed Yasir Jafri	Lambert Publications.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Digital Signal Processing

Semester: V

Subject Code: ML5TH2

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To study about discrete Fourier transform and to learn about FFT algorithms.
2.	To study the design techniques and realization methods for FIR and IIR digital filters
3.	To study the applications of DSP

Unit	Course content	hrs
Unit I	Introduction to Digital Signal Processing: Basic elements of Digital Signal Processing system, advantages of digital over analog signal processing, Applications of DSP. Discrete Fourier transform: Introduction, Fourier representations of finite-duration sequences, properties of DFT, Linear convolution using DFT, computation of Circular convolution and correlation.	08
Unit II	Computation of DFT: Filtering of long sequences: Overlap-Save and Overlap-add method, Decimation-in-time and decimation-in-frequency radix-2 FFT, Linear filtering approach to computation of the DFT.	08
Unit III	Filter design techniques: Ideal filter characteristics, low-pass, high-pass and band-pass filters; digital resonators, notch filters. Design of FIR filters: Issues in filter design, importance of linear phase, frequency response of linear phase FIR filters, locations of zeros of FIR filters, Design techniques of FIR filters, windowing, frequency sampling method, design of Hilbert transformer.	08
Unit IV	Design of IIR filters: Analog filter design- Butterworth and Chebyshev filter, frequency transformations in analog domain, Elementary properties of IIR filters, Design of digital filters from analog filters, impulse invariant transformation and bilinear transformation methods, comparison of FIR and IIR filters.	08
Unit V	Implementation of discrete-time systems: Basic structures for FIR systems: Direct, Cascade, Linear Phase and frequency sampling structures. Structures for IIR systems: Direct, Cascade and Parallel structures. Applications: Dual Tone Multi Frequency signal detection, Spectral analysis using DFT, Musical sound processing.	07



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Incorporate the knowledge about signals and systems and hence appreciate the methods involved to realize discrete Fourier transforms Discrete Fourier Transforms and hence appreciate the efficient methods involved to solve engineering problems
CO2	Recognize the importance of techniques to solve discrete Fourier transforms faster using FFT
CO3	Comprehend and interpret the various techniques involved in the design and implementation of IIR and FIR filters
CO4	Realize various types of IIR and FIR filters using various approaches

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Signal Processing: Principles, Algorithms and Applications	J.G. Proakis and D. G.Manolakis.	Fourth Edition ,2006, PHI
2	Digital Signal Processing: A computer-Based Approach	S. K. Mitra	2nd Edition, 2001, TMH.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Fundamentals of Digital Signal Processing,	John Wiley &sons. Lonnie C. Ludeman	2 nd Edition, 1991,
2	Digital Signal Processing	Hussain, Zahir M., Sadik, AminZ., O'Shea, Peter	Springer publications. 2011
4	Digital Signal Processing	<u>Nagoor Kani</u>	Tata McGraw Hill Publications



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Bio-optics

Semester: V

Subject Code: ML5TH3

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To expose the students to the basic concepts of optical fibers and their properties
2.	To provide adequate knowledge about the Industrial applications of optical fibers
3.	To expose the students to the Laser fundamentals
4.	To provide adequate knowledge about Medical applications of lasers.

Unit	Course content	Teaching hrs
Unit I	Optical Fibers: Introduction, electromagnetic spectrum, fiber optic transmission link, nature of light, basic optical laws with definitions, quantum nature of light, optical fiber modes, ray optics representation, optical couplers, fiber joints, fiber splices, fiber connectors.	08
Unit II	Fiber Structures and Fabrication: optical fibers- fundamentals, light transmission in optical fibers-principles, types of fabrication methods, power transmission through optical fibers, fiber ends and tips, attenuation.	08
Unit III	Lasers: Historical background. Medical Lasers: Introduction, Laser physics-fundamentals, principles, Medical Lasers-fundamentals, principles(co2, Nd-YAG, helium, eximer, dye - lasers), advances(semiconductor laser, free electron laser). Medical Laser Systems-fundamentals, principles. Laser safety-fundamentals.	08
Unit IV	Applications of Lasers in Therapy & Diagnosis: Introduction, laser assisted diagnosis and therapy-fundamentals, interaction of laser beams and materials-principles, laser interaction with tissue-principles, laser assisted diagnostics-principles, applications of lasers in diagnosis and imaging-advances, Laser surgery and therapy- principles: photo thermal, photo mechanical mechanism, thermal interaction between laser and tissue.	07
Unit V	Clinical Applications of Lasers: Fiber optic laser systems in gastroenterology, general surgery and thoracic surgery, gynecology, neurosurgery, oncology, ophthalmology, orthopedics, urology, flow diagram for laser angioplasty, flow diagram for photo dynamic therapy.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Understand the basics of optical fibers, fiber joints & fiber couplers.
CO2	Comprehend fiber structure & different fabrication technology.
CO3	Realize different types of laser and its applications.
CO4	Gain the knowledge about application of laser technology in clinical field.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Lasers and Optical fibers in Medicine	Abraham Katzir	Academic Press
2	Optical Fiber Communication	Gred Keiser	McGraw-Hill Education (India) Pvt Limited

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Optical Fiber Communication	<u>P Chakrabarti</u>	McGraw-Hill Education (India) Pvt Limited
2	Optical Fiber Communication	Sr. Kakani and Shubhadra Kakani	CBS Publications and Distributors
3	Optical Fiber Communication: Principles and Applications	T L Singhal	Cambridge University.
4	Lasers for Medical Applications	Helena Jelínková	Woodhead Publishing



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Digital Image Processing

Semester: V

Subject Code: ML5TH4

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Understand and analyze the representation of a digital image.
2.	To realize algorithms to solve image processing problems and meet design specifications.
3.	To comprehend the techniques of image processing to enhance the image resolution.
4.	To grasp various transformations and restoration techniques to gain knowledge with respect to different types of noise.

Unit	Course content	Teaching hrs
Unit I	Introduction: Background, digital image representation, examples of field that use DIP, fundamental steps in digital image processing, elements of digital image processing system. Digital image fundamentals: Simple image model, Sampling and quantization, some basic relationships between pixels, some basic transformations	08
Unit II	Image enhancement in the spatial domain: Background, Basic gray level transformations, histogram processing, enhancement using arithmetic/logic operations, basics of spatial filtering, smoothing and sharpening spatial filters, combining spatial enhancement methods.	08
Unit III	Image enhancement in the frequency domain: introduction to the frequency domain, smoothing and sharpening frequency domain filters, homomorphic filtering, implementation, generation of spatial masks from frequency domain specifications, color image processing	08
Unit IV	Image Transforms: unitary transform- DFT, DCT, Wavelet, Haar, Hadamard, sine transforms with their properties and applications.	07
Unit V	Image Restoration: Degradation model, Noise models, restoration in the presence of noise only (Spatial and frequency domain filters), linear position invariant degradations, wiener filters, Inverse filtering, LMS filtering.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Understand the relevant aspects of digital image representation and their practical implications, components required in digital image processing.
CO2	Foster on different techniques employed for the enhancement of images in both spatial and frequency.
CO3	Emphasize the need for image transforms different types of image transforms and their properties and applications.
CO4	learn different causes for image degradation and implement various filtering techniques to enhance quality of the image.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Image Processing	by R C Gonzalez & RE Woods	Pearson Education, 2 nd Edition.
2	Fundamentals of Digital Image Processing	Anil K Jain	Eastern Economy Edition, Prentice Hall of India Private Limited, 2003.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Image Processing	Sid Ahmed	McGraw Hill
2	Digital Image Processing	S Jayaramanand Esakirajan	Tata McGraw Hill Publications
3	Introduction to Digital Image Processing	William J Pratt	CRC Press
4	Fundamentals of Digital Image Processing	Annadurai	Pearson Publications



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Medical Physics

Semester: V

Subject Code: ML5PE51

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To describe effects of heat and cold in medicine.
2.	To describe effects of physics of lung and breathing mechanism.
3.	To discuss the pumping action of the heart and how the blood pressure changes occur.
4.	To discuss the electrical conduction system of the nerves in the brain, the heart and the eyes, application of low and high frequency electricity in medicine, magnetism in medicine.
5.	To discuss how the ultrasound is helpful in Medicine, physics of ear and hearing to know about how light is helpful in Medicine

Unit	Course content	Teaching hrs
Unit I	Introduction to Medical Physics: Metabolism in human body: Conservation of energy and heat flow, Energy content of body fuel: Metabolizable energy, energy storage, Energy storage molecules: Production of ATP, usage of ATP, Metabolic rates, loss of body heat, Body temperature.	08
Unit II	Descriptive measures: Measures of Central Tendency, Measures of Physics of fluid flow in human body: Characteristic pressures in the body, basic physics of pressure and flow of fluids, diffusion, pressure and flow in the body, motion of humans in fluid.	08
Unit III	Physics of speech and hearing: Physics of sound waves, speech production and the physics involved, physics of human hearing, other vibrations in the body.	08
Unit IV	Physics of light and vision: structure and focusing elements of the human eye, imaging and detection by the eye, vision impairment, visual perception, vision in other animals.	07
Unit V	Electrical and magnetic properties in human body: electrical properties of body tissues, nerve conduction, Ion Channels, Hair Cells, Balance, Taste, and Smell, Electrical Properties of the Heart, Electrical Signals in the Brain, Effects of Electric Shock, Magnetic Properties, Electromagnetic Waves.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Comprehend the basics concepts of physics to the different functional aspects in human body.
CO2	Understand the physiology of blood and other fluids in the human body, with respect to fluid laws of physics.
CO3	Comprehend the functional aspects of various types of sensory aspects in human beings.
CO4	Analyze the working of different organ systems in human from the perspective of medical physics.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Physics of the human body	Wayne W. Daniel	Springer publications, 2016

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Physics in biology and medicine	Paul Davidovits	5 th edition, Academic press, New York, 2018.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Embedded System Design and ARM Processors

Semester: V

Subject Code: ML5PE52

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To emphasize on the major components that constitute an embedded system and provide experience to integrate hardware and software for microcontroller applications systems.
2.	Implement small programs to solve well-defined problems on an embedded platform.
3.	Develop familiarity with tools used to develop an embedded environment.
4.	To learn various communication protocols applicable in embedded system applications.

Unit	Course content	Hrs
Unit I	Introduction: Overview of embedded systems, embedded system design challenges, common design metrics and optimizing them. Survey of different embedded system design technologies, trade-offs. Custom Single- Purpose Processors, Design of custom singlepurpose processors. Single-Purpose Processors: Hardware, Combinational Logic, Sequential Logic, RT level Combinational and Sequential Components	08
Unit II	General Processors-Software: Basic Architecture, Operation, Programmer's View, Development Environment, ASIPS. Standard Single-Purpose Peripheral: Timers, Counters, UART, PWM, LCD Controllers, Keypad controllers, Stepper Motor Controller, A to D Converters, Examples	08
Unit III	Memory and communication: Introduction, Common memory Types, Composing memory, Memory Hierarchy and Cache, Advanced RAM. Interfacing: Communication Basics, Microprocessor Interfacing, Arbitration, Advanced Communication Principles, Protocols – Serial, Parallel and Wireless.	08
Unit IV	ARM Embedded Systems: The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. ARM processor fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and Vector Table, Core Extensions, Architecture Revisions, ARM Processor Families.	07
Unit V	Introduction to the Arm Instructions Set: Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instructions, Program Status Register Instruction, Loading Constants, ARMv5E Extensions, Conditional Execution, and Example Programs.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Foster to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, Manufacturability and sustainability.
CO2	Identify and analyze the formal design methodologies to optimize various aspects in the design of embedded systems for industrial applications.
CO3	Apply Knowledge of various embedded processor architectures in real time applications to perform the real time processing.
CO4	Emphasizes on ARM family of microcontrollers that are widely used in design of real time sophisticated embedded systems like tablets, hand held devices, automation and industrial control systems.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Embedded System Design: A unified hardware and software: introduction	Frank Vahid/ Tony Givrgis	WileyIndia Edition, 2002.
2	ARM Systems Developer's Guide Designing and Optimizing System Software	Andrew N. Sloss, Dominic Symes, ChrisWright,	Morgan Kaufmann Publishers, ElseveirInc, 2004

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Introduction to Embedded Systems	Shibu K V	Tata McGraw Education Private Limited, 2017. Hill
2	Embedded systems	Raj Kamal	Tata McGraw H edition.
3	Embedded Systems: Hardware, Design and Implementation	Krzysztof Iniewski	Wiley Publications
4	Embedded System Design	Santanu Chattopadhyay	PHI Publications



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Biostatistics

Semester: V

Subject Code: ML5PE53

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To learn the statistical data analysis and bio statistical analysis.
2.	Quantitative and qualitative analysis of human motion and performance.
3.	Understand how biomechanical principles can be applied to examine human activities such as sport and orthopedic rehabilitation.
4.	Understand the relationship between mechanical properties and anatomical functions.

Unit	Course content	Teaching hrs
Unit I	Introduction of Biostatistics: Statistics, Biostatistics, statistical terms, Statistical Data, Organization and Classification of data, Frequency distribution, Representation of data	08
Unit II	Descriptive measures: Measures of Central Tendency, Measures of Location or Averages of Partition value, Measures of variability or dispersion	08
Unit III	Basic Probability theory: probability, set theory and Venn diagram, probability distribution: Normal, binomial and Poisson Distribution	08
Unit IV	Inferential statistics: Inferential statistics, hypothesis testing and test of significance, nonparametric statistical tests.	07
Unit V	Inferential statistics: Correlation, Regression, students t-Test, Analysis of Variance, Chi- Square Test	08

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Assess the importance of statistics in healthcare.
CO2	Extend the basic concepts of statistics to statistical descriptive oriented applications
CO3	Interpret the aspects of probability and sampling to solve problems in statistics
CO4	Interpret the aspects of statistics for obtaining the inference on the sample data

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biostatistics-A Foundation for Analysis in the Health Sciences	Wayne W. Daniel	John Wiley & Sons Publication, 6th Edition, 2008

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Principles of Biostatistics	Marcello Pagano and Kimberlee Gauvreu	Thomson Learning Publication, 2006.
2	The Biomedical Hand Book	Predko	CRC Press, 2nd Edition, 2000.
3	Introduction to Biostatistics	Ronald N Forthofer and Eun Sul Lee	Academic Press, 2009



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Biomedical Instrumentation

Semester: V

Subject Code: ML5OE61

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To Familiarize Students with Basic Approach to Biomedical signals and its Instruments.
2.	To Motivate Students to Explore importance of Biomedical Therapeutic and Diagnostic Instruments in Hospitals.
3.	To Enable the Students to Understand the role of Engineers in Hospitals.

Unit	Course content	hrs
Unit I	Introduction to Biomedical engineering: Introduction to biomedical engineering, the need for bioinstrumentation, man instrumentation system, components of the man instrumentation system, problems encountered in measuring living systems. Sources for bio-electric potentials: Cells, Neuron, Bioelectricity, Resting Membrane Potential, Action Potential, Transmission of potentials.	08
Unit II	Biopotentials and its Measurements: Electrical Activity of the Heart, ECG waveforms, Electrical Activity of the Brain, EEG Characteristics, Electrical activity of Muscles, EMG waveforms, Electrooculogram (EOG), Electro Retinogram (ERG).	08
Unit III	Introduction to Diagnostic Instruments: Pulse Oximeter, Blood pressure, blood flow, Respiratory measurement. Introduction to imaging with their applications in medicine: X-ray, CT, MRI.	08
Unit IV	Introduction to Therapeutic Instruments: need for cardiac pacemakers, pacing modes, implantable pacemakers, external pacemakers and Defibrillators.	07
Unit V	Role of an Engineer in Hospital [Case Study]: Role of Engineers in medicine i) Computer Engineer [Computers in medicine] ii) Electrical Engineer [safety and its measures by electrical engineer] iii) importance of Civil Engineer [water treatment in Hospitals] iv) Mechanical Engineer [design hydraulics system in Hospitals] v) Biomedical engineer.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Reminisce the basics of bio instrumentation and the sources of biopotentials.
CO2	To understand the biopotentials and relate the same to medical equipment's used in healthcare.
CO3	To understand the importance of diagnostic and therapeutic equipment's.
CO4	To understand the role of engineers in design of hospitals and instruments.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation & Measurements	Leslie Cromwell	PHI/Pearson Education, 2 nd e
2	Principles of applied biomedical instrumentation	Geddes and Baker	John Wiley, 3 rd e

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Handbook of biomedical instrumentation.	Khandpur, R.S.	Tata McGraw-Hill Education, 2012.
2	Biomedical Instrumentation	M Armugam	Anuradha Publications, 2 nd e.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



	3. From tuple 4. Random values 18. Using a numpy module create array and check the following: 1. Reshape 3X4 array to 2X2X3 array 2. Sequence of integers from 0 to 30 with steps of 5 3. Flatten array 4. Constant value array of complex type 19. Write a program to concatenate the dataframes with two different objects. 20. Write a python code to read a csv file using pandas module and print the first and last five lines of a file.

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Develop programs for the given problem statement in the real world. 2 3 4
CO2	Implement the programs on object oriented concepts.
CO3	Demonstrate the usage of NumPy module for numerical data analysis.
CO4	Apply data manipulation tools available in pandas for data cleaning and analysis



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Digital Signal Processing Lab

Semester: V

Subject Code: ML5LB2

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No.	Course Objectives
1.	To study about discrete Fourier transform and to learn about FFT algorithms.
2.	To study the design techniques and realization methods for FIR and IIR digital filters
3.	To study the applications of DSP

Sl.No	Course content	Teaching hrs
1	Verification of sampling theorem.	3 Hrs/ Week
2	Impulse response of a given system	
3	Linear convolution of two given sequences.	
4	Circular convolution of two given sequences	
5	Autocorrelation of a given sequence and verification of its properties.	
6	Cross correlation of given sequences and verification of its properties.	
7	Solving a given difference equation.	
8	Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.	
9	Linear convolution of two sequences using DFT and IDFT.	
10	Circular convolution of two given sequences using DFT and IDFT	

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Ability to use computational tools to do basic operations for signal processing.
CO2	Ability to develop algorithms for designing and implementation of FIR and IIR filters with standard techniques.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Principles of Medical Imaging Modalities

Semester: VI

Subject Code: ML6TH1

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Build the physics background of interaction of radiation with matter, enabling participants to understand projection radiography, mammography, and fluoroscopy and train them to assess image distortions, image attenuation for x-ray radiography systems.
2.	Expose students to the developments in X-ray Computed Tomography leading to modern day multi-slice, helical CT scanners and introduce the concept of computed tomography reconstruction.
3.	Divulge the image formation, image quality, and imaging hardware for ultrasound scanning. Explain the imaging principles and derive the fundamental equation of MRI.
4.	Expose the participants to advanced MR techniques including fast spin echoes, MRI angiography, echo planar imaging, magnetization prepared sequences, diffusion and perfusion theory and sequences.

Unit	Course content	Teaching hrs
Unit I	X-rays: Introduction to Electromagnetic Spectrum, Fundamentals of Rays, Generation and Detection of X-Rays, X-ray Diagnostic Method	08
Unit II	X-Rays: Recent Developments, X-ray Imaging Characteristics, Biological effects of Ionizing radiation.	08
Unit III	Ultrasound: Fundamentals of Acoustic Propagation, Generation and Detection of Ultrasound, Ultrasonic Diagnostics Methods, New Developments, Image Characteristics, Biological effects of Ultrasounds.	08
Unit IV	Radionuclide Imaging: Fundamentals of Radioactivity, Generation and Detection of nuclear emission, Diagnostic methods using radiation detector probes, Radionuclide Imaging Systems, New Radionuclide Imaging methods, Characteristics of Radionuclide Images, Internal radiation dosimeter and biological effects.	07
Unit V	Magnetic Resonance Imaging Fundamentals of nuclear magnetic resonance, Generation and Detection of NMR signal, Imaging Methods, In vivo NMR Spectroscopy, Characteristics of MRI, Biological Effects of Magnetic Fields.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	To gain knowledge on X-rays and its generation.
CO2	To understand and distinguish different diagnostic method.
CO3	To explain concepts of CT, Projection functions of CT.
CO4	Understand the principles of Radionuclide imaging and Magnetic resonance imaging.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Principles of Medical Imaging	Shung K. Kirk, Tsui Benjamin, Smith.B.Michael,	Academic press, 2012
2	Fundamentals of Medical Imaging	Suetens Paul	Cambridge University Press, 2002

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Handbook of Biomedical Instrumentation	Khandpur R.S	3 rd Ed., Tata-McGraw Hill, 2014
2	Medical Imaging Principles and Practices	Mostafa Analoui Joseph D. Bronzino Donald R. Peterson	CRC Press 2013
3	Scientific Basis of Medical Imaging	Wells P.N.T	Newyork presss, 1982
4	Handbook of Biological Effects of Electromagnetic Fields	Polks c and Postow E	CRC Press, 2014



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Medical Image Analysis

Semester: VI

Subject Code: ML6TH2

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To provide students with an overview of the computational and mathematical methods in medical image processing.
2.	To study many of the current methods used to enhance and extract useful information from medical images.
3.	Understand different image segmentation techniques used on medical images.
4.	Know various application of medical image processing.

Unit	Course content	hrs
Unit I	Introduction to biomedical images: introduction, block diagram of computer aided diagnosis (CAD), objectives of biomedical image analysis, nature of biomedical images, body temperature as an image, transillumination, medical imaging types and modalities: X-ray imaging, Computed Tomography (CT), nuclear medicine imaging, ultrasound imaging, magnetic resonance imaging.	08
Unit II	Medical image segmentation: introduction to image segmentation, edge detection, thresholding, region based methods, boundary based methods, active contour method, watershed segmentation.	08
Unit III	Morphological Image Processing: Basic concepts of set theory, Logical operations involving binary images, Dilation and erosion, Opening and closing, The hit-or-miss transformation, Basic morphological algorithms.	08
Unit IV	Representation and Description: Representation Schemes, Boundary Descriptors, Regional Descriptors.	07
Unit V	Medical Image Application: computer aided diagnosis in mammography, tumor imaging and treatment, Retinal Vessel Segmentation, Segmentation in Lung CT Images, Lesion Segmentation in Brain MRI .	08

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Acquire a basic understanding of the important concepts related to medical image processing.
CO2	Identify and formulate the various difficulties associated with medical images and eliminate the same
CO3	Recognize and apply various segmentation techniques for medical images and apply the techniques of set theory and logical operations.
CO4	Apply image processing algorithms on various medical images to diagnose tumors of various organs.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Image Analysis	Rangaraj M Rangayyan	CRC press
2	Digital Image Processing For Medical Applications	Geoff Dougherty	Cambridge University 2009

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Image Processing	Sid Ahmed	McGraw Hill
2	Digital Image Processing	S Jayarama and Esakirajan	Tata McGraw Hill Publications
3	Introduction to Digital Image Processing	William J Pratt	CRC Press
4	Fundamentals of Digital Image Processing	Annadurai	Pearson



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Medical Devices Regulations and Intellectual Property Rights

Semester: VI

Subject Code: ML6TH3

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	The course has been introduced to make the student be aware about the concepts of Medical safety and ISO standards.
2.	To classify of medical devices.
3.	To know medical device regulatory system in Asia and united states.
4.	To have basic knowledge of Intellectual Property Rights.

Unit	Course content	Teaching hrs
Unit I	Medical Device Safety and Related ISO Standards: Biomedical Devices: Overview, Labeling, Label, and Language: A Truly Global Matter, Clinical Trials: Legal and Ethical Considerations of Increasing Globalization, Regulatory Affairs for Medical Device Clinical Trials in Asia Pacific.	08
Unit II	Medical Device Classification and Standards: Medical Device Classification Guide, ISO 13485:2003 Medical Devices — Quality Management Systems — Requirements or Regulatory Purposes, ISO 14971: Application of Risk Management to Medical Devices.	08
Unit III	Harmonization of Medical Devices in Asia: Medical Devices in the World Health Organization, Asian Harmonization Working Party, Asia-Pacific Economic Cooperation, Harmonization of Medical Device in ASEAN.	08
Unit IV	Medical Device Regulatory System in the United States: United States Medical Device Regulatory Framework, Regulation of Combination Products in the United States Medical Device Regulatory System in Asia-Pacific Region: Medical Device Regulations in Australia & China.	07
Unit V	Basics Of Intellectual Property Rights: Introduction – to the need for intellectual property right (IPR) Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design -Genetic Resources and Traditional Knowledge - Trade Secret IPR in India : Genesis and development –IPR in abroad – Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Cooperation Treaty, 1970, the TRIPS Agreement, 1994 Text1: Sec 1.1,1.2,1.3,1.4,1.5,1.6	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Classify and explain the importance of essential requirements. and Explain the process of conformity assessment and the use of harmonized standards. (PO-3,8,9 & PSO-1)
CO2	Comprehend the legislative framework for medical device regulation in the world. (PO-3,12 & PSO-2)
CO3	Resolve if a device or product qualifies as a “medical device”, “active implantable medical device”, “in vitro diagnostic medical device” or “drug-device” combination under the definitions contained within the Directives.(PO-3, 8 & PSO-2)
CO4	Provide a holistic approach to the understanding of the national and international IPR and ethics for biomedical engineers in hospitals. (PO-6,8 & PSO-2)

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100%syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Handbook of Medical Device Regulatory Affairs in Asia	Jack Wong, Raymond Tong Kaiyu CRC Press , Taylor & Francis group	
2	Medical Device Regulations Globaloverview and guiding principles (WHO)Geneva Latin American Medical Device Regulations	Patricia M. Flood	
3	Basic principles and acquisition of Intellectual Property Rights	Dr. T Ramakrishna	2005



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Sensors and Transducers

Semester: VI

Subject Code: ML6PE41

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Make students familiar with the constructions, working principle, parameters and classifications of different types of sensors and transducers.
2.	Be aware of the measuring instruments and the methods of measurement and the use of different transducers
3.	Be aware of the characteristics of sensors and uses of it.
4.	. Know various applications of sensors in all the fields.

Unit	Course content	Teaching hrs
Unit I	Introduction to sensors and transducers: Principles, classification, parameters, characterization, types of sensors resistive potentiometer, inductive sensors, capacitive sensors, stress sensors, ultrasonic sensors.	08
Unit II	Thermal sensors: Gas thermometric sensors, Acoustic temperature sensor, magnetic thermometer, resistance change type thermometric sensors, thermal radiation sensor. Magnetic sensor: introduction, principle behind, magneto resistive sensors, hall effect and sensors, electromagnetic flow meter.	08
Unit III	Radiation sensors: introduction, basic characteristics, types of photo detectors, X-ray and Nuclear radiation sensors, and fiber optic sensors.	08
Unit IV	Smart Sensors: introduction, primary sensors, compensation, information coding and processing, data communication and automation. Recent trends in sensor technology and applications: Film sensors, semiconductor IC technology- standard methods, MEMS, Nano-sensors, automotive sensors, home appliance sensors, sensors for medical diagnosis.	07
Unit V	Bio Sensors for Health Applications: introduction, Biorecognition elements and transduction technology, Biosensors for diabetes applications, Biosensors for cardiovascular diseases applications, Biosensors for cancer applications, conclusion.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Identify the classifications and principles of working of a sensor and a transducer.
CO2	Be acquainted with different types of sensors, its structure and functioning.
CO3	Realize the working of various smart sensors and their applications in various fields.
CO4	Know the importance of biosensors and its use in solving various health issues.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Sensors and Transducers	D. Patranabis	PHI publications, 2018
2	Biosensors for health applications	Cibele Marli Cação Paiva Gouvêa	PHI publications, 2018

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Sensors and Transducers	Ian R Sinclair	Newnes, 2001
2	Sensors and Transducers	Dr. A. D. Shaligram	Chittan Publications.
3	Sensors and Transducers	C. R. Balamurugan and D.Periazhaagar	Sruthi Publishers
4	Sensors and Transducers	M.J. Ushe	Palgrave Macmillan Publications



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Pattern Recognition in medicine

Semester: VI

Subject Code: ML6PE42

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Pattern recognition techniques are used to design automated systems that improve their own performance through experience. This course covers the methodologies, technologies, and algorithms of statistical pattern recognition from a variety of perspectives. Topics including Bayesian Decision Theory, Estimation Theory, Linear Discrimination Functions, Nonparametric Techniques, Decision Trees, and Clustering Algorithms etc. will be presented.

Unit	Course content	Teaching hrs
UNIT I	Introduction: Machine perception, pattern Recognition systems, Design cycles, learning and adaptation. Probability: Random variable, joint distribution and densities, moments of random variable, Estimation of parameters from sample.	08
UNIT II	Statistical decision making: Introduction, Baye's theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, characteristic curves, problems. (3.1-3.7, 3.9 from text 1)	08
UNIT III	Non parametric Decision making: Introduction, Histograms, kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate functions, minimum squared error discriminant functions. (4.1-4.7 text 1)	08
UNIT IV	Clustering: Introduction, Hierarchical clustering, partitional clustering, Unsupervised Bayesion learning, Hierarchical clustering, partitional clustering, problems.	07
UNIT V	Processing of waveforms and images: Introduction, gray level scaling transformations, equalization, geometric image scaling and interpolation, edge detection, laplacian and sharpening operators, line detection and template matching, logarithmic gray level scaling. (7.1-7.9 text 1)	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Understand the basic concepts of Pattern Recognition and its applications.
CO2	Apply the concepts of joint distribution & densities and risk estimators of events.
CO3	Understand Statistical decision making and Non parametric decision making.
CO4	Understand the concepts of clustering - hierarchical clustering and partitional clustering and analysis of wave forms and Image.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Pattern Recognition and Image Analysis.	Earl Gose, Richard Johnson Baugh and Steve jost	PHI, 2017
2	pattern classification	Richard O.Duda, Peter E.Herd and David & Stork	john Wiley and sons, Inc 2 nd Ed.2001

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Pattern classification	Richard O.Duda, Peter E.Herd and David & Stork	John Wiley and sons, Inc 2 nd Ed.2001.
2	Pattern Recognition: Statistical Structural and Neural Approaches	Robert Schlkoff	John Wiley and sons, Inc, 1992.
3	Pattern Recognition	S.Theodoridis and K.Koutroumbas	4 th Ed., Academic Press, 2009.
4	Pattern Recognition and Machine Learning	C.M.Bishop	Springer, 2006.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Brain Computer Interface

Semester: VI

Subject Code: ML6TH43

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Obtain the background to understand brain-computer interaction and human-computer Interaction.
2.	Understand the literature in the field of brain sensing for human-computer interaction research.
3.	Understand the various tools used in brain sensing, with a focus on.

Unit	Course content	hrs
I	Basic Neurosciences: Basic Neuroscience: Neurons, Action Potentials or Spikes, Dendrites and Axons, Synapses, Spike Generation, Adapting the Connections: Synaptic Plasticity – (LTP, LTD, STDP, Short-Term Facilitation and Depression), Brain Organization, Anatomy, and Function.	08
II	Recording and Stimulating the Brain: Recording Signals from the Brain: Invasive Techniques & Non-invasive Techniques. Stimulating the Brain - Invasive Techniques & non-Techniques. Simultaneous Recording and Stimulation: Multi-electrode Arrays, Neurochip.	08
III	Signal Processing for BCI's: Spike Sorting, Frequency Domain Analysis: Fourier analysis, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Spectral Features, Wavelet Analysis. Time Domain Analysis: Hjorth Parameters, Fractal Dimension, Autoregressive (AR) Modeling, Bayesian Filtering, Kalman Filtering, Particle Filtering Spatial Filtering: Bipolar, Laplacian, and Common Average Referencing, Principal Component Analysis (PCA), Independent Component Analysis (ICA), Common Spatial Patterns (CSP) 73 Artifact.	08
IV	Building a BCI: Major Types of BCIs: Brain Responses Useful for Building BCIs: Conditioned Responses, Population Activity, Imagined Motor and Cognitive Activity, Stimulus-Evoked Activity. Invasive BCIs: Two Major Paradigms in Invasive Brain-Computer Interfacing: BCIs Based on Operant Conditioning, BCIs Based on Population Decoding. Invasive BCIs in Humans: Cursor and Robotic Control Using a Multielectrode Array Implant, Cognitive BCIs in Humans, Long-	07



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



	Term Use of Invasive BCIs, Long-Term BCI Use and Formation of a Stable Cortical Representation, Long-Term Use of a Human BCI Implant. Semi-Invasive BCIs: Electrocorticographic (ECoG) BCIs -ECoG BCIs in Animals, ECoG BCIs in Humans, BCIs Based on Peripheral Nerve Signals Nerve-Based BCIs, Targeted Muscle Innervations(TMR). Non-Invasive BCIs: Oscillatory Potentials and ERD, Slow Cortical Potentials, Movement Related Potentials, Stimulus Evoked Potentials; BCIs Based on Cognitive Tasks, Error Potentials in BCIs, Co-adaptive BCIs, Hierarchical BCIs.	
V	Medical Applications: Sensory Restoration, Motor Restoration, Cognitive Restoration, Rehabilitation, Restoring Communication with Menus, Cursors, and Spellors, Brain Controlled Wheelchairs. Nonmedical Applications: Web Browsing and Navigating Virtual Worlds, Robotic Avatars, High Throughput Image Search Lie Detection and Applications in Law, Monitoring Alertness, Estimating Cognitive Load, Education and Learning, Security, Identification, and Authentication, Physical Amplification with Exoskeletons, Mnemonic and Cognitive Amplification, Applications in Space, Gaming and Entertainment, Brain-Controlled Art.	08

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Apply the knowledge of mathematics science and engineering fundamentals to understand the Brain Organization.
CO2	Apply the knowledge of mathematics science and engineering fundamentals understand the brain anatomy and Function.
CO3	Analyse and process the brain signals for artefact reduction.
CO4	Understand types of BCI, principles and its applications which are present state of art in the Neurosciences domain.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to 1 choice). Each question carries maximum 4 subdivisions.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Brain-Computer Interfacing	Rajesh P. N. Rao	PHI, 1 st Edition, 2007
2	Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction	Bernhard Graimann, Brendan Z. Allison, Gert Pfurtscheller	The Frontiers Collection Hardcover – 13 Dec 2010

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Brain Computer Principles and Practices	Jonathan Wolpaw, Elizabeth Winter Wolpaw	Oxford University Press. 2009.



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Image Processing

Semester: VI

Subject Code: ML6OE51

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Understand and analyze the basic concepts, steps and components required to process a digital image.
2.	To realize the methods to enhance the image quality both in spatial and frequency domain.
3.	To realize the different transformation techniques to process a digital image.
4.	To grasp various transformations and restoration techniques to gain knowledge.

Unit	Course content	Teaching hrs
Unit I	Introduction: Background, digital image representation, examples of field that use DIP, fundamental steps in digital image processing, elements of digital image processing system.	08
Unit II	Digital image fundamentals: Simple image model, Sampling and quantization, some basic relationships between pixels, some basic transformations	08
Unit III	Image enhancement in the spatial domain: Background, Basic gray level transformations, histogram processing, enhancement using arithmetic/logic operations, basics of spatial filtering, smoothing and sharpening spatial filters. Image enhancement in the frequency domain: introduction to the frequency domain, smoothing and sharpening frequency domain filters, homomorphic filtering, implementation, , color image processing	08
Unit IV	Image Transforms: Discrete Fourier Transform, Discrete Cosine Transform, Haar Transform, Hadamard Transform, Unitary Transform and their properties.	07
Unit V	Image Restoration: Degradation model, Noise models, restoration in the presence of noise only (Spatial and frequency domain filters), linear position invariant degradations, wiener filters, algebraic approach to restoration, Inverse filtering, LMS filtering.	08



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Course Outcomes:

Sl. No.	Course Outcomes
CO1	Understand the relevant aspects of digital image representation and their practical implications, components required in digital image processing.
CO2	Foster on different techniques employed for the enhancement of images in both spatial and frequency.
CO3	Emphasize the need for image transforms different types of image transforms and their properties and applications.
CO4	learn different causes for image degradation and implement various filtering techniques to enhance quality of the image.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Image Processing	R C Gonzalez & R E Woods	2e,Pearson Education
2	Fundamentals of Digital Image processing	A K Jain	PHI /Pearson Education, 1989

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Image Processing	Sid Ahmed	McGraw Hill
2	Digital Image Processing	S Jayaraman and Esakirajan	Tata McGraw Hill Publications
3	Introduction to Digital Image Processing	William J Pratt	CRC Press
4	Fundamentals of Digital Image Processing	Annadurai	Pearson Publications



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



Subject Name: Medical Image Processing Lab

Semester: VI

Subject Code: ML6LB1

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To provide students with an overview of the computational and mathematical methods in medical image processing.
2.	To study many of the current methods used to enhance and extract useful information from medical images.
3.	Understand different image segmentation techniques used on medical images and to know various application of medical image processing.

Unit	Course content	Teaching hrs.
Cycle I		3 Hrs/ Week
1.	Simulation of a binary, gray scale and color image with its negative.	
2.	Implementation of image enhancement in spatial domain technique using various techniques.	
3.	Implementation of image enhancement technique in frequency domain using various techniques.	
4.	Implementation of image smoothening and sharpening filters.	
5.	Implementation of homomorphic filtering technique for image enhancement	
Cycle II		
1.	Histogram processing and spectra in understanding the Information content of medical images.	
2.	Effect of blurring and noise on the error measure 2-D convolution.	
3.	Image Segmentation using edge/ boundary detection, binary and global thresholding.	
4.	Image Segmentation using region-oriented segmentation techniques	
5.	Basic Morphological operations: Erosion and dilation	
6.	Applications- blood vessel detection in retinal images, tumor detection in MRI images, lung nodules detection in CT images.	



Sri Siddhartha Institute of Technology, Tumkur

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF MEDICAL ELECTRONICS

Syllabus for the Academic Year 2022-23



subject Name: Advance Biomedical instrumentation Lab

Semester:VI

Subject Code: ML6LB2

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
5.	To Understand an ECG waveform measurements and determine arrhythmias.
6.	To Understand audiometry and its importance in hearing diagnosis.
7.	To Understand respiratory measurements using Spirometer.
8.	To Familiarize in OT and ICU Instruments.

SL No.	Course Content	
1.	To determine amplitude and timings of P, QRS, and T Waveforms and analyze PQ, ST-segments.	
2.	Using ECG waveform determine electrical axis/Einthoven triangle of the heart.	
3.	To plot audiogram of the subject using air conduction pure tone audiometer.	
4.	To observe and measure respiratory parameters using spirometer.	
LIST OF STUDY AND CASE STUDY EXPERIMENTS		
5.	To study the operation and troubleshooting of Infusion pump and syringe pump	OT Instruments
6.	To study the operation and troubleshooting Electrosurgical unit	
7.	To study the operation and troubleshooting Heart lung machine	
8.	To study the operation and troubleshooting Anaesthesia machine	
9.	To study the operation and troubleshooting Defibrillator machine	
10.	To study the operation and troubleshooting Ventilators	ICU Instruments
11.	To study the operation and troubleshooting of Patient Monitoring System	

Course Outcomes:

Sl. No.	Course Outcomes
CO1	To analyze the ECG signals and determine arrhythmias.
CO2	To analyze the conduction of the heart.
CO3	To measure and plot audiogram and respiratory parameters.
CO4	To study and understand the working principles of OT and ICU instruments.