GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

(AUTONOMOUS)

NELLORE–524317 (A.P) INDIA

B.TECH - ELECTRONICS & COMMUNICATION ENGINEERING

(ACCREDITATED BY NBA)

COURSE STRUCTURE AND SYLLABI

UNDER

RG 23 REGULATIONS

K. Sreenivasa Kumar
MEMBER SECRETARY

Head of the Department
Dept. of Electronics & Communication Engg.
GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
Gangavaram (V), Kovur (M)
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Autonomous

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3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

(ACCREDITATED BY NBA)

VISION

Achieving academic excellence in Electronics and Communication Engineering by shaping next-generation technocrats keeping pace with socio-economic needs.

MISSION

M1: Adopting outcome oriented teaching -learning processes to provide comprehensive knowledge inthe application of Electronics and Communication Engineering principles.

M2: Striving for implementation of advanced technology to cater to industrial demands and societal concerns.

M3: Producing highly skilled and responsible professionals with robust ethical values.

M4: Integrating technical capabilities, life skills and entrepreneurship abilities to produce dynamic contributors to social advancement.

Program Educational Objectives (PEOs)

After few years of graduation, the graduates of B.Tech. (ECE) will be:

PEO-1: Demonstrating a deep passion for continuous learning through technical expertise for a promising career.

PEO-2: Exhibiting a strong commitment to serving the society with adherence to professional ethics.

PEO-3: Managing resources efficiently as competent engineers through effective socialinteraction.

PEO-4: Engaging in advanced learning and contributing to technological innovations.

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Program Outcomes

On successful completion of the Program, the graduates of B.Tech. (ECE) Program will be able to:

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, andsynthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, andneed for sustainable development
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities andnorms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member orleader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with theengineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and giveand receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engagein independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1	Design and develop electronic circuits and communication systems, applying the principles of signal, image processing, VLSI, Embedded and wireless applications relevant to industry and society.
PSO2	Adopting software tools like Matlab, Xilinx, Microwind, NS-2 to develop intelligent systems to offer customized solutions.

B.TECH Electronics & Communication Engineering
RG – 23 Course Structure & Syllabus

(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

S. No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

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B. Tech I Year I Semester (Theory-5, Lab-4)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	BS&H	23A0003T	Engineering Physics	3	0	0	3
2.	BS&H	23A0001T	Linear Algebra and calculus	3	0	0	3
3.	PC	23A0501T	Introduction to programming	3	0	0	3
4.	ES	23A0201T	Basic Electrical and Electronics Engineering	3	0	0	3
5.	ES	23A0301	Engineering Graphics	1	0	4	3
6.	ES	23A0202P	Electrical and Electronics Engineering Workshop	0	0	3	1.5
7.	ES	23A0503P	IT Workshop	0	0	2	1
8.	BS&H	23A0006P	Engineering Physics Lab	0	0	2	1
9.	PC	23A0502P	Computer Programming Lab	0	0	3	1.5
10	MC	23AYG01P	Health and Wellness, Yoga and Sports	0	0	1	0.5
			Total credits				**20.5**

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B. Tech I Year II Semester (Theory-5, Lab-4)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BS&H	23A0009T	Communicative English	2	0	0	2
2	BS&H	23A0004T	Engineering Chemistry / Chemistry	3	0	0	3
3	ES	23A0002T	Differential Equations and vector calculus	3	0	0	3
4	ES	23A0101T	Basic Civil and Mechanical Engineering	3	0	0	3
5	PC	23A0205T	Network Analysis	3	0	0	3
6	ES	23A0302P	Engineering Workshop	0	0	3	1.5
7	BS&H	23A0010P	Communicative English Lab	0	0	2	1
8	BS&H	23A0007P	Engineering Chemistry Lab	0	0	2	1
9	PC	23A0206P	Network Analysis and Simulation Lab	0	0	3	1.5
10	MC	23ANS01P	NSS/NCC/Scouts and Guides / Community Service	0	0	1	0.5
			Total credits				**19.5**

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B. Tech II Year I Semester (Theory-5, Lab-2, SEC-1,AC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	BS	23A0014T	Probability and Complex Variables	3	0	0	3
2.	HSM	23A0021T	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3
3.	ES	23A0401T	Signals, Systems and Stochastic Processes	3	0	0	3
4.	PC	23A0402T	Electronic Devices and Circuits	3	0	0	3
5.	PC	23A0403T	Digital Circuits Design	3	0	0	3
6.	PC	23A0404P	Electronic Devices and Circuits Lab	0	0	3	1.5
7.	PC	23A0405P	Digital Circuits& Signal Simulation Lab	0	0	3	1.5
8.	SEC	23A0510P	Python Programming	0	1	2	2
9.	MC	23A0109T	Environmental Science	2	0	0	-
Total				**16**	**02**	**08**	**20**

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B. Tech II Year II Semester ((Theory-6, Lab-2, SEC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	HSM	23A0022T	Managerial Economics and Financial Analysis	2	0	0	2
2.	ES	23A0217T	Linear Control Systems	3	0	0	3
3.	PC	23A0407T	EM Waves and Transmission Lines	3	0	0	3
4.	PC	23A0408T	Electronic Circuits Analysis	3	0	0	3
5.	PC	23A0409T	Analog and Digital Communications	3	0	0	3
6.	PC	23A0410P	Electronic Circuits Analysis Lab	0	0	3	1.5
7.	PC	23A0411P	Analog and Digital Communications Lab	0	0	3	1.5
8.	SEC	23A0026P	Soft Skills	0	1	2	2
9.	ES	23A0413T	Design Thinking and Innovation	1	0	2	2
Total				**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08weeks duration during summer vacation							

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B. Tech III Year I Semester (Theory-5, Lab-2, SEC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	PC	23A0413T	Analog and Digital IC Applications	3	0	0	3
2.	PC	23A0414T	Antennas & Wave Propagation	3	0	0	3
3.	PC	23A0415T	Microprocessors and Microcontrollers	3	0	0	3
4.	PC	23A0522T	Introduction To Quantum Technologies And Applications	3	0	0	3
5.	PE		**Professional Elective-I**	3	0	0	3
6.	OE		**Open Elective-I**	3	0	0	3
7.	PC	23A0413P	Analog & Digital IC Applications Lab	0	0	3	1.5
8.	PC	23A0415P	Microprocessors and Microcontrollers Lab	0	0	3	1.5
9.	SOC	23A0419P	**Skill oriented course -III** PCB Design and Prototype development	0	1	2	2
10.	SOC	23A0420P	Tinkering Lab	0	0	2	1
11.	PR	23A0421	Evaluation of Community Service Internship	-	-	-	2
Total				**18**	**01**	**10**	**26**

S. No.	Course Code	Name of the Professional Elective
1	23A0543T	Computer Architecture & Organization
2	23A0417T	Information Theory and Coding
3	23A0418T	Detection and Estimation Theory

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S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0148T	Green Buildings	CIVIL
2.	23A0149T	Construction Technology and Management	
3.	23A0222T	Electrical Safety Practices and Standards	EEE
4.	23A0319T	Sustainable Energy Technologies	MECH
5.	23A0545T	Java Programming	CSE & Allied/IT
6.	23A0546T	Fundamentals of Artificial Intelligence	
7.	23A0547T	Quantum Technology & Applications	
8.	23A0027T	Mathematics for Machine Learning and AI	Mathematics
9.	23A0034T	Materials Characterization Techniques	Physics
10.	23A0040T	Chemistry of Energy Systems	Chemistry
11.	23A0044T	English for Competitive Examinations	Humanities
12.	23A0051T	Entrepreneurship and New Venture Creation	

Note:

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline**.**

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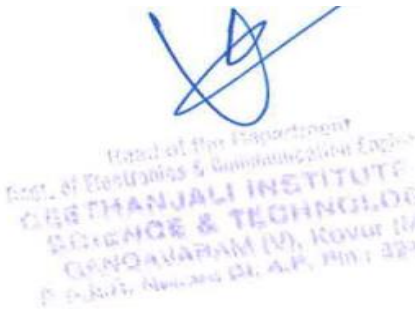

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B. Tech III Year II Semester (Theory-6, Lab-2, SEC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	PC	23A0422T	Digital Signal Processing	2	0	0	2
2.	PC	23A0423T	Microwave and Optical Communications	3	0	0	3
3.	PC	23A0424T	VLSI Design	3	0	0	3
4.	PE		**Professional Elective-II**	3	0	0	3
5.	PE		**Professional Elective-III**	3	0	0	3
6.	OE		**Open Elective-II**	3	0	0	3
7.	PC	23A0423P	Microwave and Optical Communications Lab	0	0	3	1.5
8.	PC	23A0424P	VLSI Design Lab	0	0	3	1.5
9.	SOC	23A0430P	**Skill oriented course -IV** Machine Learning and DSP	0	1	2	2
10.	AC	23A0053T	Technical Paper Writing & IPR	2	0	0	-
Total				**20**	**01**	**08**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation							

S. No.	Course Code	Name of the Professional Elective
1	23A0425T	Electronic Measurements and Instrumentation
2	23A0426T	Embedded systems & IOT
3	23A0427T	Speech Processing
4	23A0428T	Digital Image Processing
5	23A0544T	Artificial Intelligence & Machine learning
6	23A0429T	Satellite Communications

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S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0150T	Disaster Management	CIVIL
2.	23A0151T	Sustainability In Engineering Practices	
3.	23A0232T	Renewable Energy Sources	EEE
4.	23A0334Tb	Automation and Robotics	MECH
5.	23A0548T	Fundamentals of Operating Systems	CSE & Allied/IT
6.	23A0529T	Machine Learning	
7.	23A0030T	Optimization Techniques	Mathematics
8.	23A0029T	Mathematical Foundation Of Quantum Technologies	
9.	23A0035T	Physics Of Electronic Materials And Devices	Physics
10.	23A0041T	Chemistry Of Polymers And Applications	Chemistry
11.	23A0045T	Academic Writing and Public Speaking	Humanities

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B. Tech IV Year I Semester (Theory-6, Lab-2, SEC-1)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	PC	23A0431T	Data Communications and Networking	3	0	0	3
2.	ME		**Management Course-II**	2	0	0	2
3.	PE		**Professional Elective-IV**	3	0	0	3
4.	PE		**Professional Elective-V**	3	0	0	3
5.	OE		**Open Elective-III**	3	0	0	3
6.	OE		**Open Elective-IV**	3	0	0	3
7.	SOC	23A0438P 23A0439P	**Skill oriented course – V** 1.RF System Design tools 2.Industrial IOT & Automation	0	1	2	2
8.	AC	23A0054T	**Audit Course** Gender Sensitization	2	0	0	-
9.		23A0440	Evaluation of Industry Internship	-	-	-	2
Total				**19**	**01**	**02**	**21**

S. No.	Course Code	Name of the Management Course
1	23A0049T	Business Ethics and Corporate Governance
2	23A0050T	E-Business
3	23A0048T	Management Science

S. No.	Course Code	Name of the Professional Elective
1	23A0432T	Radar Engineering
2	23A0433T	DSP Processors & Architectures
3	23A0434T	Cellular & Mobile Communications
4	23A0435T	Low Power VLSI Design
5	23A0436T	Wireless Sensor Networks
6	23A0437T	5G Communications

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S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0152T	Building Materials and Services	CIVIL
2.	23A0121T	Environmental Impact Assessment	
3.	23A0241T	Smart Grid Technologies	EEE
4.	23A0335T	3D Printing Technologies	MECH
5.	23A0512T	Data Base Management Systems	CSE & Allied/IT
6.	23A0532Tb	Cyber Security	
7.	23A0031T	Wavelet transforms and its Applications	Mathematics
8.	23A0036T	Smart Materials And Devices	Physics
9.	23A0037T	Introduction to Quantum Mechanics	
10.	23A0042T	Green Chemistry And Catalysis For Sustainable Environment	Chemistry
11.	23A0046T	Employability Skills	Humanities
12.	23A0153T	Geo-Spatial Technologies	CIVIL
13.	23A0154T	Solid Waste Management	
14.	23A0242T	Electric Vehicles	EEE
15.	23A0334Td	Total Quality Management	MECH
16.	23A0520T	Computer Networks & Internet Protocols	CSE & Allied/IT
17.	23A0450T	Internet of Things	
18.	23A3315a	Introduction to Quantum Computing	
19.	23A0032T	Financial Mathematics	Mathematics
20.	23A0038T	Sensors And Actuators For Engineering Applications	Physics
21.	23A0043T	Chemistry Of Nano materials And Applications	Chemistry
22.	23A0047T	Literary Vibes	Humanities

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B. Tech IV Year II Semester							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.		23A0441	Internship	-	-		4
			Project				8
Total							12

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B. Tech I Year I semester

B. Tech I Year I Semester (Theory-5, Lab-4)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1.	BS&H	23A0003T	Engineering Physics	3	0	0	3
2.	BS&H	23A0001T	Linear Algebra and calculus	3	0	0	3
3.	PC	23A0501T	Introduction to programming	3	0	0	3
4.	ES	23A0201T	Basic Electrical and Electronics Engineering	3	0	0	3
5.	ES	23A0301	Engineering Graphics	1	0	4	3
6.	ES	23A0202P	Electrical and Electronics Engineering Workshop	0	0	3	1.5
7.	ES	23A0503P	IT Workshop	0	0	2	1
8.	BS&H	23A0006P	Engineering Physics Lab	0	0	2	1
9.	PC	23A0502P	Computer Programming Lab	0	0	3	1.5
10	MC	23AYG01P	Health and Wellness, Yoga and Sports	0	0	1	0.5
			Total credits				**20.5**

K. Sravan kumar
MEMBER SECRETARY

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B. Tech I Year I semester

LINEAR ALGEBRA &CALCULUS
(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
23A0001T	3 : 0 : 0	3	CIE: 30 SEE:70	3 Hours	BS&H

Course Objectives:

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

SYLLABUS		Total Hours:48
Unit- I	**Matrices**	**10**

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations - Gauss elimination method, Iteration Methods: Gauss- Jacobi and Gauss Seidel Iteration Methods. Applications: Finding the current in electrical circuits.

Unit- II	**Eigen values, Eigenvectors and Orthogonal Transformation**	**8**

Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Unit- III	**Calculus**	**10**

Mean Value Theorems: Rolle's Theorem (Without Proof), Lagrange's mean value theorem (Without Proof) with their geometrical interpretation, Cauchy's mean value theorem (Without Proof), Taylor's and Maclaurin theorems with remainders (Without Proof), Problems and applications on the above theorems.

Unit- IV	**Partial differentiation and Applications (Multi variable calculus)**	**10**

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers, Differentiation under the integral sign (Liebntiz's rule)

Unit- V	**Multiple Integrals (Multi variable Calculus)**	**10**

Double integrals, triple integrals, change of order of integration (Cartesian Coordinate only), change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals)

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha ScienceInternational

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Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.

Course Outcomes:

On completion of this course, the students are able to:

CO1: Solving systems of linear equations that is needed by engineers for practical applications.

CO2: Find the eigen values and eigen vectors to facilitate the calculation of matrix characteristics.

CO3: Utilize mean value theorems to real life problems.

CO4: Apply the technique of partial differentiation to find the Jacobian and the extreme values of functions of several variables.

CO5: Apply the techniques of multiple integrals to find the areas and volumes.

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B. Tech I Year I semester

INTRODUCTION TO PROGRAMMING
(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
23A0501T	**3 : 0 : 0**	**3**	**CIE: 30** **SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions and arrays.
- To encourage collaborative learning and team work in coding projects.

SYLLABUS		**Total Hours:48**
Unit- I	**Introduction to Programming and Problem Solving**	**10**

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool),pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.
Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

Unit- II	**Control Structures**	**8**

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

Unit- III	**Arrays and Strings**	**10**

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

Unit- IV	**Pointers & User Defined Data types**	**10**

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types - Structures and Unions.

Unit- V	**Functions & File Handling**	**10**

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, command line arguments, Preprocessor directives, Basics of File Handling

Textbooks:

1. "TheCProgrammingLanguage",BrianW.KernighanandDennisM.Ritchie,Prentice-Hall,1988
2. Schaum'sOutlineofProgrammingwithC,ByronSGottfried,McGraw-HillEducation,1996

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-HillEducation, 2008.
2. Programming in C, RemaTheraja, Oxford, 2016,2nd edition

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3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition
Course Outcomes: On completion of this course, the students are able to: **CO1:** Understand basics of computers, the concept of algorithm and algorithmic thinking. **CO2:** Analyse a problem and develop an algorithm to solve it. **CO3:** Implement various algorithms using the C programming language. **CO4:** Understand more advanced features of C language. **CO5:** Develop problem-solving skills and the ability to debug and optimize the code.

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B. Tech I Year I semester

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
23A0201T	3 : 0 : 0	3	CIE: 30 SEE:70	3 Hours	ESC

Course Objectives:

To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

SYLLABUS		Total Hours:48
Unit- I	**DC & AC Circuits**	**10**

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL &KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

Unit- II	Machines and Measuring Instruments	8

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

Unit- III	Energy Resources, Electricity Bill & Safety Measures	10

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops,Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker(MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, FirstEdition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti,Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, ThirdEdition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019,Fourth Edition

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2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford UniversityPress, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications,2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

Course Outcomes:

On completion of this course, the students are able to:

CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MIinstruments.
CO2: Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
CO3: Apply mathematical tools and fundamental concepts to derive various equations relatedto machines, circuits and measuring instruments; electricity bill calculations and layout CO5: Develop problem-solving skills and the ability to debug and optimize the code.
CO4: Analyze different electrical circuits, performance of machines and measuring instruments.
CO5: Evaluate different circuit configurations, Machine performance and Power systems operation.

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications

SYLLABUS		**Total Hours:48**
Unit- I	**Semiconductor Devices**	**10**
Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics ofPN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.		
Unit- II	**Basic Electronic Circuits and Instrumentation**	**8**
Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.		
Unit- III	**DIGITAL ELECTRONICS**	**10**
Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XORand XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)		

Textbooks:

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1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall,India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version,Pearson Education, 2009.

Course Outcomes:

On completion of this course, the students are able to:

CO1: Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.

CO2: Explain the characteristics of diodes and transistors.

CO3: Familiarize with the number systems, codes, Boolean algebra and logic gates.

CO4: Understand the working mechanism of different combinational, sequential circuits andtheir role in the digital systems.

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B. Tech I Year I semester

ENGINEERING GRAPHICS
(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
23A0301	1 : 0 : 4	3	CIE: 30 SEE:70	3 Hours	ESC

Course Objectives:

The students completing the course are expected to:

- Understand the basic principles and conventions of engineering drawing use engineering instruments and draw engineering curves.
- Use orthographic projections and make the students draw the projections of lines and planes inclined to both the planes.
- Draw the projections of the solids in different positions with respect to the reference planes.
- Understand the importance of sectioning and concept of development of surfaces.
- Represent and convert isometric views to orthographic views and vice versa.

SYLLABUS	Total Hours:48
Unit- I	**10**

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

Unit- II	8

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

Unit- III	10

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Unit- IV	10

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development Parallel line development and radial line

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development. Development of a cube, prism, cylinder, pyramid and cone.

Unit- V	**10**

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Textbooks:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson EducationInc, 2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

Course Outcomes:

On completion of this course, the students are able to:

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.

CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.

CO3: Understandandapplyconceptsofsectionalviewstorepresentdetailsofsolidsinsimple positions.

CO4: Gain a clear understanding of the principles behind development of surfaces and to understand how to unfold basic geometric shapes into flat patterns.

CO5: Developtheabilitytodrawisometricviewsandorthographicviewsandshouldbeable to convert isometric views to orthographic views and vice versa.

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B. Tech I Year I semester

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
(Common to all branches)

Course Code	L: T:P	Credits	Exam.Marks	Exam Duration	Course Type
23A0202P	**0:0:3**	**1.5**	**CIE:30** **SEE:70**	**3 Hours**	**ESC**

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

Syllabus

Activities:

- Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
- Provide some exercises so that hardware tools and instruments are learned to be usedby the students.
- Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
- Provide some exercises so that measuring instruments are learned to be used by thestudents.
- Components:
- Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc
- Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Note: Minimum Six Experiments to be performed.

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, FirstEdition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti,Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, ThirdEdition

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Course Outcomes:

CO1: Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.

CO2: Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.

CO3: Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.

CO4: Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.

CO5: Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:

To impart knowledge on the principles of digital electronics and fundamentals ofelectron devices & its applications.

Syllabus

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gatesusing ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

References:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Course Outcomes:

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

CO1: Identify & testing of various electronic components.

CO2: Understand the usage of electronic measuring instruments.

CO3: Plot and discuss the characteristics of various electron devices.

CO4: Explain the operation of a digital circuit.

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B. Tech I Year I semester

IT WORKSHOP
(Common to all branches)

Course Code	L: T:P	Credits	Exam.Marks	Exam Duration	Course Type
23A0503P	**0:0:3**	**1**	**CIE:30** **SEE:70**	**3 Hours**	**ESC**

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spreadsheets and Presentation tools.

Syllabus

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task2: EverystudentshoulddisassembleandassemblethePCbacktoworkingcondition.Labinstructorsshouldverifytheworkandfollowitupwitha Viva.Alsostudentsneedtogothroughthe video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot(VMWare)withbothWindowsandLinux.Labinstructorsshouldverifytheinstallationandfollowitupwitha Viva

Task5: EverystudentshouldinstallBOSSonthecomputer.Thesystemshouldbeconfiguredas dual boot (VM Ware) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their LocalAreaNetworkandaccesstheInternet.IntheprocesstheyconfiguretheTCP/IPsetting.Finallystudentsshoulddemonstrate,totheinstructor,howtoaccessthewebsitesandemail. If there is No internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task3: Search Engines &Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

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Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active downloads to avoid viruses and/or worms.

Task 5:

Install any anti-virus software on your computer

LaTeX and WORD

Task 1: Word Orientation: The mentor needs to give an overview of Latex and Microsoft(MS)office or equivalent(FOSS) tool word: Importance of Latex and MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using Latex and word– Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using Latex and Word to create a project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table,BulletsandNumbering,ChangingTextDirection,Cellalignment,Footnote,Hyperlink,Symbols,SpellCheck,TrackChanges.

Task4: Creating a News letter: Features to be covered:-Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent(FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would becoveredineach.UsingExcel–Accessing,overviewoftoolbars,savingexcelfiles,Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel –average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking,
Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWERPOINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, WordArt, Formatting Text, Bullets and Numbering, AutoShapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slides lotter, notes etc),and Inserting–Background,textures,DesignTemplates,Hiddenslides.

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B. Tech I Year I semester

AITOOLS– Chat GPT

Task1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing in complete sentences to see how the model completes them.
Ex: Prompt:"You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dreamtech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware- A Handbook, Kate J. Chase, PHI(Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme.– CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan–CISCO Press, Pearson Education, 3rdedition

Course Outcomes:

CO1: Perform Hardware trouble shooting.
CO2: Understand Hardware components and interdependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/ Presentation preparation.
CO5: Perform calculations using spreadsheets.

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B. Tech I Year I semester

ENGINEERING PHYSICS LAB (Common to all branches)					
Course Code	**L: T:P**	**Credits**	**Exam.Marks**	**Exam Duration**	**Course Type**
23A0006P	**0 : 0 : 2**	**1**	**CIE:30 SEE:70**	**3 Hours**	**BS&H**

Course Objectives:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Syllabus

List of Experiments

1. Determination of radius of curvature of a given plano convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using
3. diffraction grating in normal incidence configuration.
4. Verification of Brewster's law
5. Determination of wavelength of Laser light using diffraction grating.
6. Estimation of Planck's constant using photoelectric effect.
7. Magnetic field along the axis of a current carrying circular coil by Stewart Gee'sMethod.
8. Determination of dielectric constant using charging and discharging method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. Determination of magnetic susceptibility by Kundt's tube method.
11. Determination of the resistivity of semiconductors by four probe methods.
12. Determination of energy gap of a semiconductor using p-n junction diode.
13. Determination of Hall voltage and Hall coefficient of a given semiconductor usingHall Effect.
14. Determination of temperature coefficients of a thermistor.
15. Determination of rigidity modulus of the material of the given wire using Torsionalpendulum.
16. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
17. Determination of Frequency of electrically maintained tuning fork by Melde'sexperiment.
18. Sonometer : Verification of laws of stretched string.
19. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum

Note: Any **TEN** of the listed experiments are to be conducted. Out of which any **TWO** experiments may be conducted in virtual mode.

References:

1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. ChandPublishers, 2017.

Course Outcomes:

CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate dielectric constant of capacitor and magnetic induction of current carrying coil
CO3: Identify the type of semiconductor and calculate band gap of it.
CO4: Evaluate different modulus of materials.
CO5: Measure the frequency of tuning fork and verify the laws in Sonometer

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B. Tech I Year I semester

HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
23AYG01P	0 : 0 : 1	0.5	CIE: 30 SEE:70	3 Hours	MC

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

SYLLABUS

Unit- I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

Unit- II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

Unit- III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics.
ii) Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice.
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993.
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014.
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.

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B. Tech I Year I semester

2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

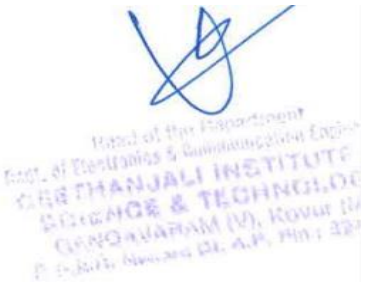
- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.

A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

Course Outcomes:

On completion of this course, the students are able to:

CO-1: Understand the importance of yoga and sports for Physical fitness and sound health.
CO-2: Demonstrate an understanding of health-related fitness components.
CO-3: Compare and contrast various activities that help enhance their health.
CO-4: Compare and contrast various activities that help enhance their health.
CO-5: Develop Positive Personality



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B. Tech I Year II Semester (Theory-5, Lab-4)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BS&H	23A0009T	Communicative English	2	0	0	2
2	BS&H	23A0004T	Engineering Chemistry / Chemistry	3	0	0	3
3	ES	23A0002T	Differential Equations and vector calculus	3	0	0	3
4	ES	23A0101T	Basic Civil and Mechanical Engineering	3	0	0	3
5	PC	23A0205T	Network Analysis / Electrical Circuits Analysis – I / Data Structures)	3	0	0	3
6	ES	23A0302P	Engineering Workshop	0	0	3	1.5
7	BS&H	23A0010P	Communicative English Lab	0	0	2	1
8	BS&H	23A0007P	Engineering Chemistry Lab	0	0	2	1
9	PC	23A0206P	Network Analysis and Simulation Lab	0	0	3	1.5
10	MC	23ANS01P	NSS/NCC/Scouts and Guides / Community Service	0	0	1	0.5
			Total credits				**19.5**

K. Sravan kumar
MEMBER SECRETARY

Head of the Department
Dept. of Electronics & Communication Engineering
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B. Tech I Year II semester

COMMUNICATIVE ENGLISH
(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
230009T	2 : 0 : 0	2	CIE: 30 SEE:70	3 Hours	BS&H

Course Objectives:

- Facilitate effective **listening skills** for better comprehension of academic lectures and English spoken by native speakers
- Help improve **speaking skills** motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate **reading skills** for comprehension of various academic texts and authentic materials
- Impart effective strategies for good **writing skills** in summarizing, writing well organized essays, drafting formal letters and designing well structured reports
- Broaden the knowledge base of **grammatical structures** and **vocabulary** and encourage their appropriate use in speech and writing

SYLLABUS		Total Hours:32
Unit- I	**HUMAN VALUES: Gift of Magi (Short Story)**	**8**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text Scanning to look for specific pieces of information.
Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

Unit- II	**The Brook by Alfred Tennyson (Poem)**	**7**

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structured talks**.**
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

Unit- III	**BIOGRAPHY: Elon Musk**	**6**

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing

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B. Tech I Year II semester

Grammar: Verbs - tenses; subject-verb agreement; Compound words**,**
Vocabulary: Compound words, Collocations

Unit- IV	**INSPIRATION: The Toys of Peace -Saki**	**6**

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data
Writing: Letter Writing: Official Letters, Resumes
Grammar : Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

Unit- V	**MOTIVATION: The Power of Intrapersonal Communication (An Essay)**	**5**

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading for Comprehension
Writing: Writing structured essays on specific topics**.**
Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

Textbooks:

1. " Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

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1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Course Outcomes:

On completion of this course, the students are able to:

CO1: The learner will be able to speak and write grammatically accurate sentences through applications of principles of English grammar

CO2: The learner will enhance vocabulary skills to build strong language skills.

CO3: The learner acquires the ability to understand the academic text from multiple dimensions employing ethical and logical reasoning based on accurate comprehension

CO4: The learner gains evaluation potential by employing standard reading & listening strategies to grasp the core essence and spirit of the text

CO5: The learner will gain mastery on speaking & writing skills through the application of relevant guidelines, through consistent practice of functional English expression

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B. Tech I Year II semester

CHEMISTRY
(Common to CSE, AI&ML, CS, ECE, EEE, DS)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
230004T	3 : 0 : 0	3	CIE: 30 SEE:70	3 Hours	BS&H

Course Objectives:

- To familiarize chemistry and its applications.
- To train the students on the principles and applications of electrochemistry and polymers.
- To introduce instrumental methods.

SYLLABUS		Total Hours:48
Unit- I	**Structure and Bonding Models**	**9**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ2, particle in one dimensional box, molecular orbital theory – bonding in homo- and hetero-nuclear diatomic molecules – energy level diagrams of O2, CO, and NO. π- molecular orbitals of butadiene and benzene, calculation of bond order.

Unit- II	**Modern Engineering materials**	**10**

Semiconductors – Introduction, basic concept, application

Superconductors: Introduction, Basic concept and Applications.

Super capacitors: Introduction, Basic concept, Classification and Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphine nano particles

Unit- III	**Electrochemistry and Applications**	**10**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry-potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

Unit- IV	**Polymer Chemistry**	**10**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications.

Biodegradable polymers - **poly dioxanone,** Polyglycolic Acid (PGA), Polylactic Acid (PLA).

Unit- V	**Instrumental Methods and applications**	**9**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification, **Gas chromatography,** HPLC: Principle, Instrumentation and applications.

Textbooks:

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1. 1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.

Reference Books:

1. 1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. J.M.Lehn, Supra Molecular Chemistry, VCH Publications

Course Outcomes:

On completion of this course, the students are able to:

CO1: Describe Planck's quantum theory, dual nature of matter, Schrodinger equation, molecular orbital Theory and molecular orbital energy level diagram of differentmolecules

CO2: Explain Crystal field theory, splitting in octahedral and tetrahedral geometry and the magnetic behavior, Oxidation state, coordination and color of complexes.

CO3: Explain the principle of Band diagrams of conductors, superconductor, semiconductorsand insulator and nonmaterial

CO4: Discuss the principles of electrochemistry in potentiometry, conductometry, battery and electrochemical sensors

CO5: Explain polymerization and the preparation, properties, and applications of thermoplastics &thermosetting, elastomers, & conducting polymers

CO6: Discuss the different applications of analytical instruments

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B. Tech I Year II semester

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
230002T	3 : 0 : 0	3	CIE: 30 SEE:70	3 Hours	ES

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

SYLLABUS		Total Hours:45
Unit- I	**Differential equations of first order and first degree**	**9**
Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decayElectrical circuits.		
Unit- II	**Linear differential equations of higher order (Constant Coefficients)**	**9**
Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.		
Unit- III	**Partial Differential Equations**	**9**
Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.		
Unit- IV	**Vector differentiation**	**9**
Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.		
Unit- V	**Vector integration**	**9**
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems		

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. 2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International

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Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017
6. 6. Engineering Mathematics I by T.K.V. Iyengar, B.Krishna Gandhi,, S. Chand Publications, 2015 Edition.

Course Outcomes:

On completion of this course, the students are able to:

CO1: Solve the first order differential equations related to various engineering fields.
CO2: Solve the linear differential equations of higher order with constant coefficients
CO3: Identifysolutionmethodsforpartialdifferentialequationsthatmodelphysical processes.
CO4: Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO5: Apply Green's, Stokes and Divergence theorem in work done, circulation, flux and triple integrals.

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B. Tech I Year II semester

BASIC CIVIL & MECHANICAL ENGINEERING
(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
230101T	3 : 0 : 0	3	CIE: 30 SEE:70	3 Hours	ES

Course Objectives:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water
- Introduction to basic civil engineering materials and construction techniques

SYLLABUS	Total Hours:45

PART-A

Unit- I	9

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of CivilEngineering-StructuralEngineering-Geo-technicalEngineering-TransportationEngineering Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of eachdiscipline-BuildingConstructionandPlanning-ConstructionMaterials-Cement-Aggregate-Bricks-Cementconcrete-Steel.Introductionto Prefabricated construction Techniques

Unit- II	10

Fluid Mechanics: Properties of fluids and types of fluids.
Surveying: Objectives of Surveying- Horizontal Measurements-Angular Measurements-Introduction to Bearings Leveling instruments used for leveling – Simple problems on leveling and bearings-Contour mapping.

Unit- III	9

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements-Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.
Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water-Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs)

Textbooks:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. BasicCivilEngineering,SatheeshGopi,PearsonPublications,2009,FirstEdition

Reference Books:

1. Surveying, Vol -I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers,Delhi.2016

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3. Irrigation Engineering and Hydraulic Structures – Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K. Khanna, C.E.G. Justoand Veeraraghavan, Nemchandand Brothers Publications 2019. 10th Edition.

E- Resources :

https://archive.nptel.ac.in/courses/105/106/105106201/

PART-B	
Unit- I	**9**
Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.	
Unit- II	**9**
Manufacturing Processes: Principles of Casting, Forming, and joining processes, Machining, Introduction CNC machines, 3D printing, and Smart manufacturing. **Thermal Engineering** – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles	
Unit- III	**9**
Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants. Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications. Introduction to **Robotics** - Joints & links, configurations, and applications of robotics. (Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)	
Textbooks: 1.Internal Combustion Engines by V. Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd. 2.A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd. 3.An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, cengage learning India pvt. Ltd	
Reference Books: 1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I 2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications 3. Thermal Engineering by Mahesh M Rathore Tata Mcgraw Hill publications (India) Pvt. Ltd. 4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata Mcgraw Hill publications (India) Pvt. Ltd.	
Course Outcomes: On completion of this course, the students are able to:	

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CO1: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying

CO2: Realize the importance of Transportation in nation's economy and the engineering measures related to highways in terms of geometrics

CO3: Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.

CO4: Understand the different manufacturing processes

CO5: The basics of thermal engineering and its applications.

CO6: Describe the working of different mechanical power transmission systems and power Plants; learn basics of robotics.

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B. Tech I Year II semester

NETWORK ANALYSIS					
Course Code	**L : T : P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23A0205T	**3 : 0 : 0**	**3**	**CIE: 30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

- To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
- To impart knowledge on applying appropriate theorem for electrical circuit analysis
- To explain transient behavior of circuits in time and frequency domains
- To teach concepts of resonance
- To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship

SYLLABUS	**Total Hours:45**
Unit- I	**9**

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples.

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens - problem solving using dependent sources also.

Unit- II	**9**

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots.

Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

Unit- III	**9**

Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.

Unit- IV	**9**

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.

Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits-problem solving.

Unit- V	**9**

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also.

Image and iterative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching networks.

Textbooks:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin,

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9th Edition 2020.
3. Network lines and Fields by John. D. Ryder 2nd Edition, PHI

Reference Books:

1. D. Roy Choudhury, Networks and Systems, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education.

Course Outcomes:

On completion of this course, the students are able to:

CO1: Understand basic electrical circuits with nodal and mesh analysis.
CO2: Analyse the circuit using network simplification theorems.
CO3: Find Transient response and Steady state response of a network.
CO4: Analyse electrical networks in the Laplace domain.
CO5: Compute the parameters of a two-port network.

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B. Tech I Year II semester

ENGINEERING WORKSHOP
(Common to all branches)

Course Code	L: T:P	Credits	Exam.Marks	Exam Duration	Course Type
23A0302P	**0 : 0 : 3**	**1.5**	**CIE:30 SEE:70**	**3 Hours**	**ES**

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Syllabus

List of Experiments

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a. Half –Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b)Conical funnel c)Elbow pipe d)Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit b) Dovetail fit c)Semi-circular fit
   d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b)Two-way switch c) Go down lighting
   d)Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Text Books:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn.2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 &2017.

References:

1. Elements of Workshop Technology, Vol. I by S.K. Hajra Choudhury &Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

Course Outcomes:

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, and foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

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B. Tech I Year II semester

COMMUNICATIVE ENGLISH LAB
(Common to all branches)

Course Code	L: T:P	Credits	Exam.Marks	Exam Duration	Course Type
23A0010P	**0 : 0 : 2**	**1**	**CIE:30** **SEE:70**	**3 Hours**	**BS&H**

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning students will get trained in the basic communication skills and also make them ready to face job interviews

Syllabus

List of Experiments

1. VOWELS & CONSONANTS
2. NEUTRILIZATION/ ACCENT RULES
3. COMMUNICATION SKILLS & JAM
4. ROLE PLAY OR CONVERSATIONAL PRACTICE
5. EMAIL WRIRING
6. RESUME WRITING, COVER LETTER, SOP
7. GRPOUP DISCUSSION-METHODS & PRACTICE
8. DEBATE - METHOD & PRACTICE
9. PPT PRESENTATION / PSTER PRESENTATION
10. INTERVIEW SKILLS

Suggested Software: Walden InfoTech / Young India Films

References:

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students,(3rd Ed) Trinity Press.

Online Learning Resources/Virtual Labs:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured

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B. Tech I Year II semester

10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc

Course Outcomes:

CO1: Analyze the English speech sounds, stress, intonation for better Listening practice

CO2: Apply communication skills through various language learning activities

CO3: Application of writing skills through design and preparation of professional Resume & email writing

CO4: Create effective resonate and prepare themselves to face interviews in future

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B. Tech I Year II semester

CHEMISTRY LAB
(Common to CSE, AI&ML, ECE, EEE, DS)

Course Code	L: T:P	Credits	Exam.Marks	Exam Duration	Course Type
23A0007P	0 : 0 : 2	1	CIE:30 SEE:70	3 Hours	BS&H

Course Objectives:

- Verify the fundamental concepts with experiments

Syllabus

List of Experiments

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Simultaneous estimation of Mn and Cr ions by spectrophotometry in water samples.
10. Wavelength measurement of sample through UV-Visible Spectroscopy
11. Identification of functional groups in organic compounds by IR Spectroscopy.
12. Preparation of nano materials by precipitation method
13. Estimation of Ferrous Iron by Dichrometry
14. Determination of Hardness of a groundwater sample
15. pH metric titration of strong acid vs strong base

(**Any 10 experiments from the above list)References:**

Text Book(s):

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Jain & Jain. Engineering Chemistry: Dhanapath rai Publications., 2015.
3. S.S.Dara, Experiments and Calculations in Engineering Chemistry: S-Chand Publications,Revised edition, 2008.

Reference Book(s):

1. "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publicationsby J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

Course Outcomes:

CO1: Determine the cell constant and conductance of solutions and the strength of an acid by conductometry

CO2: Synthesize of advanced polymer materials

CO3: Measure the strength of an acid present in secondary battery and Ferrous ion usingvolumetric analysis

CO4: Determine the potentials and EMFs of solutions by Potentiometry

CO5: Identify some organic and inorganic compounds by instrumental methods

CO6: Synthesize of nano materials by simple methods

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B. Tech I Year II semester

NETWORK ANALYSIS AND SIMULATION LABORATORY					
Course Code	**L: T:P**	**Credits**	**Exam.Marks**	**Exam Duration**	**Course Type**
23A0206P	**0 : 0 : 3**	**1.5**	**CIE:30 SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- To gain hands on experience in verifying Kirchoff's laws and network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters

Syllabus

List of Experiments (**Conduct all experiments)**

The following experiments need to be performed using both Hardware and simulation Software.
The experiments need to be simulated using software and the same need to be verified using the hardware.

1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits
4. Verification of maximum power transfer theorem for AC circuits
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Study of DC transients in RL, RC and RLC circuits
7. To study frequency response of various 1st order RL & RC networks
8. To study the transient and steady state response of a 2nd order circuit by varying its various parameters and studying their effects on responses
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
10. Determination of open circuit (Z) and short circuit (Y) parameters
11. Determination of hybrid (H) and transmission (ABCD) parameters
12. To measure two port parameters of a twin-T network and study its frequency response.

Hardware Requirements:

Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components.

Software requirements:

Multisim/ Pspice/Equivalent simulation software tool, Computer Systems with required specifications.

References:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.

Course Outcomes:

CO1: Implement various DSP Algorithms using MATLAB.
CO2: Implement DSP algorithms with Digital Signal Processor.
CO3: Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of

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digital IIR-Butterworth filters.

CO4: Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital IIR- Chebyshev filters.

CO5: Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.

CO6: Analyze and implement various digital filters.

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B. Tech I Year II semester

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

(Common to all branches)

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
23ANS01P	**0 : 0 : 1**	**0.5**	**CIE: 30** **SEE:70**	**3 Hours**	**BS&H**

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

SYLLABUS

Unit- I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution

Unit- II Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

Unit- III Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders Survey in the village, identification of problems- helping them to solve via media authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.

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iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Any other programmes in collaboration with local charities, NGOs etc

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service SchemeVol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

Course Outcomes:

On completion of this course, the students are able to:

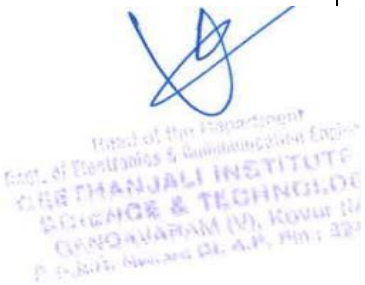
CO-1: Understand the importance of discipline, character and service motto

CO-2: Solve some societal issues by applying acquired knowledge, facts, and techniques.

CO-3: Explore human relationships by analyzing social problems.

CO-4: Determine to extend their help for the fellow beings and downtrodden people.

CO-5: Develop leadership skills and civic responsibilities.



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B. Tech II Year I Semester (Theory-5, Lab-2, SEC-1,AC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	BS	23A0014T	Probability and Complex Variables	3	0	0	3
2.	HSM	23A0021T	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3
3.	ES	23A0401T	Signals, Systems and Stochastic Processes	3	0	0	3
4.	PC	23A0402T	Electronic Devices and Circuits	3	0	0	3
5.	PC	23A0403T	Digital Circuits Design	3	0	0	3
6.	PC	23A0404P	Electronic Devices and Circuits Lab	0	0	3	1.5
7.	PC	23A0405P	Digital Circuits & Signal Simulation Lab	0	0	3	1.5
8.	SEC	23A0510P	Python Programming	0	1	2	2
9.	MC	23A0109T	Environmental Science	2	0	0	-
Total				**16**	**02**	**08**	**20**

K. Sravan kumar
MEMBER SECRETARY

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B. Tech II Year I semester

PROBABILITY AND COMPLEX VARIABLES					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0014T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**BS**

Syllabus		**Total Hours: 45**
Unit-I	**Probability Distributions**	**9 Hrs**

Introduction to Probability Theory, Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh.

Moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function.

Unit-II	**Operations On Random Variable**	**9 Hrs**

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence.

Unit -III	**Operations On Multiple Random Variables**	**9 Hrs**

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables.

Unit -IV	**Complex Variable – Differentiation**	**9 Hrs**

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.

Unit -V	**Complex Variable – Integration**	**9 Hrs**

Line integral-Contour integration, Cauchy's integral theorem(Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof).

Textbooks:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition

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Reference Books:

1. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India
3. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing," 3rd Edition, Pearson Education, 2002.
4. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill publishers.

E-resources:

1. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma66/preview#:~:text=This%20course%20provides%20random%20variable,and%20simple%20Markovian%20queueing%20models.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the concepts of Probability, Random Variables and their characteristics (L2)

CO2: Learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L3, L5)

CO3: Formulate and solve the engineering problems involving random variables. (L3)

CO4: Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.(L2, L3)

CO5: Understand Cauchy theorem, Cauchy integral formulas and apply these to evaluate complex contour integrals. Classify singularities and poles, residues.(L3)

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B. Tech II Year I semester

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0021T	2:1:0:0	3	CIE:30 SEE:70	3 Hours	HSM

Course Objectives:

1. To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Syllabus

Unit-I	Introduction to Value Education (6 lectures and 3 tutorials for practice session)

- Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
- Understanding Value Education
- Practice Session PS1 Sharing about Oneself
- self-exploration as the Process for Value Education
- Continuous Happiness and Prosperity – the Basic Human Aspirations
- Exploring Human Consciousness
- Happiness and Prosperity – Current Scenario
- Method to Fulfill the Basic Human Aspirations
- Exploring Natural Acceptance

Practice Sessions for UNIT I – Introduction to Value Education

- PS1 Sharing about Oneself
- PS2 Exploring Human Consciousness
- PS3 Exploring Natural Acceptance

Unit-II	Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

- Understanding Human being as the Co-existence of the self and the body.
- Distinguishing between the Needs of the self and the body
- Exploring the difference of Needs of self and body.
- The body as an Instrument of the self
- Understanding Harmony in the self
- Exploring Sources of Imagination in the self
- Harmony of the self with the body

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- Programme to ensure self-regulation and Health
- Exploring Harmony of self with the body

Practice Sessions for UNIT II – Harmony in the Human Being

- PS4 Exploring the difference of Needs of self and body
- PS5 Exploring Sources of Imagination in the self
- PS6 Exploring Harmony of self with the body

Unit -III	**Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)**

- Harmony in the Family – the Basic Unit of Human Interaction
- Trust' – the Foundational Value in Relationship
- Exploring the Feeling of Trust
- 'Respect' – as the Right Evaluation
- Exploring the Feeling of Respect
- Other Feelings, Justice in Human-to-Human Relationship
- Understanding Harmony in the Society
- Vision for the Universal Human Order
- Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT III – Harmony in the Family and Society

- PS7 Exploring the Feeling of Trust
- PS8 Exploring the Feeling of Respect
- PS9 Exploring Systems to fulfil Human Goal

Unit -IV	**Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)**

- Understanding Harmony in the Nature
- Interconnectedness, self-regulation and Mutual Fulfilment among
- the Four Orders of Nature
- Exploring the Four Orders of Nature
- Realizing Existence as Co-existence at All Levels
- The Holistic Perception of Harmony in Existence
- Exploring Co-existence in Existence.

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

- PS10 Exploring the Four Orders of Nature
- PS11 Exploring Co-existence in Existence

Unit -V	**Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)**

- Natural Acceptance of Human Values
- Definitiveness of (Ethical) Human Conduct
- Exploring Ethical Human Conduct
- A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
- Competence in Professional Ethics
- Exploring Humanistic Models in Education

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B. Tech II Year I semester

- Holistic Technologies, Production Systems and Management Models-Typical Case Studies
- Strategies for Transition towards Value-based Life and Profession
- Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

- PS12 Exploring Ethical Human Conduct
- PS13 Exploring Humanistic Models in Education
- PS14 Exploring Steps of Transition towards Universal Human Order

Textbooks:

1. R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria,*Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.

E-resources:

1. https://fdp-si.aicte-india.org/UHV- %20Class%20Notes%20&%20Handouts/UHV%20Handout%201 Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-0Respect%20July%2023.pdf

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
CO2: Identify one's self, and one's surroundings (family, society nature) (L1, L2)
CO3: Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
CO4: Relate human values with human relationship and human society. (L4)
CO5: Justify the need for universal human values and harmonious existence (L5)
CO6: Develop as socially and ecologically responsible engineers (L3, L6)

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B. Tech II Year I semester

SIGNALS, SYSTEMS AND STOCHASTIC PROCESSES					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0401T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**ES**

Course Objectives:

- Understanding the basics of signals and systems required for ECE courses.
- To teach concepts of signals and systems and its analysis using different transform techniques.
- To provide basic understanding of random processes which is essential for the random signals and systems encountered in communications and signal Processing areas

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error,

Fourier series: Trigonometric & Exponential forms of Fourier series, Properties, Concept of discrete spectrum, Illustrative Problems.

Unit-II	**9 Hrs**

Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing. Illustrative Problems.

Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the s-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions, Illustrative Problems.

Unit -III	**9 Hrs**

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

Unit -IV	**9 Hrs**

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict Sense Stationarity, Time Averages and Ergodicity, Autocorrelation

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B. Tech II Year I semester

Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

Unit -V	**9 Hrs**

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

Textbooks:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd Edition, PHI, 2009.

Reference Books:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002
3. Simon Haykin and Van Veen, "Signals & Systems", 2nd Edition, Wiley, 2005.
4. Matthew Sadiku and Warsame H. Ali, "Signals and Systems A primer with MATLAB", CRC Press, 2016.
5. Hwei Hsu, "Schaum's Outline of Signals and Systems", 4thEdition, TMH, 2019.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the mathematical description and representation of continuous-time and discrete-time signals and systems.

CO2: understand the concepts of various transform techniques and Random Processes (L2)

CO3: Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L3)

CO4: Formulate and solve engineering problems involving random processes. (L3)

CO5: Analyze the frequency spectra of various continuous-time signals using different transform methods. (L4)

CO6: Classify the systems based on their properties and determine the response of them. (L4)

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B. Tech II Year I semester

ELECTRONIC DEVICES & CIRCUITS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0402T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

- Students will be able understand the basic principles of all semiconductor devices.
- Able to analyze diode circuits, various biasing and small signal equivalent circuits of amplifiers, compare the performance of BJTs and MOSFETs
- Able to design rectifier circuits and various amplifier circuits using BJTs and MOSFETs.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

PN junction diode: Band structure of PN Junction, Quantitative Theory of PN Diode, types of PN junction diode, VI Characteristics, PN diode current equation, Diode resistance, Transition and Diffusion Capacitance, effect of temperature on PN junction diode, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics, Clipping and Clamping circuits, Voltage doubler ,Illustrative problems.

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, Varactor Diode, LED, LCD, Photo Diode, SCR and UJT.

Unit-II	**9 Hrs**

Bipolar Junction Transistors: Transistor construction, BJT Operation, Transistor as an Amplifier and as a Switch, Common Emitter, Common Base and Common Collector Configurations, Limits of Operation, BJT Specifications.

Biasing and Stabilization: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self-Bias, Bias Stability, Thermal Runaway, Thermal Stability, Illustrative problems

Unit -III	**9 Hrs**

MOS Field Effect Transistors: Introduction, Device Structure and Physical Operation, CMOS, V - I Characteristics, MOSFET Circuits at DC, MOSFET as an Amplifier and as a Switch. Biasing in MOS **Amplifier circuits** - biasing by fixing VGS with and without source resistance, biasing using drain to gate feedback resistor, biasing using constant current source, body effect, Problem solving.

Unit -IV	**9 Hrs**

BJT Small Signal Operation and Models- the transconductance, input resistance at the base, input resistance at the emitter, Voltage gain, separating the Signal and the DC Quantities, The Hybrid π Model, the T Model. Single Stage BJT Amplifiers - Common-Emitter (CE) amplifier without and with emitter resistance, Common-Base (CB) amplifier, Common-Collector (CC) amplifier or Emitter Follower, Problem solving.

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B. Tech II Year I semester

Unit -V	**9 Hrs**

MOSFET Small Signal Operation Models– the dc bias, separating the DC analysis and the signal analysis, Small signal equivalent circuit models, the transconductance, the T equivalent circuit model, Single stage MOS Amplifiers – common source (CS) amplifier without and with source resistance, common gate (CG) amplifier, source follower, Problem Solving.

Textbooks:

1. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits – Theory and Applications", 6th Edition, Oxford Press, 2013.
2. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.

Reference Books:

1. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.
2. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
3. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand principle of operation, characteristics and applications of Semiconductor diodes, Bipolar Junction Transistor and MOSFETs. (L2)

CO2: Applying the basic principles solving the problems related to Semiconductor diodes, BJTs, and MOSFETs. (L3)

CO3: Analyze diode circuits for different applications such as rectifiers, clippers and clampers (L4)

CO4: analyze biasing circuits of BJTs, and MOSFETs. (L4)

CO5: Design of diode circuits and amplifiers using BJTs, and MOSFETs. (L4)

CO6: Compare the performance of various semiconductor devices. (L4)

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B. Tech II Year I semester

DIGITAL CIRCUITS DESIGN					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0403T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

- Understand the properties of Boolean algebra, logic operations, and minimization of Boolean functions.
- Analyze combinational and analyze sequential logic circuits.
- Understand the concepts of FSM and compare various Programmable logic devices.
- Model combinational and sequential circuits using HDLs.

Syllabus		**Total Hours: 45**
Unit-I	**Boolean algebra, logic operations, and minimization of Boolean functions**	**9 Hrs**

Number Systems and Codes, Representation of unsigned and signed integers, Floating Point representation of real numbers, Laws of Boolean Algebra, Theorems of Boolean Algebra, Realization of functions using logic gates, Canonical forms of Boolean Functions, Minimization of Functions using Karnaugh Maps.

Unit-II	**Combinational Logic Circuits**	**9 Hrs**

Combinational circuits, Design with basic logic gates, design procedure, adders, subtractors, 4-bit binary adder/ subtractor circuit, BCD adder, carry look- a-head adder, binary multiplier, magnitude comparator, data selectors, priority encoders, decoders, multiplexers, demultiplexers.

Unit -III	**Hardware Description Language**	**9 Hrs**

Introduction to Verilog - structural specification of logic circuits, behavioral specification of logic circuits, hierarchical Verilog Code, Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop using storage elements with CAD tools-using Verilog constructs for storage elements, flip-flop with clear capability, using Verilog constructs for registers and counters.

Unit -IV	**Sequential Logic Circuits**	**9 Hrs**

Basic architectural distinction between combinational and sequential circuits, Design procedure, latches, flip-flops, truth tables and excitation tables, timing and triggering consideration, conversion of flip- flops, design of counters, ripple counters, synchronous counters, ring counter, Johnson counter, registers, shift registers, universal shift register.

Unit -V	**Finite State Machines and Programmable Logic Devices**	**9 Hrs**

Types of FSM, capabilities and limitations of FSM, state assignment, realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa, reduction of state tables using partition technique, Design of

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sequence detector. Types of PLD's: PROM, PAL, PLA, basic structure of CPLD and FPGA, advantages of FPGAs, Design of sequential circuits using ROMs, PLAs, CPLDs and FPGAs,

Textbooks:

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI. (Unit I to IV)
2. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill (Unit V)

Reference Books:

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers.
2. ZviKohavi and NirajK.Jha, "Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.
4. D.P. Leach, A.P. Malvino, "Digital Principles and Applications", TMH, 7th Edition.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the properties of Boolean algebra and logic operations (L2)

CO2: Understand the concepts of FSM (L2)

CO3: Apply techniques for minimization of Boolean functions (L3)

CO4: Analyze combinational and Sequential logic circuits. (L4)

CO5: Compare various Programmable logic devices. (L4)

CO6: Design and Model combinational and sequential circuits using HDLs. (L5, L6)

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B. Tech II Year I semester

ELECTRONIC DEVICES & CIRCUITS LAB					
Course Code	**L:T:P**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
23A0404P	**0:0:3**	**1.5**	**CIE:30** **SEE:70**	**3 Hours**	**PC**

Syllabus

LIST OF EXPERIMENTS: (Execute any 12 experiments).

Note: All the experiments shall be implemented using both Hardware and Software.

1. Verification of Volt- Ampere characteristics of a PN junction diode and find static, dynamic and reverse resistances of the diode from the graphs obtained.
2. Design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally. Vary the load and find ripple factor. Draw suitable graphs.
3. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs.
4. Design a Zener diode-based ***voltage regulator*** against variations of supply and load. Verify the same from the experiment.
5. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find ***Threshold voltage (V_T), g_m, & K*** from the graphs.
6. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Depletion mode) or JFET in Common Source Configuration experimentally. Find ***I_{DSS}, g_m, & V_P*** from the graphs.
7. Verification of the input and output characteristics of BJT in **Common Emitter** configuration experimentally and find required ***h – parameters*** from the graphs.
8. Study and draw the input and output characteristics of BJT in **Common Base** configuration experimentally and determine required ***h – parameters*** from the graphs.
9. Study and draw the Volt Ampere characteristics of UJT and determine ***η, I_P, I_v, V_P, &Vv*** from the experiment.
10. Design and analysis of voltage- divider bias/self-bias circuit using BJT.
11. Design and analysis of self-bias circuit using MOSFET.
12. Design a suitable circuit for switch using MOSFET/BJT.
13. Design a small signal amplifier using MOSFET (common source) for the given specifications. Draw the frequency response and find the bandwidth.
14. Design a small signal amplifier using BJT(common emitter) for the given specifications. Draw the frequency response and find the bandwidth.

Tools / Equipment Required: Software Toollike Multisim/ Pspice or Equivalent,
DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

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B. Tech II Year I semester

Course Outcomes:

After the completion of the course students will be able to:

CO1: Understand the characteristics and applications of basic electronic devices. (L2)

CO2: Plot the characteristics of electronic devices. (L3)

CO3: Analyze various biasing circuits and electronic circuits as amplifiers (L4).

CO4: Design MOSFET / BJT based amplifiers for the given specifications. (L5)

CO5: Simulate all circuits in PSPICE /Multisim. (L5).

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B. Tech II Year I semester

DIGITAL CIRCUITS & SIGNAL SIMULATION LAB

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
23A0405P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	PC

Syllabus

PART A

1. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
2. Verification of functional table of 3 to 8-line Decoder /De-multiplexer
3. 4 variable logic function verification using 8 to1 multiplexer.
4. Design full adder circuit and verify its functional table.
5. Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output.
6. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output.

Note: Design the above Experiments by using both Hardware kits and Hardware Description Language

7. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
8. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test It with a low frequency clock and sketch the output waveforms.
9. Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.
10. (a) Draw the circuit diagram of a single bit comparator and test the output
    (b) Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.

Note: Design and verify above Experiments by using Hardware Description Language

References:

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI

PART B

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.

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B. Tech II Year I semester

4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences.
6. Write a program to find autocorrelation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous System.
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).
11. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.
12. To plot pole-zero diagram in S-plane of given signal/sequence and verify its stability.

Note: Any 10 experiments. All the experiments are to be simulated using MATLAB or equivalent software.

References:

1. Stephen J. Chapman, "MATLAB Programming for Engineers", Cengage, November 2012.

Course Outcomes:

After the completion of the course students will be able to:

CO1: Verify the truth tables of various logic circuits. (L2)

CO2: Understand how to simulate different types of signals and system response. (L2)

CO3: Design sequential and combinational logic circuits and verify their functionality. (L3, L4)

CO4: Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals. (L4)

CO5: Generate different random signals for the given specifications. (L5)

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B. Tech II Year I semester

PYTHON PROGRAMMING					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0510P	**0:1:2:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**SEC**

Course Objectives:

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook. Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language. Control Flow Statements: if statement, if-else statement, if…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators

5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

Unit-II	**9 Hrs**

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

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, del Statement.

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Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list: additionii. insertioniii. slicing
12. Write a program to perform any 5 built-in functions by taking any list

Unit -III	**9 Hrs**

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

Unit -IV		**9 Hrs**

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

18. 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.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

Unit -V	**9 Hrs**

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B. Tech II Year I semester

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame
    b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Textbooks:

1. Stuart Russell and Peter Norvig, Artificial Intelligence A Modern Approach, 3rdEdition, Pearson Education.
2. Elaine Rich, Kevin Knight & Shivashankar B Nair, "Artificial Intelligence", 3rd - Edition, McGraw Hill Education.

Reference Books:

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

E-resources:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Showcase adept command of Python syntax, deftly utilizing variables, data types, control structures, functions, modules, and exception handling to engineer robust and efficient code solutions. (L4)
CO2: Apply Python programming concepts to solve a variety of computational problems (L3)
CO3: Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)
CO4: Proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)
CO5: Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)

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B. Tech II Year I semester

ENVIRONMENTAL SCIENCE					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0109T	**2:0:0:0**	**-**	**CIE: 30**	**-**	**MC**

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers

Syllabus

Unit-I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Unit-II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem.

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit –III

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution

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g. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Unit -IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Unit -V

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.

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B. Tech II Year II Semester ((Theory-6, Lab-2, SEC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	HSM	23A0022T	Managerial Economics and Financial Analysis	2	0	0	2
2.	ES	23A0217T	Linear Control Systems	3	0	0	3
3.	PC	23A0407T	EM Waves and Transmission Lines	3	0	0	3
4.	PC	23A0408T	Electronic Circuits Analysis	3	0	0	3
5.	PC	23A0409T	Analog and Digital Communications	3	0	0	3
6.	PC	23A0410P	Electronic Circuits Analysis Lab	0	0	3	1.5
7.	PC	23A0411P	Analog and Digital Communications Lab	0	0	3	1.5
8.	SEC	23A0026P	Soft Skills	0	1	2	2
9.	ES	23A0413T	Design Thinking and Innovation	1	0	2	2
Total				**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08weeks duration during summer vacation							

K. Sravan kumar
MEMBER SECRETARY

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B. Tech II Year II semester

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0022T	**2:0:0:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**HSM**

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Syllabus		**Total Hours: 45**
Unit-I	**Managerial Economics**	**9 Hrs**

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

Unit-II	**Production and Cost Analysis**	**9 Hrs**

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

Unit -III	**Business Organizations and Markets**	**9 Hrs**

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

Unit -IV	**Capital Budgeting**	**9 Hrs**

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

Unit -V	**Financial Accounting and Analysis**	**9 Hrs**

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance-

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B. Tech II Year II semester

Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

E-resources:

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Define the concepts related to Managerial Economics, financial accounting and management(L2)
CO2: Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
CO3: Apply the Concept of Production cost and revenues for effective Business decision (L3)
CO4: Analyze how to invest their capital and maximize returns (L4)
CO5: Evaluate the capital budgeting techniques. (L5)
CO6: Develop the accounting statements and evaluate the financial performance of business entity (L5)

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B. Tech II Year II semester

LINEAR CONTROL SYSTEMS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0217T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**ES**

Course Objectives:

- Introduce the basic principles and applications of control systems.
- Learn the time response and steady state response of the systems.
- Know the time domain analysis and solutions to time invariant systems.
- Understand different aspects of stability analysis of systems in frequency domain.
- Understand the concept of state space, controllability and observability.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Control Systems Concepts: Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Controller components, DC Servomotor and AC Servomotor- their transfer functions, Synchros.

Unit-II	**9 Hrs**

Time Response Analysis: Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, Study of effects and Design of P, PI, PD and PID Controllers on second order system.

Unit -III	**9 Hrs**

Stability Analysis in Time Domain: The concept of stability – Routh's stability criterion – Stability and conditional stability - limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

Unit -IV	**9 Hrs**

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram - Stability Analysis from Bode Plots. Polar Plots- Nyquist Plots- Phase margin and Gain margin-Stability Analysis. Compensation techniques – Study of Effects and Design of Lag, Lead, Lag-Lead Compensator design in frequency Domain on a second order system.

Unit -V	**9 Hrs**

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State Space Analysis of Continuous Systems: Concepts of state, state variables and state model - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability.

Textbooks:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

Reference Books:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, McGraw Hill Education,2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition,2003.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, McGraw Hill Education,2013.
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami- Naeini, 6th Edition, Pearson,2010.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Summarize the basic principles and applications of control systems. (L2)
CO2: Understand the time response and steady state response of the systems. (L2)
CO3: Understand the concept of state space, controllability and observability. (L2)
CO4: Apply time domain analysis to find solutions to time invariant systems. (L3)
CO5: Analyze different aspects of stability analysis of systems in frequency domain. (L4)

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B. Tech II Year II semester

EM WAVES AND TRANSMISSION LINES					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0407T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

- To understand and analyze different laws and theorems of electrostatic fields.
- To study and analyze different laws and theorems of magnetostatic fields.
- Analyzing Maxwell's equations in different forms.
- To learn the concepts of wave theory and its propagation through various mediums.
- To get exposure to the properties of transmission lines.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Review of Co-ordinate Systems, **Electrostatics:** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

Unit-II	**9 Hrs**

Magnetostatics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems**.**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

Unit -III	**9 Hrs**

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

Unit -IV	**9 Hrs**

Transmission Lines - I : Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

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Unit -V	**9 Hrs**

Transmission Lines – II: Input Impedance Relations, Reflection Coefficient, VSWR, Average Power, Shorted Lines, Open Circuited Lines, and Matched Lines, Low loss radio frequency and UHF Transmission lines, UHF Lines as Circuit Elements, Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

Textbooks:

1. Elements of Electromagnetics, Matthew N.O. Sadiku, 4th Edition, Oxford University Press, 2008.
2. Electromagnetic Waves and Radiating Systems, E.C. Jordan and K.G. Balmain, 2nd Edition, PHI, 2000.

Reference Books:

1. Electromagnetic Field Theory and Transmission Lines, G. S. N. Raju, 2nd Edition, Pearson Education, 2013.
2. Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 7th Edition, Tata McGraw Hill, 2006.
3. Electromagnetics, John D. Krauss, 3rd Edition, McGraw Hill, 1988.
4. Networks, Lines, and Fields, John D. Ryder,2nd Edition, PHI publications, 2012.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the concepts of wave theory and its propagation through various mediums. (L2)
CO2: Understand the properties of transmission lines and their applications. (L2)
CO3: Apply the laws & theorems of electrostatic fields to solve the related problems (L3)
CO4: Gain proficiency in the analysis and application of magnetostatic laws and theorems (L4).
CO5: Analyze Maxwell's equations in different forms. (L4)

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B. Tech II Year II semester

ELECTRONIC CIRCUITS ANALYSIS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0408T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

- Understand the characteristics of Differential amplifiers, feedback and power amplifiers.
- Analyze the response of tuned amplifiers
- Categorize different oscillator circuits based on the application
- Design the electronic circuits for the given specifications and for a given application.

Syllabus		**Total Hours: 45**
Unit-I	**Multistage and Differential Amplifiers**	**9 Hrs**

Introduction –Classification of Amplifiers- Distortion in amplifiers, Coupling Schemes, RC Coupled Amplifier using BJT, Cascaded RC Coupled BJT Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, and other Non-ideal Characteristics of the Differential Amplifier.

Unit-II	**Frequency Response**	**9 Hrs**

Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS, follower, CE, CG and Cascode Amplifiers

Unit -III	**Feedback Amplifiers**	**9 Hrs**

Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Transconductance Amplifier (Series—Series), The Feedback Trans-Resistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series).

Unit -IV	**Oscillators and Tuned Amplifiers**	**9 Hrs**

Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Relaxation Oscillator, Crystal Oscillators, Illustrative Problems.

Tuned Amplifiers: Basic Principle, Use of Transformers, Single Tuned Amplifiers, Amplifiers with multiple Tuned Circuits, Stagger Tuned Amplifiers.

Unit -V	**Power Amplifiers**	**9 Hrs**

Introduction, Classification of Output Stages, Class A Output Stage, Class B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, MOS Power Transistors.

Textbooks:

1. Millman, C Chalkias, “Integrated Electronics”, 4thEdition, McGraw Hill Education (India) Private Ltd., 2015.

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2. Adel. S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits," 6th Edition, Oxford University Press, 2011.

Reference Books:

1. Behzad Razavi, "Fundamentals of Micro Electronics", Wiley, 2010.
2. Donald A Neamen, "Electronic Circuits – Analysis and Design," 3rdEdition, McGraw Hill (India), 2019.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 9th Edition, Pearson/Prentice Hall, 2006.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the characteristics of differential amplifiers, feedback and power amplifiers. (L2)

CO2: Examine the frequency response of multistage and differential amplifier circuits using BJT & MOSFETs at low and high frequencies. (L3)

CO3: Investigate different feedback and power amplifier circuits based on the application. (L4)

CO4: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillator circuits. (L4)

CO5: Evaluate the performance of different tuned amplifiers (L5)

CO6: Design analog circuits for the given specifications and application. (L6)

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ANALOG AND DIGITAL COMMUNICATIONS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0409T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

- Introduce various modulation and demodulation techniques of analog and digital communication systems.
- Analyze different parameters of analog and digital communication techniques.
- Understand function of various stages of AM, FM transmitters and Know characteristics of AM &FM receivers.
- Analyze the performance of various digital modulation techniques in the presence of AWGN.

Syllabus		**Total Hours: 45**
Unit-I	**Continuous Wave Modulation**	**9 Hrs**

Introduction: The communication Process, Communication Channels, Baseband and Pass band Signals, Analog vs. Digital Communications, Need for the modulation.

Amplitude Modulation (AM): AM and its modifications – DSB, SSB, VSB. Frequency Translation, Frequency Division Multiplexing (FDM).

Angle Modulation: Frequency Modulation (FM), Phase Modulation, PLL, Nonlinear Effects in FM, Super heterodyne Receivers.

Unit-II	**Noise and Pulse Modulation**	**9 Hrs**

Introduction to Noise: Types of Noise, Receiver Model, Noise in AM, DSB, SSB, and FM Receivers, Pre-Emphasis and De-emphasis in FM.

Introduction to Pulse Modulation: The Sampling Process, PAM, TDM, Bandwidth-Noise Trade off, Quantization process, PCM, Noise considerations in PCM systems, Delta Modulation, DPCM, Coding speech at low bit rates.

Unit -III	**Baseband Pulse Transmission**	**9 Hrs**

Introduction, Matched Filter, Properties of Matched Filter, Error rate due to noise, Inter Symbol Interference (ISI), Nyquist Criterion for distortion less baseband binary transmission, Correlative level coding, Baseband M-ary PAM transmission, QAM, MAP and ML decoding, Equalization, Eye pattern.

Unit -IV	**Digital Pass band Transmission**	**9 Hrs**

Introduction, Pass band Transmission Model, Gram-Schmidt Orthogonalization Procedure, Geometric Interpretation of Signals, Response of bank of correlators in noise, Correlation receiver, Probability of Error, Detection of Signals with unknown phase.

Unit -V	**Digital Modulation Schemes**	**9 Hrs**

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Coherent Digital Modulation Schemes – ASK, BPSK, BFSK, QPSK, Non-coherent BFSK, and DPSK. M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency, Timing and Frequency synchronization. Information theory: Entropy, Mutual Information and Channel capacity theorem.

Textbooks:

1. Simon Haykin, "Communication Systems", JohnWiley& Sons, 4th Edition, 2004.
2. B. P. Lathi, Zhi Ding " Modern Digital and Analog Communication Systems", Oxford press, 2011.

Reference Books:

1. Sam Shanmugam, "Digital and Analog Communication Systems",JohnWiley& Sons, 1999.
2. Bernard Sklar, F. J. harris"Digial Communications: Fundamentals andApplications", Pearson Publications, 2020.
3. Taub and Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2007.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Recognize the basic terminology used in analog and digital communication technique for transmission of information/data. (L1)

CO2: Explain the basic operation of different analog communication systems at baseband and pass band level. (L2)

CO3 Explain the basic operation of different digital communication systems at baseband and pass band level. (L2)

CO4: Compute various parameters of baseband and pass band transmission schemes by applying basic engineering knowledge. (L3)

CO5: Analyze the performance of different modulation & demodulation techniques to solve complex problems in the presence of noise. (L4)

CO6: Evaluate the performance of all analog and digital modulation techniques to know the merits and demerits of each one of them in terms of bandwidth and power efficiency. (L5)

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B. Tech II Year II semester

ELECTRONIC CIRCUITS ANALYSIS LAB					
Course Code	**L:T:P**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
23A0410P	**0:0:3**	**1.5**	**CIE:30** **SEE:70**	**3 Hours**	**PC**

Syllabus

List of Experiments:

1. Design and Analysis of Darlington pair.
2. Frequency response of CE – CC multistage Amplifier
3. Design and Analysis of Cascode Amplifier.
4. Frequency Response of Differential Amplifier
5. Design and Analysis of Series – Series feedback amplifier and find the frequency response of it.
6. Design and Analysis of Series – Shunt feedback amplifier and find the frequency response of it.
7. Design and Analysis of Shunt – Series feedback amplifier and find the frequency response of it.
8. Design and Analysis of Shunt – Shunt feedback amplifier and find the frequency response of it.
9. Design and Analysis of Class A power amplifier
10. Design and Analysis of Class AB amplifier
11. Design and Analysis of RC phase shift oscillator
12. Design and Analysis of LC Oscillator
13. Frequency Response of Single Tuned amplifier

Note: At least 10 experiments shall be performed. Both BJT and MOSFET based circuits shall be implemented.

Faculty members who are handling the laboratory shall see that students are given design specifications for a given circuit appropriately and monitor the design and analysis aspects of the circuit.

Course Outcomes:

After the completion of the course students will be able to:

CO1: Know about the usage of equipment/components/software tools used to conduct experiments in analog circuits. (L2)

CO2: Conduct the experiment based on the knowledge acquired in the theory about various analog circuits using BJT/MOSFETs to find the important parameters of the circuit experimentally. (L3)

CO3: Analyze the given analog circuit to find required important metrics of it theoretically. (L4)

CO4: Compare the experimental results with that of theoretical ones and infer the conclusions. (L4)

CO5: Design the circuit for the given specifications. (L6)

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B. Tech II Year II semester

ANALOG AND DIGITAL COMMUNICATIONS LAB					
Course Code	**L:T:P**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
23A0411P	**0:0:3**	**1.5**	**CIE:30** **SEE:70**	**3 Hours**	**PC**

Syllabus

List of Experiments:

Design the circuits and verify the following experiments taking minimum of six from each section shown below.

Section-A

1. AM Modulation and Demodulation
2. DSB-SC Modulation and Demodulation
3. Frequency Division Multiplexing
4. FM Modulation and Demodulation
5. Radio receiver measurements
6. PAM Modulation and Demodulation
7. PWM Modulation and Demodulation
8. PPM Modulation and Demodulation

Section-B

1. Sampling Theorem.
2. Time Division Multiplexing
3. Delta Modulation and Demodulation
4. PCM Modulation and Demodulation
5. BPSK Modulation and Demodulation
6. BFSK Modulation and Demodulation
7. QPSK Modulation and Demodulation
8. DPSK Modulation and Demodulation

Note: Faculty members (who are handling the laboratory) are requested to instruct the students not to use readymade kits for conducting the experiments. They are advised to make the students work in the laboratory by constructing the circuits and analyzing them during the lab sessions.

Course Outcomes:

After the completion of the course students will be able to:

CO1: Know about the usage of equipment/components/software tools used to conduct experiments in analog and digital modulation techniques. (L2)

CO2: Conduct the experiment based on the knowledge acquired in the theory about modulation and demodulation schemes to find the important metrics of the communication system experimentally. (L3)

CO3: Analyze the performance of a given modulation scheme to find the important metrics of the system theoretically. (L4)

CO4: Compare the experimental results with that of theoretical ones and infer the conclusions. (L4)

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B. Tech II Year II semester

SOFT SKILLS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0026P	**0:1:2:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**SEC**

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To enhance healthy relationship and understanding within and outside an organization
- To function effectively with heterogeneous teams

Syllabus

Unit-I	**Soft Skills & Communication Skills**

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity.

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation.

Unit-II	**Problem Solving & Decision Making**

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the Problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.Case Study & Group Discussion

Unit -III	**Critical Thinking**

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open mindedness– Creative Thinking - Positive thinking - Reflection

Activities:

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Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis Case Study & Group Discussion

Unit -IV	**Emotional Intelligence & Stress Management**

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

Unit -V	**Corporate Etiquette**

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips -Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

Textbooks:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018

Reference Books:

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K, Soft Skills S.Chand & Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Soft Skills for a Big Impact (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

Online Learning Resources:

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1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview

Course Outcomes(CO):

On completion of this course, student will be able to:
CO1: List out various elements of soft skills (L1, L2)
CO2: Describe methods for building professional image (L1, L2)
CO3: Apply critical thinking skills in problem solving (L3)
CO4: Analyse the needs of an individual and team for well-being (L4)
CO5: Assess the situation and take necessary decisions (L5)
CO6: Create a productive workplace atmosphere using social and work-life skills ensuring personal and emotional well-being (L6)

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E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

B. Tech II Year II semester

DESIGN THINKING & INNOVATION					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0413T	**1:0:2:0**	**2**	**CIE:30 SEE:70**	**3 Hours**	**ES**

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Syllabus

Unit-I	**Introduction to Design Thinking**

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

Unit-II	**Design Thinking Process**

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

Unit -III	**Innovation**

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

Unit -IV	**Product Design**

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

Unit -V	**Design Thinking in Business Processes**

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Textbooks:

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1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Define the concepts related to design thinking. (L1, L2)
CO2: Explain the fundamentals of Design Thinking and innovation (L1, L2)
CO3: Apply the design thinking techniques for solving problems in various sectors. (L3)
CO4: Analyse to work in a multidisciplinary environment (L4)
CO5: Evaluate the value of creativity (L5)
CO6: Formulate specific problem statements of real time issues (L3, L6)

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B. Tech II Year II semester

COMMUNITY SERVICE PROJECT
(Experiential learning through community engagement)

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- Management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to

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be recorded.

- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law & Order
    - Excise and Prohibition
    - Mines and Geology
    - Energy
    - Internet

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- Free Electricity
- Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

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- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases

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22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

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1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology

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xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.
2. **Community Awareness Campaigns (One Week)**
   Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.
3. **Community Immersion Programme (Three Weeks)**
   Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.
4. **Community Exit Report (One Week)**

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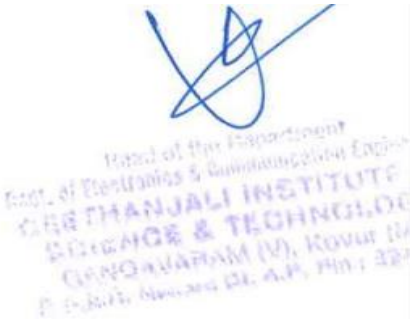
During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.



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B. Tech III Year I Semester (Theory-5, Lab-2, SEC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	PC	23A0413Ta	Analog and Digital IC Applications	3	0	0	3
2.	PC	23A0414T	Antennas & Wave Propagation	3	0	0	3
3.	PC	23A0415T	Microprocessors and Microcontrollers	3	0	0	3
4.	PC	23A0522T	Introduction To Quantum Technologies And Applications	3	0	0	3
5.	PE		**Professional Elective-I**	3	0	0	3
6.	OE		**Open Elective-I**	3	0	0	3
7.	PC	23A0413P	Analog & Digital IC Applications Lab	0	0	3	1.5
8.	PC	23A0415P	Microprocessors and Microcontrollers Lab	0	0	3	1.5
9.	SOC	23A0419P	**Skill oriented course -III** PCB Design and Prototype development	0	1	2	2
10.	SOC	23A0420P	Tinkering Lab	0	0	2	1
11.	PR	23A0421	Evaluation of Community Service Internship	-	-	-	2
Total				**18**	**01**	**10**	**26**

S. No.	Course Code	Name of the Professional Elective
1	23A0543T	Computer Architecture & Organization
2	23A0417T	Information Theory and Coding
3	23A0418T	Detection and Estimation Theory

K. Sravan kumar
MEMBER SECRETARY

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B. Tech III Year I semester

S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0148T	Green Buildings	CIVIL
2.	23A0149T	Construction Technology and Management	
3.	23A0222T	Electrical Safety Practices and Standards	EEE
4.	23A0319T	Sustainable Energy Technologies	MECH
5.	23A0545T	Java Programming	CSE & Allied/IT
6.	23A0546T	Fundamentals of Artificial Intelligence	
7.	23A0547T	Quantum Technology & Applications	
8.	23A0027T	Mathematics for Machine Learning and AI	Mathematics
9.	23A0034T	Materials Characterization Techniques	Physics
10.	23A0040T	Chemistry of Energy Systems	Chemistry
11.	23A0044T	English for Competitive Examinations	Humanities
12.	23A0051T	Entrepreneurship and New Venture Creation	

Note:

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

K. Sravan kumar
MEMBER SECRETARY

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B. Tech III Year I semester

ANALOG AND DIGITAL IC APPLICATIONS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0413Ta	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PC**

Course Objectives:

1. To introduce the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp.
2. To analyse linear and non-linear applications of Op-Amp.
3. To gain knowledge on active filters, timers and phased locked loops.
4. To understand the working of Voltage Regulators and Converters.
5. To study about different types of Digital ICs and their applications.

Syllabus	**Total Hours: 45**
ICs and OP- AMPS	**9 Hrs**

Integrated Circuits and Operational Amplifier: Introduction, Classification of IC's, IC chip size and circuit complexity, basic information of Op-Amp IC741 and its features, the ideal Operational amplifier and practical OP-amp, Op-Amp internal circuit, Op-Amp characteristics - DC and AC, Features of 741 Op-Amp.

UNIT II Applications of OP- AMP	**9 Hrs**

Linear Applications of Op-Amp: Inverting, non-inverting, Differential amplifiers, adder, subtractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator.

Non-Linear Applications of Op-Amp: Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multi vibrators, Triangular and Square waveform generators, Oscillators.

UNIT III Active Filters and other ICs	**9 Hrs**

Active Filters: Introduction, Butterworth filters – 1st order, 2nd order low pass and high pass filters, band pass, band reject and all pass filters.

Timer and Phase Locked Loops: Introduction to IC 555 timer, description of functional diagram, monostable and astable operations and applications, Schmitt trigger, PLL - introduction, basic principle, Transfer characteristics, phase detector/comparator, voltage controlled oscillator (IC 566), low pass filter, monolithic PLL and applications of PLL.

UNIT IV Voltage Regulators and Converters	**9 Hrs**

Voltage Regulator: Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching Regulator.

D to A and A to D Converters: Introduction, basic DAC techniques - weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A to D converters - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

UNIT V Digital ICs	**9 Hrs**

CMOS Logic: CMOS logic levels, MOS transistors, Basic CMOS Inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic.

Combinational Logic IC's: Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders & drivers for LED &LCD displays .Encoders, Priority Encoders, Multiplexers, Demultiplexers, Parallel Binary Adder/ Subtractor using 2's complement system Magnitude Comparators, priority generator/checker circuits

Sequential Logic IC's: Familiarity with commonly available 74XX & CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

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B. Tech III Year I semester

Textbooks:

1. D. Roy Choudhury, Shail B. Jain, ―Linear Integrated Circuit‖, 4th edition (2012), New Age International Pvt. Ltd., New Delhi, India
2. Floyd, Jain, ―Digital Fundamentals‖, 8th edition (2009), Pearson Education, New Delhi.

Reference Books:

1. Ramakant A. Gayakwad, ―OP-AMP and Linear Integrated Circuits‖, 4th edition (2012), Prentice Hall / Pearson Education, New Delhi.
2. Sergio Franco (1997), Design with operational amplifiers and analog integrated circuits, McGraw Hill, New Delhi. 3. Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International, New Delhi.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp.
CO2: Analyse linear and non-linear applications of Op-Amp.
CO3: Gain knowledge on active filters, timers and phased locked loops.
CO4: Understand the working of Voltage Regulators
CO5: Understand The theory of ADC and DAC
CO6: Know about different types of Digital ICs and their applications.

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B. Tech III Year I semester

ANTENNAS & WAVE PROPAGATION					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0414T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

- To learn the antennas basic terminology, radiation mechanism of antennas and dipole antennas.
- To gain knowledge on HF, VHF & UHF antennas, their operation and applications.
- Analyze the working and applications of Microwave antennas.
- Understand different techniques involved in the design of antenna arrays and antenna parameter measurements.
- To study the various types of radio wave propagation methods.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Antenna Basics & Dipole antennas: Definition of antenna, Radiation Mechanism – single wire, two wire, dipoles, Antenna Parameters - Radiation Patterns, Main Lobe and Side Lobes, Beam widths, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Aperture Efficiency, Effective Height and length, Antenna Theorems. Radiation – Basic Maxwell‘s equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, far fields and patterns of Thin Linear Center-fed Antennas of different lengths, Illustrative problems.

Unit-II	**9 Hrs**

HF, VHF and UHF Antennas: Loop Antennas - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, Radiation Resistances and Directives of small and large loops (Qualitative Treatment), Arrays with Parasitic Elements - Yagi - Uda Arrays, Folded Dipoles & their characteristics. Log periodic Antenna, Helical Antennas-Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas- Types, Fermat‘s Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

Unit -III	**9 Hrs**

Microwave Antennas : Micro strip Antennas- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, reflector antennas - Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, Lens Antennas - Geometry of Non-metallic Dielectric Lenses, Zoning , Tolerances, Applications, Illustrative Problems.

Unit -IV	**9 Hrs**

Antenna Arrays: Point sources - Definition, Patterns, arrays of 2 Isotropic sources- Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison, BSA with Non-uniform Amplitude Distributions - General considerations and Binomial Arrays, Illustrative problems. Antenna Measurements: Introduction, Sources of errors, Patterns to be Measured, Pattern Measurement

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Arrangement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

Unit -V	**9 Hrs**

Wave Propagation: Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts, Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections, Space wave propagation - Introduction, field strength variation with distance and height, effect of earth‘s curvature, absorption, Super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations, Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Summary of Wave Characteristics in different frequency ranges, Illustrative problems.

Textbooks:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S.Khan, ―Antennas and wave propagation‖, TMH, New Delhi, 4th Ed., 2010.
2. C.A. Balanis, ―Antenna Theory- Analysis and Design‖, John Wiley & Sons, 2nd Edn., 2001.
3. K.D. Prasad and SatyaPrakashan, ―Antennas and Wave Propagation‖, New Delhi, Tech. India Publications, 2001.

Reference Books:

1. E.C. Jordan and K.G. Balmain, ―Electromagnetic Waves and Radiating Systems‖, 2nd Edition, PHI, 2000.
2. G.S.N Raju, ―Antenna and Wave Propagation‖, Pearson Education India, 3rd Edition 2009.
3. R K Shevgaonkar,‖ Electromagnetic Waves‖. Tata McGraw-Hill, 2006

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the antennas basic terminology and radiation mechanism of antennas.
CO2: Gain knowledge on VHF and UHF antennas, their operation and applications.
CO3: Design and analyze the working and applications of Microwave antennas.
CO4: Analyze different techniques involved in the design of antenna arrays and antenna parameter measurements.
CO5: Gain a comprehensive knowledge about the types of radio wave propagation methods.
CO6: Compare the performance of various types of the antennas.

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B. Tech III Year I semester

MICROPROCESSORS AND MICROCONTROLLERS

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0415T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

- To learn the fundamental architectural concepts of microprocessors.
- To gain knowledge about assembly language programming concepts.
- To get familiar about 8086 interfacing.
- To understand the fundamentals of the 8051 Microcontroller.
- To learn interfacing with the 8051 Microcontroller.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

Unit-II	**9 Hrs**

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

Unit -III	**9 Hrs**

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

Unit -IV	**9 Hrs**

Microcontroller : Introduction to RISC Processors, Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

Unit -V	**9 Hrs**

Interfacing Microcontroller :- Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor & Microcontroller, PIC and ARM processors

Textbooks:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

Reference Books:

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1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the fundamental architectural concepts of microprocessors.
CO2: Gain knowledge about assembly language programming concepts.
CO3: Understand the concepts of 8086 interfacing.
CO4: Learn the fundamentals of the 8051 Microcontroller.
CO5: Know the interfacing with the 8051 Microcontroller.
CO6: Understand the concepts of interfacing 8051 Microcontroller.

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B. Tech III Year I semester

INTRODUCTION TO QUANTUM TECHNOLOGY AND APPLICATIONS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0522T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PC**

Course Objectives:

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies

Syllabus		**Total Hours: 44**
Unit-I	**Introduction to Quantum Theory and Technologies**	**7 Hrs**
The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China		
Unit-II	**Theoretical Structure of Quantum Information Systems**	**10 Hrs**
What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role		
Unit -III	**Building a Quantum Computer – Theoretical Challenges and Requirements**	**7 Hrs**
What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities		
Unit -IV	**Quantum Communication and Computing – Theoretical Perspective**	**10 Hrs**
Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential		

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B. Tech III Year I semester

Unit -V	Applications, Use Cases, and the Quantum Future	10 Hrs

Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, Psi Quantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skill sets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race

Textbooks:

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

Reference Books:

1. David McMahon, *Quantum Computing Explained*, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press, 2007.
3. Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge University Press, 2013.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Explain core quantum principles in a non-mathematical manner.
CO2: Compare classical and quantum information systems.
CO3: Identify theoretical issues in building quantum computers.
CO4: Discuss quantum communication and computing concepts.
CO5: Recognize applications, industry trends, and career paths in quantum technology

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B. Tech III Year I semester

COMPUTER ARCHITECTURE & ORGANIZATION					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0543T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To learn the design of various functional units of digital computers and performance issues of computer systems.
- To understand the basic processing unit and their connections.
- To get familiar with different types of Data representation and Computer Arithmetic operations.
- To know about different types of memory and their interconnections.
- To learn the basics of parallel computing and pipelining.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

Unit-II	**9 Hrs**

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

Unit -III	**9 Hrs**

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Unit -IV	**9 Hrs**

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Unit -V	**9 Hrs**

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor arbitration, Inter-processor communication and synchronization, Cache Coherence.

Textbooks:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

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Reference Books:

1. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the design of various functional units of digital computers and performance issues of computer systems.
CO2: Understand the basic processing unit and their connections.
CO3: Know about different types of Data representation and Computer Arithmetic operations.
CO4: Learn about different types of memory and their interconnections.
CO5: Understand the basics of parallel computing.
CO6: Understand the basics of pipelining.

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B. Tech III Year I semester

INFORMATION THEORY AND CODING					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0417T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To provide an insight into the concept of information in the context of communication theory and communication receivers.
- To implement various source coding algorithms and analyze their performance.
- To gain knowledge about techniques for error detection and error correction.
- To design linear block codes and cyclic codes.
- To get familiar with various convolutional codes.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Information Theory: Introduction, Definition of Entropy, Conditional Entropy, Relative Entropy, Basic Properties of Entropy, Mutual Information, Information Inequalities, Problem solving.

Block to Variable length Coding: Prefix-free Code, Coding a single Random Variable, Prefix, Free Code, Kraft Inequality, Bounds on optimal Code length, Coding a Single Random Variable, Rooted Tree with Probabilities, Shanon-Fano Coding, Free fix code, Coding an information Source, Huffman Coding, Example.

Variable to Block Length Coding: Proper message set, Assigning probabilities to K-ary rooted tree corresponding to a proper message set, Prefix free Coding of a proper message set, Tunstall message set, Tunstall coding.

Unit-II	**9 Hrs**

Asymptotic Equi-partition Property, Chebyshev inequality, Weak law of large numbers, Typical Sequences, Block to Block Coding of DMS: Consequences of Asymptotic Equipartition Property, Problem solving.

Universal Source Coding: Lempel-Ziv Algorithm, LZ -77 Encoding and Decoding, LempelZiv Welch (LZW) Algorithm, LZW Encoding, and Decoding. Coding of Sources with memory, Channel Capacity, Noisy Channel Coding Theorem, Differential Entropy, Gaussian Channel, Rate Distortion Theory, Blahut-Arimoto Algorithm, problem solving.

Unit -III	**9 Hrs**

Error Control Coding: Introduction to Error Control Codes, Error Probability with Repetition in the Binary Symmetric Channel, Parity Check Bit Coding for Error Detection, Block Coding for Error Detection and Correction, The Hamming Distance, The upper bound of the Probability of Error with Coding, Soft Decision Decoding, Hard Decision Decoding.

Unit -IV	**9 Hrs**

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Encoding Block Codes, Decoding of Block Codes, Single Parity Check bit Code, Repeated Codes, Hadamard Code, Hamming Code, Cyclic Codes, Generator and Parity-Check Matrices of Cyclic Codes, Encoding and Decoding of Cyclic Codes, BCH codes, Reed-Solomon Code.

Unit -V	**9 Hrs**

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B. Tech III Year I semester

Convolutional Coding, Code Generation, Decoding Convolutional Code, the Code Tree, Decoding in the presence of Noise, State and Trellis Diagrams, The Viterbi Algorithm, Comparison of Error Rates in Coded and Uncoded Transmission, Turbo Codes, LDPC codes, Hard and Soft Decision Decoding.

Textbooks:

1. Thomas M.Cover, Joy A. Thomas, Elements of Information Theory, John Wiley & Sons,2nd Edition, 2006.
2. Herbert Taub, Donald L Shilling, Goutam Saha, Principles of Communication Systems, 4th Edition, McGraw Hill, 2017.

Reference Books:

1. Shu Lin, Daniel J. Costello Jr., Error Control Coding, Pearson, Second Edition, 2013.
2. Simon Haykin, Communication Systems, John Wiley, 4th Edition, 2010.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the concepts of information in the context of communication theory.
CO2: Learn the concepts of information in the context of communication receivers.
CO3: Implement various source coding algorithms and analyze their performance.
CO4: Gain knowledge about techniques for error detection and error correction..
CO5: Design linear block codes and cyclic codes.
CO6: Understand various convolutional codes.

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B. Tech III Year I semester

DETECTION AND ESTIMATION THEORY					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0418T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To understand the impact of white Gaussian noise on the detection of signals.
- To analyze the detection of deterministic signals and random signals.
- To learn about the nonparametric detections.
- To analyze estimation signal parameter and apply suitable estimation techniques.
- To understand the signal estimation in Discrete-Time techniques.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Statistical Decision Theory: Review of Gaussian variables and processes; problem formulation and objective of signal detection and signal parameter estimation in discrete-time domain. Bayesian, minimax, and Neyman-Pearson decision rules, likelihood ratio, receiver operating characteristics, composite hypothesis testing, locally optimum tests, detector comparison techniques, asymptotic relative efficiency.

Unit-II	**9 Hrs**

Detection of Deterministic Signals: Matched filter detector and its performance; generalized matched filter; detection of sinusoid with unknown amplitude, phase, frequency and arrival time, linear model. Detection of Random Signals: Estimator-correlator, linear model, general Gaussian detection, detection of Gaussian random signal with unknown parameters, weak signal detection

Unit -III	**9 Hrs**

Nonparametric Detection: Detection in the absence of complete statistical description of observations, sign detector, Wilcoxon detector, detectors based on quantized observations, robustness of detectors.

Unit -IV	**9 Hrs**

Estimation of Signal Parameters: Minimum variance unbiased estimation, Fisher information matrix, Cramer-Rao bound, sufficient statistics, minimum statistics, complete statistics; linear models; best linear unbiased estimation; maximum likelihood estimation, invariance principle; estimation efficiency; Bayesian estimation: philosophy, nuisance parameters, risk functions, minimum mean square error estimation, maximum a posteriori estimation.

Unit -V	**9 Hrs**

Signal Estimation in Discrete-Time: Linear Bayesian estimation, Weiner filtering, dynamical signal model, discrete Kalman filtering.

Textbooks:

1. H. L. Van Trees, "Detection, Estimation and Modulation Theory: Part I, II, and III", John Wiley, NY, 1968.
2. H. V. Poor, "An Introduction to Signal Detection and Estimation", Springer, 2/e, 1998.

Reference Books:

1. S. M. Kay, "Fundamentals of Statistical Signal Processing: Estimation Theory", Prentice Hall PTR, 1993.
2. S. M. Kay, "Fundamentals of Statistical Signal Processing: Detection Theory", Prentice Hall PTR, 98.

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B. Tech III Year I semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the impact of white Gaussian noise on the detection of signals.
CO2: Analyze the detection of deterministic signals.
CO3: Analyze the detection of random signals.
CO4: Learn about the nonparametric detections.
CO5: Analyze estimation signal parameter and apply suitable estimation techniques.
CO6: Understand the signal estimation in Discrete-Time techniques

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B. Tech III Year I semester

GREEN BUILDINGS
(CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0148T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand the fundamental concepts of green buildings, their necessity, and sustainable features.
- To Analyse green building concepts, rating systems, and their benefits in India.
- To apply green building design principles, energy efficiency measures, and renewable energy sources.
- To evaluate air conditioning systems, HVAC designs, and energy modeling for sustainable buildings.
- To assess material conservation strategies, waste management, and indoor environmental qualityin green buildings.

Syllabus		Total Hours: 45
Unit-I	**Introduction to Green Building**	**8 Hrs**

Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing A Green Building, Important Sustainable Features for Green Buildings.

Unit-II	Green Building Concepts and Practices	10 Hrs

Indian Green Building Council, Green Building Movement in India, Benefits Experiencedin Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approachesin Buildings, LEED India Rating System, and Energy Efficiency.

Unit -III	Green Building Design	10 Hrs

Introduction, Reductionin Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

Unit -IV	Air Conditioning	10 Hrs

Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

Unit -V	Material Conservation	10 Hrs

Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.

Textbooks:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by tom woolley and Sam kimings, 2009.

Reference Books:

1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code –ECBC-2020, published by BEE

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B. Tech III Year I semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the importance of green buildings, their necessity, and sustainable features.

CO2: Analyse various green building practices, rating systems, and their impact on environmental sustainability.

CO3: Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.

CO4: Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.

CO5: Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.

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B. Tech III Year I semester

CONSTRUCTION TECHNOLOGY AND MANAGEMENT
(CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0149T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand project management fundamentals, organizational structures, and leadership principles in construction.
- To analyse manpower planning, equipment management, and cost estimationin civil engineering projects.
- To apply planning, scheduling, and project management techniques such as CPM and PERT.
- To evaluate various contract types, contract formation, and legal aspectsin construction management.
- To assess safety management practices, accident prevention strategies, and quality management systems in construction.

Syllabus		Total Hours: 45
Unit-I	**Introduction to Project Management**	**8 Hrs**

Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.

Unit-II	Planning of Man power and Machine	10 Hrs

Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.

Unit -III	Planning, Scheduling and Project Management	10 Hrs

Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network- formulation and Time Computation.

Unit -IV	Contracts	10 Hrs

Types of Contracts, formation of Contract – Contract Conditions – Contract for Labour, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.

Unit -V	Safety Management	10 Hrs

Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics.

Textbooks:

1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016.
2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019
3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd.

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Reference Books:

1. Brien, J.O. andPlotnick, F.L., CPMin Construction Management, Mcgraw Hill, 2010.
2. Punmia, B.C., andKhandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.
3. Construction Methods and Management: Pearson New International Edition 8 th Edition Stephens Nunnally.
4. Rhoden, M and Cato B, Construction Management andOrganisationalBehaviour, Wiley-Blackwell, 2016.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand project management fundamentals, organizational structures, and leadership principles in construction.

CO2: Analyse manpower planning, equipment management, and cost estimation in civil engineering projects.

CO3: Apply planning, scheduling, and project management techniques such as CPM and PERT.

CO4: Evaluate various contract types, contract formation, and legal aspects in construction management.

CO5: Assess safety management practices, accident prevention strategies, and quality management systems in construction.

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B. Tech III Year I semester

ELECTRICAL SAFETY PRACTICES AND STANDARDS
(All Branches Except EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0222T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Syllabus		Total Hours: 45
Unit-I	**Introduction To Electrical Safety**	**10 Hrs**

Fundamentals of Electrical safety-Electric Shock- physiological effects of electric current - Safety requirements –Hazards of electricity- Arc - Blast- Causes for electrical failure.

Unit-II	Safety Components	9 Hrs

Introduction to conductors and insulators- voltage classification -safety against over voltages- safety against static electricity-Electrical safety equipment‘s - Fire extinguishers for electrical safety.

Unit -III	Grounding	10 Hrs

General requirements for grounding and bonding- Definitions- System grounding-Equipment grounding - The Earth - Earthing practices- Determining safe approach distance-Determining arc hazard category.

Unit -IV	Safety Practices	10 Hrs

General first aid- Safety in handling hand held electrical appliances tools- Electrical safety in train stations- swimming pools, external lighting installations, medical locations-Case studies.

Unit -V	Standards For Electrical Safety	9 Hrs

. Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electrical inspectorate

Textbooks:

1. Massimo A.G.Mitolo, —Electrical Safety of Low-Voltage Systems‖, McGraw Hill, USA, 2009.
2. Mohamed El-Sharkawi, —Electric Safety - Practice and Standards‖, CRC Press, USA, 2014

Reference Books:

1. Kenneth G.Mastrullo, Ray A. Jones, —The Electrical Safety Program Book‖, Jones and Bartlett Publishers, London, 2nd Edition, 2011.
2. Palmer Hickman, —Electrical Safety-Related Work Practices‖, Jones & Bartlett Publishers, London, 2009.
3. Fordham Cooper, W., —Electrical Safety Engineering‖, Butterworth and Company, London, 1986.
4. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, —Electrical Safety Hand book, McGraw-Hill, New York, USA, 4th edition, 2012

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understanding the Fundamentals of Electrical Safety.
CO2: Identifying and Applying Safety Components.
CO3: Analyzing Grounding Practices and Electrical Bonding.
CO4: Applying Safety Practices in Electrical Installations and Environments.
CO5: Evaluating Electrical Safety Standards and Regulatory Compliance.

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B. Tech III Year I semester

SUSTAINABLE ENERGY TECHNOLOGIES
(CSE, CSE-AIML,CSE-CS,CSE-DS,CE,ECE,EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0319T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To demonstrate the importance the impact of solar radiation, solar PV modules.
- To understand the principles of storage in PV systems.
- To discuss solar energy storage systems and their applications.
- To get knowledge in wind energy and bio-mass.
- To gain insights in geothermal energy, ocean energy and fuel cells.

Syllabus	Total Hours: 48

Unit-I **8 Hrs**

Solar Radiation: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

Solar PV Modules and PV Systems: PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems, Design of Off Grid Solar Power Plant. Installation and Maintenance.

Unit-II **10 Hrs**

Storage in PV Systems: Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System

Unit -III **10 Hrs**

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

Solar Energy Storage and Applications: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

Unit -IV **10 Hrs**

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

Bio-Mass: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

Unit -V **10 Hrs**

Geothermal Energy: Origin, Applications, Types of Geothermal Resources, Relative Merits

Ocean Energy: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges

Fuel Cells: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric

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Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

Textbooks:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH.
2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006

Reference Books:

1. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth& John F Kreider / Taylor &Francis.
2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd.
3. Renewable Energy Technologies -Ramesh & Kumar /Narosa.
4. Non-conventional Energy Source- G.D Roy/Standard Publishers

Online Learning Resources:

- https://nptel.ac.in/courses/112106318
- https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2XSuSiNy13
- https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WEr&si=Apfjx6oDfz1Rb_N3
- https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Illustrate the importance of solar radiation and solar PV modules.

CO2: Discuss the storage methods in PV systems.

CO3: Explain the solar energy storage for different applications.

CO4: Understand the principles of wind energy, and bio-mass energy.

CO5: Attain knowledge in geothermal energy, ocean energy and fuel cells.

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B. Tech III Year I semester

JAVA PROGRAMMING
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0545T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception
- handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java apis for program development

Syllabus	Total Hours: 48
Module-I	**10 Hrs**

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data Types, **Variables, and Operators :**Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

Module-II	9 Hrs

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

Module-III	10 Hrs

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface,

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B. Tech III Year I semester

Functional Interfaces, Annotations.

Module-IV	**9 Hrs**

Packages and Java Library : Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java. lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto un boxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java. .Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throw able, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

Module-V	**10 Hrs**

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter thread Communication - Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing My SQL and My SQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Textbooks:

1. JAVA one step ahead, Anitha Seth, B.L. Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

Reference Books:

1. The complete Reference Java, 11thedition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson.

Web References:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.

CO2: Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects.

CO3: Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.

CO4: Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.

CO5: Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interfaces (GUI) programming using JavaFX.

CO6: Choose appropriate data structure of Java to solve a problem

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B. Tech III Year I semester

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0546T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To learn the distinction between optimal reasoning vs human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Syllabus	Total Hours: 48
Unit-I	**10 Hrs**

Introduction to AI - Intelligent Agents, Problem-Solving Agents
Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

Unit -II	9 Hrs

Games - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents,
Logic- Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

Unit -III	10 Hrs

First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.
Knowledge Representation: Ontological Engineering, Categories and Objects, Events

Unit -IV	9 Hrs

Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

Unit -V	10 Hrs

Probabilistic Reasoning: Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

Textbooks:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

Reference Books:

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

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B. Tech III Year I semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.

CO2: Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.

CO3: Learn different knowledge representation techniques.

CO4: Understand the concepts of state space representation, exhaustive search, and heuristic search together with the time and space complexities.

CO5: Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.

CO6: Analyze Supervised Learning Vs. Learning Decision Trees

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B. Tech III Year I semester

QUANTUM TECHNOLOGY AND APPLICATIONS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0547T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To introduce the fundamentals of quantum mechanics relevant to quantum technologies.
- To explain key quantum phenomena and their role in enabling novel technologies.
- To explore applications in quantum computing, communication, and sensing.
- To encourage understanding of emerging quantum-based technologies and innovations.

Syllabus		Total Hours: 41
Unit-I	**Fundamentals of Quantum Mechanics**	**7 Hrs**
Classical vs Quantum Paradigm, Postulates of Quantum Mechanics, Wave function and Schrödinger Equation (Time-independent), Quantum states, Superposition, Qubits, Measurement, Operators, and Observables, Entanglement and Non-locality		
Unit-II	**Quantum Computing**	**7 Hrs**
Qubits and Bloch Sphere, Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates, Quantum Circuits, Basic Algorithms: Deutsch-Jozsa. Gover‘s, Shor‘s (conceptual), Error Correction and Decoherence		
Unit -III	**Quantum Communication and Cryptography**	**7 Hrs**
Teleportation & No-Cloning, BB84 Protocol, Quantum Networks & Repeaters, Classical vs Quantum Cryptography, Challenges in Implementation		
Unit -IV	**Quantum Sensors and Metrology**	**10 Hrs**
Quantum Sensing: Principles and Technologies, Quantum-enhanced Measurements, Atomic Clocks, Gravimeters, Magnetometers, NV Centers, Industrial Applications		
Unit -V	**Quantum Materials and Emerging Technologies**	**10 Hrs**
Quantum Materials: Superconductors, Topological Insulators, Quantum Devices: Qubits, Josephson Junctions, National Quantum Missions (India, EU, USA, China), Quantum Careers and Industry Initiatives		

Textbooks:

1. "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press).
2. "Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman

Reference Books:

1. "Quantum Computing for Everyone" by Chris Bernhardt (MIT Press).
2. "Quantum Physics: A Beginner‘s Guide" by Alastair I.M. Rae.
3. "An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca
4. IBM Quantum Experience and Qiskit Documentation (https://qiskit.org/).

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand key quantum mechanical concepts and phenomena.

CO2: Comprehend the structure and function of quantum algorithms and circuits.

CO3: Explore applications in quantum communication and cryptography.

CO4: Appreciate the role of quantum technologies in modern engineering systems.

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B. Tech III Year I semester

MATHEMATICS FOR MACHINE LEARNING AND AI
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0027T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.
- To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.
- To equip students with optimization techniques and graph-based methods used in AI applications.
- To develop critical problem-solving skills for analysing mathematical formulations in AI/ML

Syllabus		Total Hours: 48
Unit-I	**Linear Algebra for Machine Learning**	**8 Hrs**

Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

Unit-II	**Probability and Statistics for AI**	**8 Hrs**

Probability distributions: Gaussian, Binomial, Poisson. Bayes' Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP).Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains

Unit -III	**Optimization Techniques for ML**	**8 Hrs**

Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton's method, BFGS method

Unit -IV	**Vector Calculus & Transformations**	**8 Hrs**

Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

Unit -V	**Graph Theory for AI**	**8 Hrs**

Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

Textbooks:

1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.
2. Pattern Recognition and Machine Learningby Christopher Bishop, Springer.

Reference Books:

1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.
2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

Web References:

1. MIT– Mathematics for Machine Learning https://ocw.mit.edu
2. Stanford CS229 – Machine Learning Course https://cs229.stanford.edu/
3. DeepAI – Mathematical Foundations for AI https://deepai.org

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Apply linear algebra concepts to ML techniques like PCA and regression.
CO2: Analyze probabilistic models and statistical methods for AI applications.
CO3: Implement optimization techniques for machine learning algorithms.
CO4: Utilize vector calculus and transformations in AI-based models.
CO5: Develop graph-based AI models using mathematical representations

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B. Tech III Year I semester

MATERIALS CHARACTERIZATION TECHNIQUES
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0034T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To provide exposure to different characterization techniques.
- To explain the basic principles and analysis of different spectroscopic techniques.
- To elucidate the working of Scanning electron microscope - Principle, limitations and applications.
- To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.
- To educate the uses of advanced electric and magnetic instruments for characterization

Syllabus		Total Hours: 45
Unit-I	**Structure analysis by Powder X-Ray Diffraction**	**9 Hrs**

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

Unit-II	Microscopy technique -1 –Scanning Electron Microscopy (SEM)	9 Hrs

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

Unit -III	Microscopy Technique -2 - Transmission Electron Microscopy (TEM)	9 Hrs

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

Unit -IV	Spectroscopy Techniques	9 Hrs

Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

Unit -V	Electrical & Magnetic Characterization Techniques	9 Hrs

Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID

Textbooks:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013.
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

Reference Books:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall , 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley –

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2021.
4. Materials Characterization Techniques -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008

Web References:

1. https://nptel.ac.in/courses/115/103/115103030/
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Analyze the crystal structure and crystallite size by various methods.
CO2: Analyze the morphology of the sample by using a Scanning Electron Microscope.
CO3: Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope.
CO4: Explain the principle and experimental arrangement of various spectroscopic techniques.
CO5: Identify the construction and working principle of various Electrical & Magnetic Characterization technique

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B. Tech III Year I semester

CHEMISTRY OF ENERGY SYSTEMS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0040T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications.
- Necessarily of harnessing alternate energy resources such as solar energy and its basic concepts.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method

Syllabus		Total Hours: 45
Unit-I	**Electrochemical Systems**	**9 Hrs**

Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction , Lead-acid , Nickel- cadmium, Lithium ion batteries and their applications

Unit-II	**Fuel Cells**	**9 Hrs**

Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications

Unit -III	**Photo and Photo electrochemical Conversions**	**9 Hrs**

Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications

Unit -IV	**Solar Energy**	**9 Hrs**

Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications.

Unit -V	**Hydrogen Storage**	**9 Hrs**

Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers

Textbooks:

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins

Reference Books:

1. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services
2. And corporation)

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3. Hand book of solar energy and applications by ArvindTiwari and Shyam.
4. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
5. 4.Hydrogen storage by Levine Klebonoff

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Solve the problems based on electrode potential, Describe the Galvanic Cell. Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer

CO2: Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell. Discuss about the Basic design of fuel cells, Classify the fuel cell.

CO3: Differentiate between Photo and Photo electrochemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions,Interpret advantages of photoelectron catalytic conversion.

CO4: Apply the photo voltaic technology; Demonstrate about solar energy and prospects. Illustrate the Solar cells, Discuss about concentrated solar power.

CO5: Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures

CO6: Describe the liquification methods

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B. Tech III Year I semester

ENGLISH FOR COMPETITIVE EXAMINATIONS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0044T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To enable the students to learn about the structure of competitive English
- To understand the grammatical aspects and identify the errors
- To enhance verbal ability and identify the errors
- To improve word power to answer competitive challenges
- To make them ready to crack competitive exams

Syllabus		Total Hours: 45
Unit-I	**GRAMMAR-1**	**9 Hrs**

Nouns – classification - errors - Pronouns – types – errors - Adjectives – types – errors - Articles - definite indefinite - Degrees of Comparison - Adverbs – types – errors - Conjunctions-usage Prepositions – usage - Tag Questions, types - identifying errors - Practice

Unit-II	GRAMMAR-2	9 Hrs

Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause-Voice-active voice and passive voice- reported Speech-Agreement- subject and verb-Modals-Spotting Errors-Practices

Unit -III	VERBAL ABILITY	9 Hrs

Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction-Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.

Unit -IV	READING COMPREHENSION AND VOCUBULARY	9 Hrs

Competitive Vocabulary :Word Building – Memory techniques-Synonyms, Antonyms, Affixes-Prefix &Suffix-One word substitutes-Compound words-Phrasal Verbs-Idioms and Phrases-Homophones-Linking Words-Modifiers-Intensifiers - Mastering Competitive Vocabulary- Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering–Elimination methods

Unit -V	WRITING FOR COMPETITIVE EXAMINATIONS	9 Hrs

Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs- Essay writing-types

Textbooks:

1. Wren & Martin, English for Competitive Examinations, S.Chand & Co, 2021
2. Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014

Reference Books:

1. Hari Mohan Prasad, Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.
2. Philip Sunil Solomon, English for Success in Competitive Exams, Oxford 2016

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3. Shalini Verma , Word Power Made Handy, S Chand Publications
4. Neira, Anjana Dev & Co. Creative Writing: A Beginner's Manual. Pearson Education India, 2008.
5. Abhishek Jain,Vocabulary Learning Techniques Vol.I&II,RR Global Publishers 2013.
6. Michel Swan, Practical English Usage,Oxford,2006.

Online Resources

1. https://www.grammar.cl/english/parts-of-speech.htm
2. https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech
3. https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice
4. https://languagetool.org/insights/post/verb-tenses/
5. https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council
6. https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Identify the basics of English grammar and its importance
CO2: Explain the use of grammatical structures in sentences.
CO3: Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams.
CO4: Analyze an unknown passage and reach conclusions about it.
CO5: Choose the appropriate form of verbs in framing sentences
CO6: Develop speed reading and comprehending ability thereby perform better in competitive exams

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B. Tech III Year I semester

ENTREPRENEURSHIP AND NEW VENTURE CREATION
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0051T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To foster an entrepreneurial mind-set for venture creation and intrapreneurial leadership
- To encourage creativity and innovation
- To enable them to learn pitching and presentation skills
- To make the students understand MVP development and validation techniques to determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept
- To enhance the ability of analyzing Customer and Market segmentation, estimate Market size, develop and validate Customer Personal

Syllabus		**Total Hours: 45**
Unit-I	**Entrepreneurship Fundamentals and context**	**9 Hrs**

Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16industries to choose from), Venture Activity

Unit-II	**Problem & Customer Identification**	**9 Hrs**

Understanding and analysing the macro-Problem and Industry perspective - technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion - identifying and defining problem using Design thinking principles - Analysing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.

Core Teaching Tool: Several types of activities including Class, game, Gen AI, 'Get out of the Building' and Venture Activity.

Unit -III	**Solution design, Prototyping & Opportunity Assessment and Sizing**	**9 Hrs**

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

Unit -IV	**Business & Financial Model, Go-to-Market Plan**	**9 Hrs**

Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach.

Business planning: components of Business plan- Sales plan, People plan and financial plan.

Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance. Introduction to Marketing and

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Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt& Equity Map the Start-up Life-cycle to Funding Options.

Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

Unit -V	**Scale Outlook and Venture Pitch readiness**	**9 Hrs**

Understand and identify potential and aspiration for scale vis-a-vis your venture idea. Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities

Textbooks:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business,(2011).
3. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

Reference Books:

1. Simon Sinek,Start with Why, Penguin Books limited. (2011)
2. Brown Tim,Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business.(2019)
3. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
4. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship

CO2: Comprehend the process of problem-opportunity identification through design thinking; identify market potential and customers while developing a compelling value proposition solution.

CO3: Analyze and refine business models to ensure sustainability and profitability.

CO4: Build Prototype for Proof of Concept and validate MVP of their practice venture idea.

CO5: Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture

CO6: Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders

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B. Tech III Year I semester

ANALOG & DIGITAL IC APPLICATIONS LAB

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
23A0413P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	PC

Syllabus

LIST OF EXPERIMENTS: (Execute any 12 experiments).

Note: At least 8 Linear and 4 Digital IC experiments shall be performed

PART – I: Linear IC Experiments

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op Amp and draw the comparison results of A=B, A>B, A < B
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHZ and find the roll off of it.
6. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Voltage Regulator usingIC723, IC 7805/7809/7912 and find its load regulation factor.
11. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
12. Design Parallel comparator type/ counter type/ successive approximation ADC and find its efficiency.

PART – II: Digital IC Applications

13. Design a 8x1 multiplexer using digital ICs.
14. Design a 4-bit Adder/Subtractor using digital ICs
15. Design a Decade counter and verify its truth table and draw respective waveforms.
16. Design a Up/down counter usingIC74163 and draw read/write waveforms.
17. Design a Universal shift register using IC 74194/195 and verify its shifting operation.
18. Design a 8x3 encoder/3x8 decoder and verify its truth table.

Additional experiments (Beyond Curriculum)

19.Code Convertors (Binary to gray, gray to binary)

Course Outcomes:

After the completion of the course students will be able to:

CO1: Design an Inverting and Non-inverting Amplifier using an Op Amp.
CO2: Demonstrate the Linear and Non-Linear Applications using IC 741.
CO3: Design Astable and Monostable Multivibrator using timer ICs.
CO4: Analyse the DAC and ADC converter.
CO5: Design Counters and Registers using digital ICs.
CO6: Acquaintance with lab equipment about the operation and its use.

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B. Tech III Year I semester

MICROPROCESSORS AND MICROCONTROLLERS LAB
(Common to ECE & EEE)

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
23A0415P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	PC

Syllabus

List of Experiments: (Any TEN of the experiments are to be conducted)

1. Programs for 16 Bit Arithmetic Operations (Using various addressing modes)

a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.

b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.

c) Write an ALP to find square, cube and factorial of a given number.

2. Programs Involving Bit Manipulation Instructions

a) Write an ALP to find the given data is positive or negative.

b) Write an ALP to find the given data is odd or even.

c) Write an ALP to find Logical ones and zeros in a given data.

3. Programs on Arrays for 8086

a) Write an ALP to find Addition/subtraction of N no's.

b) Write an ALP for finding largest/smallest no.

c) Write an ALP to sort given array in Ascending/descending order.

4. Programs on String Manipulations for 8086

a) Write an ALP to find String length.

b) Write an ALP for Displaying the given String.

c) Write an ALP for Comparing two Strings.

d) Write an ALP to reverse String and Checking for palindrome.

5. Programs for Digital Clock Design Using 8086

a) Write an ALP for Designing clock using INT 21H Interrupt.

b) Write an ALP for Designing clock using DOS Interrupt Functions.

c) Write an ALP for Designing clock by reading system time.

6. Interfacing Stepper Motor with 8086

a) Write an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.

b) Write an ALP to 8086 processor to Interface a stepper motor and operate it in Anti-clockwise by choosing variable step-size.

7. Interfacing ADC/DAC with 8086

a) Write an ALP to 8086 processor to Interface ADC.

b) Write an ALP to 8086 processor to Interface DAC and generate Square Wave/Triangular Wave/Step signal.

8. Communication between Two Microprocessors

a) Write an ALP to have Parallel communication between two microprocessors using 8255

b) Write an ALP to have Serial communication between two microprocessor kits using 8251.

9. Programs using Arithmetic and Logical Instructions for 8051

a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,

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b) Multiplication and Division.
c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR.
d) Programs related to Register Banks.

10. Programs to Verify Timers/Counters of 8051

a) Write a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.
b) Write a program to create a delay of 50 µsec using Timer1 in mode 0 and blink all the Pins of P2.
c) Write a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.
d) Write a program to create a delay of 80 µsec using counter1 in mode 1 and blink all the Pins of P3.

11. UART Operation in 8051

a) Write a program to transfer a character serially with a baud rate of 9600 using UART.
b) Write a program to transfer a character serially with a baud rate of 4800 using UART.
c) Write a program to transfer a character serially with a baud rate of 2400 using UART.

12. Interfacing LCD with 8051

a) Develop and execute the program to interface16*2 LCD to 8051.
b) Develop and execute the program to interface LCD to 8051 in 4-bit or 8-bit mode.

Course Outcomes:

At the end of this course, the students will be able to

CO1: Formulate a program and implement algorithms using Assembly language.
CO2: Describe an Assembly language program for the 8086 Microprocessor.
CO3: Develop programs for different applications in the 8086 Microprocessor.
CO4: Interface peripheral devices with 8086 and 8051.
CO5: Use an Assembly programming approach for solving real-world problems.
CO6: Use an Embedded C programming approach for solving real-world problems.

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B. Tech III Year I semester

PCB DESIGN AND PROTOTYPE DEVELOPMENT					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0419P	**0:1:2**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**SOC**

Course Objectives:

- Identifying Electronic Components Symbols & Footprints.
- To analyse the capability to produce PCB s of their circuit.
- To effectively use the design rules & interfacing between schematic &PCB.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Fundamental of basic electronics: Component identification, Component symbols & their footprints, understand schematic, Creating new PCB, Browsing footprints libraries, Setting up the PCB layers, Design rule checking, Track width selection, Component selection, Routing and completion of the design

Unit-II	**9 Hrs**

Introduction to PCB: Definition and Need/Relevance of PCB, Background and History of PCB, Types of PCB, Classes of PCB Design, Terminology in PCB Design, Different Electronic design automation (EDA) tools and comparison.

Unit -III	**9 Hrs**

PCB Design Process: PCB Design Flow, Placement and routing, Steps involved in layout design, Art work generation Methods - manual and CAD, General design factors for digital and analogue circuits, Layout and Artwork making for Single-side, double-side and Multilayer Boards, Design for manufacturability, Design-specification standards

Practice Exercises: (Any twelve experiments are to be done)	**9 Hrs**

1. Practice following PCB Design steps
   - Schematic Design: Familiarization of the Schematic Editor, Schematic creation, Annotation, Net list generation.
   - Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB layout Schematic.
   - Create new schematic components.
   - Create new component footprints.
2. Regulator circuit using 7805
3. Inverting Amplifier or Summing Amplifier using op-amp
4. Full-wave Rectifier
5. Astable multivibrator using IC555
6. Mono stable multivibrator using IC555
7. RC Phase-shifter oscillator using transistor.
8. Wein-bridge Oscillator using op-amp
9. Full-Adder using half-adders.
10. 4-bit binary/MOD N counter using D-Flip flops.
11. One open-ended (analog/ digital/mixed circuit) experiments of similar nature and magnitude to the above are to be assigned by the teacher (Student is expected to solve and execute/simulate independently).

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B. Tech III Year I semester

12. Design an 8051 Development board having Power section consisting of IC 7805, capacitor, resistor, headers, LED.
13. Design an 8051 Development board having Serial communication section consisting of MAX 232, Capacitors, DB9connector,Jumper, LEDs
14. Design an 8051 Development board having Reset & Input/output sections consisting of 89C51Microcontroller, Electrolytic Capacitor, Resistor, Jumper, Crystal Oscillator, Capacitors
15. Fabricate a single-sided PCB, mount the components and assemble them in a cabinet for anyone of the circuits mentioned in the above exercises.

Reference Books:

1. Jon Varteresian, Fabricating Printed Circuit Boards, 2002
2. R. Tummala, Fundamentals of Micro systems Packaging, Mc Graw-Hill 2001
3. C. Robertson. PCB Designer´s Reference. Prentice Hall, 2003
4. Open-source EDA Tool KiCad Tutorial: http://kicad-pcb.org/help/tutorials/ 13. PCB Fabrication user guide page:
5. http://www.wikihow.com/Create-Printed-Circuit-Boardshttp://www.siongboon.com/projects/2005-09-07_home_pcb_fabrication/http://reprap.org/wiki/MakePCBInstructions#Making_PCBs_yourself
6. PCB Fabrication at home(video): https://www.youtube.com/watch?v=mv7Y0A9YeUc,https://www.youtube.com/watch?v=imQTCW1yWkg

Course Outcomes(CO):

At the end of this course, the students will be able to:

CO1: Students can identify Electronic Components, Symbols & Footprints.
CO2: Students can design a schematic of their circuit.
CO3: Students can design PCB layout of their design.
CO4: Detailed description and practical of PCB designing.
CO5: Students can effectively use the design rules & interfacing between schematic &PCB

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B. Tech III Year I semester

TINKERING LAB

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0420P	0:0:2	1	CIE:30 SEE:70	3 Hours	SOC

Course Objectives:

- Encourage Innovation and Creativity.
- Provide Hands-on Learning and Impart Skill Development.
- Foster Collaboration and Teamwork.
- Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship.
- Impart Problem-Solving mind-set.

Syllabus

List of experiments

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Design and 3D print a Walking Robot
3. Design and 3D Print a Rocket.
4. Temperature & Humidity Monitoring System (DHT11 + LCD)
5. Water Level Detection and Alert System
6. Automatic Plant Watering System
7. Bluetooth-Based Door Lock System
8. Smart Dustbin Using Ultrasonic Sensor
9. Fire Detection and Alarm System
10. RFID-Based Attendance System
11. Voice-Controlled Devices via Google Assistant
12. Heart Rate Monitoring Using Pulse Sensor
13. Soil Moisture-Based Irrigation
14. Smart Helmet for Accident Detection
15. Milk Adulteration Detection System
16. Water Purification via Activated Carbon
17. Solar Dehydrator for Food Drying
18. Temperature-Controlled Chemical Reactor
19. Ethanol Mini-Plant Using Biomass
20. Smart Fluid Flow Control (Solenoid + pH Sensor)
21. Portable Water Quality Tester
22. AI Crop Disease Detection
23. AI-based Smart Irrigation
24. ECG Signal Acquisition and Plotting
25. AI-Powered Traffic Flow Prediction
26. Smart Grid Simulation with Load Monitoring
27. Smart Campus Indoor Navigator
28. Weather Station Prototype

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29. Firefighting Robot with Sensor Guidance
30. Facial Recognition Dustbin
31. Barcode-Based Lab Inventory System
32. Growth Chamber for Plants
33. Biomedical Waste Alert System
34. Soil Classification with AI
35. Smart Railway Gate
36. Smart Bin Locator via GPS and Load Sensors
37. Algae-Based Water Purifier
38. Contactless Attendance via Face Recognition

Note: The students can also design and implement their own ideas, apart from the list of experiments mentioned above.
Note: A minimum of 8 to 10 experiments must be completed by the students.

Reference Books:

1) https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2) https://atl.aim.gov.in/ATL-Equipment-Manual/
3) https://aim.gov.in/pdf/Level-1.pdf
4) https://aim.gov.in/pdf/Level-2.pdf
5) https://aim.gov.in/pdf/Level-3.pdf

Course Outcomes(CO):

At the end of this course, the students will be able to:
CO1: Demonstrate Creativity and Innovation.
CO2: Apply Hands-on Skills and Technical Knowledge.
CO3: Work Effectively in Teams and Collaborate.
CO4: Integrate Interdisciplinary Knowledge.
CO5: Solve Real-World Problems with Prototypes.
CO6: Use Modern Tools and Emerging Technologies.

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B. Tech III Year II Semester (Theory-6, Lab-2, SEC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1.	PC	23A0422T	Digital Signal Processing	3	0	0	3
2.	PC	23A0423T	Microwave and Optical Communications	3	0	0	3
3.	PC	23A0424T	VLSI Design	3	0	0	3
4.	PE		**Professional Elective-II**	3	0	0	3
5.	PE		**Professional Elective-III**	3	0	0	3
6.	OE		**Open Elective-II**	3	0	0	3
7.	PC	23A0423P	Microwave and Optical Communications Lab	0	0	3	1.5
8.	PC	23A0424P	VLSI Design Lab	0	0	3	1.5
9.	SOC	23A0430P	**Skill oriented course -IV** Machine Learning and DSP	0	1	2	2
10.	AC	23A0053T	Technical Paper Writing & IPR	2	0	0	-
Total				**20**	**01**	**08**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation							

S. No.	**Course Code**	**Name of the Professional Elective**
1	23A0425T	Electronic Measurements and Instrumentation
2	23A0426T	Embedded systems & IOT
3	23A0427T	Speech Processing
4	23A0428T	Digital Image Processing
5	23A0544T	Artificial Intelligence & Machine learning
6	23A0429T	Satellite Communications

K. Sravan kumar
MEMBER SECRETARY

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S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0150T	Disaster Management	CIVIL
2.	23A0151T	Sustainability In Engineering Practices	
3.	23A0232T	Renewable Energy Sources	EEE
4.	23A0334Tb	Automation and Robotics	MECH
5.	23A0548T	Fundamentals of Operating Systems	CSE & Allied/IT
6.	23A0529T	Machine Learning	
7.	23A0030T	Optimization Techniques	Mathematics
8.	23A0029T	Mathematical Foundation Of Quantum Technologies	
9.	23A0035T	Physics Of Electronic Materials And Devices	Physics
10.	23A0041T	Chemistry Of Polymers And Applications	Chemistry
11.	23A0045T	Academic Writing and Public Speaking	Humanities

K. Sravan kumar
MEMBER SECRETARY

Head of the Department
Dept. of Electronics & Communication Engg.
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B. Tech III Year II semester

DIGITAL SIGNAL PROCESSING					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0422T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PC**

Course Objectives:

- To get familiar with the properties of discrete time signals, systems and z-transform.
- To learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.
- To understand the implementations of digital filter structures.
- To analyse the FIR filter design using Fourier series and windowing methods.
- 5. To gain the knowledge on Programmable DSP Devices.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Introduction to discrete time signals and systems: Introduction to digital signal processing, block diagram, advantages, applications and limitations of Digital Signal Processing. Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems

Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems, analysis of linear time-invariant systems in the z-domain, pole-zero stability.

Unit-II	**9 Hrs**

Discrete Fourier Transform : Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT, sampling, Quantization effects.

Fast Fourier Transform: Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

Unit -III	**9 Hrs**

IIR Filters: Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations, Basic structures of IIR Filters - Direct form- I, Direct form-II, Cascade form and Parallel form realizations.

Unit -IV	**9 Hrs**

FIR Filters: Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations..

Unit -V	**9 Hrs**

Architectures for Programmable DSP Devices: Architecture of TMS320C5X - Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address

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Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

Textbooks:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2007.
2. A.V.Oppenheim and R.W. Schaffer, Discrete Time Signal Processing ,PHI.

Reference Books:

1. S.K.Mitra, Digital Signal Processing – A practical approach , 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum‘s Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Thomson, 2007.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand DSP block diagram and features.
CO2: To get familiar with the properties of discrete time signals, systems and z-transform.
CO3: To learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.
CO4: To understand the implementations of digital filter structures.
CO5: To analyse the FIR filter design using Fourier series and windowing methods.
CO6: To gain the knowledge on Programmable DSP Devices.

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MICROWAVE AND OPTICAL COMMUNICATIONS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0423T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PC**

Course Objectives:

- To analyse different modes of operation in rectangular wave guides, circular wave guides and resonators.
- To study and analyse various microwave components and microwave sources.
- To gain knowledge on different microwave semiconductor devices and microwave measurements procedures.
- To analyse different optical fiber modes and to study different types of distortions and losses in optical communication.
- To study various optical sources, optical detectors and to analyze various optical links.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Waveguides: Introduction, Rectangular waveguides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Power transmission and attenuation, Waveguide current and mode excitation, Circular waveguide – TE and TM modes(Qualitative treatment only), Wave propagation, Cavity resonators (Qualitative treatment only).

Unit-II	**9 Hrs**

Passive Microwave Devices: Introduction to scattering parameters and their properties, Terminations, Variable short circuit, Attenuators, Phase shifters, Hybrid Tees (H-plane, E-plane, Magic Tees), Directional Couplers – Bethe hole and Two hole Couplers, Deriving Scattering matrix for Microwave passive devices. Microwave propagation in Ferrites, Gyrator, Isolator, and Circulator.

Microwave Amplifiers and Oscillators: Microwave Tubes: Linear Beam Tubes – Two cavity Klystron amplifier -velocity modulation, bunching process, output power, Reflex Klystron oscillator, power output and efficiency, Travelling Wave Tube (TWT) – Bunching process and amplification process (Qualitative treatment only). Crossed Field Tubes – Magnetron oscillator, pi-mode operation, power output and efficiency, Hartree Condition.

Unit -III	**9 Hrs**

Microwave Semiconductor Devices: Gunn Oscillator – Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes.

Microwave Measurements: Description of Microwave bench-different blocks and their features, errors and precautions, Microwave power measurements, Measurement of attenuation, frequency, VSWR (low, medium, high), Measurement of 'Q' of a cavity, Impedance measurements.

Unit -IV	**9 Hrs**

Introduction to Optical Fibers and Transmission Characteristics - The propagation of light in optical waveguides – Classification of optical fibers – Numerical aperture, Step index and Graded index fiber – Modes in cylindrical fiber – Linearly polarized modes, Attenuation: Absorption, Scattering, Bending losses. Modal dispersion and chromatic dispersion – Single mode fiber - waveguide dispersion– MFD – PMD

Unit -V	**9 Hrs**

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Optical Transmitters and Receivers: Optical Sources: - Light source materials – LED homo and hetero structures – surface and edge emitters – Quantum efficiency – Injection Laser Diode – Modes and threshold condition – Structures and Radiation Pattern. Optical detectors: – Physical principles – PIN and APD diodes – Photo detector noise

Optical Link Design: Point- to- point links – System considerations – Link Power budget – Rise time budget.

Textbooks:

1. David M. Pozar,‖ Microwave Engineering‖ John Wiley & Sons, Inc. 4th edition, 2012
2. Samuel Y. Liao, ―Microwave Devices and Circuits‖, PHI publications, Third Edition, 1997.
3. Gerd Keiser, ―Optical Fiber Communications‖, McGraw Hill, Third Edition, 2000.

Reference Books:

1. R. E. Collin, ―Foundations for Microwave Engineering‖, Wiley Student Edition, Second Edition, 2009.
2. Om. P. Gandhi, ―Microwave: Engineering and Applications‖, Kai Fa Book Company, 1981.
3. Reich H. J., et al, ―Microwave Principles‖, MIT Press, 1972.
4. F E Terman, ―Electronic and Radio Engineering‖, McGraw Hill, 4th Edition, 1984

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Analyze different modes of operation in rectangular wave guides, circular wave guides and resonators.

CO2: Understand and analyze various microwave components and microwave sources.

CO3: Gain knowledge on different microwave semiconductor devices and microwave measurements procedures.

CO4: Analyze different optical fiber modes and to study different types of distortions and losses in optical communication.

CO5: Understand study various optical sources, optical detectors and to analyze various optical links.

CO6: Compare the performance of various microwave devices.

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B. Tech III Year II semester

VLSI DESIGN					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0424T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

- To understand the steps involved in fabrication of ICs using MOS transistor technology.
- To learn about the VLSI design processes, Stick diagrams and Layouts
- To gain knowledge on the Gate Level Design concepts
- To learn the design of various subsystems with different VLSI Design styles.
- To get familiar with CMOS testing techniques.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Introduction: Brief Introduction to IC technology MOS, PMOS, NMOS, CMOS & BiCMOS Technologies. Basic Electrical Properties of MOS and BiCMOS Circuits: IDS - VDS relationships, MOS transistor Threshold Voltage, figure of merit, Trans conductance, Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

Unit-II	**9 Hrs**

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Lambda(λ)-based design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

Unit -III	**9 Hrs**

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits. Basic Circuit Concepts: Sheet Resistance Rs and its concepts to MOS, Area Capacitances calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out

Unit -IV	**9 Hrs**

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters. VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices, parameters influencing low power design.

Unit -V	**9 Hrs**

CMOS Testing: Need for testing, Design for testability - built in self-test (BIST) – testing combinational logic –testing sequential logic – practical design for test guide lines – scan design techniques.

Textbooks:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, EshraghianDougles, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education

Reference Books:

1. CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Edn, Pearson, 2009.
2. BehzadRazavi , ―Design of Analog CMOS Integrated Circuits‖, McGraw Hill, 2003.
3. Jan M. Rabaey, ―Digital Integrated Circuits‖, Anantha Chandrakasan and Borivoje Nikolic, Prentice-

Hall of India Pvt. Ltd, 2nd edition, 2009.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the steps involved in fabrication of ICs using MOS transistor technology.
CO2: Learn about the VLSI design processes.
CO3: Learn about Stick diagrams and Layouts.
CO4: Gain knowledge on the Gate Level Design concepts.
CO5: Learn the design of various subsystems with different VLSI Design styles.
CO6: Familiar with CMOS testing techniques.

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0425T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To know about the performance characteristics of instruments and measurement of electrical quantities.
- To understand the construction, working and applications of different types of CRO‘s.
- To analyze the working of different types of bridges.
- To study the working of signal & function generators and analyzers.
- To analyze the working of sensors and transducers in measuring physical parameters.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters–multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, and shunt type, multimeter for voltage, current and resistance measurements**.**

Unit-II	**9 Hrs**

Oscilloscopes: Introduction, Basic Principle, Standard specifications of CRO,CRT features,vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method). Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements**,** Calibration of CRO used in laboratory

Unit -III	**9 Hrs**

Bridges: DC Bridges for Measurement of resistance**:** Wheat stone bridge, Kelvin‘s Bridge, AC Bridges for Measurement of inductance- Maxwell‘s bridge, Hay‘s Bridge, Anderson bridge. Measurement of capacitance- Schearing Bridge, Wien Bridge. Errors and precautions in using bridges, Applications of AC and DC Bridges

Unit -IV	**9 Hrs**

Signal Generators: Signal generator-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

Unit -V	**9 Hrs**

Sensors and Transducers –Difference between sensor and transducer. Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Textbooks:

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1. A.D. Helfrick and W.D. Cooper, ―Modern Electronic Instrumentation and Measurement Techniques, 5th Edition, PHI, 2002.
2. H. S. Kalsi, ―Electronic Instrumentation‖, 2nd edition, Tata McGraw Hill, 2004.

Reference Books:

1. David A. Bell, ―Electronic Instrumentation & Measurements‖, 2nd Edition, PHI, 2003.
2. K. Lal Kishore, ―Electronic Measurements & Instrumentations‖, Pearson Education, 2009.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn about the performance characteristics of instruments.
CO2: Learn about the measurement of electrical quantities.
CO3: Understand the construction, working and applications of different types of CRO‘s.
CO4: Compare the working of different types of bridges.
CO5: Know the working of signal & function generators and analysers.
CO6: Grasp the working of sensors and transducers in measuring physical parameters.

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B. Tech III Year II semester

EMBEDDED SYSTEMS & IOT					
Course Code	**L:T:P:C**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0426T	**3:0:0:3**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To understand the Architecture, Development & Design of Embedded Systems and IoT.
- To learn the architecture and programming of ARM Microcontroller.
- To be able to work with Raspberry Pi using Python Programming.
- To know about the loT standards, communication technologies and protocols for IoT devices.
- To implement case studies and applications using the tools and techniques of IoT Platform.

Syllabus	**Total Hours: 47**
Unit-I	**10 Hrs**

Introduction to Embedded Systems and Internet of Things (IoT): Introduction, Classifications of Embedded Systems, Design Metrics of Embedded System, Applications of Embedded Systems, Hardware & Software Architecture of Embedded Systems, Embedded Systems Development process, Architecture of Internet of Things, Physical Design & Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Tools, Applications of Embedded Systems and IoT, Design Methodology for IOT Products.

Unit-II	**9 Hrs**

ARM Microcontrollers Architecture and Programming: Architecture, Pin Diagram, Register Set & Modes, Memory Organization, Instruction set, Programming ports, Timer/Counter, Serial communication, I/O System, Development Tools, interrupts in C, Introduction ARM mBed platform.

Unit -III	**9 Hrs**

Fundamentals of Python Programming & Raspberry Pi: Introduction to python programming, Data Types & Data Structures, working with functions, Modules & Packages, File Handling, classes, REST full Web Services, Client Libraries, Introduction & programming Raspberry Pi3, Interfaces, Integrating Input Output devices with Raspberry Pi3

Unit -IV	**9 Hrs**

IoT Technologies, Standards, Tools & M2M Network: Fundamental characteristics and high-level requirements of IoT, IoT Reference models; Introduction to Communication Technologies & Protocols of IoT: BLE, Wi-Fi, LoRA, 3G/4G Technologies and HTTP, MQTT, CoAP protocols; Relevant Practicals on above technologies, M2M Network, SDN (Software Defined Networking) & NFV (Network Function Virtualization) for IoT

Unit -V	**10 Hrs**

IoT Platform, Cloud Computing Platforms & Data Analytics for IoT Development: IOT Platform Architecture (IBM Internet of Things & Watson Platforms); API Endpoints for Platform Services; Devices Creation and Data Transmission; Introduction to NODE-RED and Application deployment, Introduction to Data Analytics, Apache Hadoop, Apache Oozie, Spark & Storm

Textbooks:

1. ArsheepBahga, Vijay Madisetti, ―Internet of Things: A Hands-On Approach‖, 1st Edition, VPT, 2014.
2. K.V.K.K.Prasad, ―Embedded Real Time Systems: Concepts, Design and Programming‖, 1st Edition, Dreamtech Publication, 2014.

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3. Adrian McEwen, Hakim Cassimally, ―Designing the Internet of Things‖, Wiley Publications, 2013

Reference Books:

1. Jonathan W Valvano, ―”Embedded Microcomputer Systems: Real-Time Interfacing”, 3rd Edition, Thomson Engineering, 2012.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, ―”The Internet of Things: Key applications and Protocols”, 2nd Edition, Wiley Publications, 2012.
3. Rene Beuchat , Andrea Guerrieri & Sahand Kashani ―”Fundamentals of System-on-Chip Design on Arm Cortex-M Microcontrollers” Paperback, 2 August 2021.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the Architecture, Development & Design of Embedded Systems and IoT.
CO2: Learn the architecture and programming of ARM Microcontroller.
CO3: Understand the working with Raspberry Pi using Python Programming.
CO4: Understand the IoT Technologies, Standards and core communication protocols.
CO5: Apply the various protocols to basic sensor to cloud data transmission.
CO6: Design and implement the different case studies and applications using the tools and techniques of IoT Platform .

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B. Tech III Year II semester

SPEECH PROCESSING					
Course Code	**L:T:P:C**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0427T	**3:0:0:3**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To impart knowledge on anatomy and physiology of speech organs and the process of Speech Production.
- To understand the methods for extracting of speech using Time domain parameters.
- To learn the Frequency Domain Methods for Speech Processing.
- To interpret and analyze LPC Parameters for Speech Processing.
- To introduce the concepts of homomorphic Speech Processing.

Syllabus	**Total Hours: 46**
Unit-I	**10 Hrs**

Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production – Uniform lossless tube model, effect of losses in vocal tract and radiation at lips, Digital models for speech signals.

Unit-II	**9 Hrs**

Time Domain Methods for Speech Processing: Time domain parameters of speech, methods for extracting the parameters: Zero crossings, Auto-correlation function, pitch estimation.

Unit -III	**8 Hrs**

Frequency Domain Methods for Speech Processing: Short time Fourier analysis, Filter bank analysis, Spectrographic analysis, Formant extraction, Pitch extraction.

Unit -IV	**9 Hrs**

Linear predictive Coding (LPC) for Speech: Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains, Method of Solution of the LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Unit -V	**10 Hrs**

Homomorphic Speech Processing: Introduction Homomorphic Systems for Convolution - Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, pitch Detection and Formant Estimation; Applications of speech processing, Speech Enhancement, Speech recognition, Speech synthesis and Speaker Verification.

Textbooks:

1. L.R. Rabiner and S. W. Schafer, Digital Processing of Speech Signals, Pearson Education.
2. Douglas O‘ Shaughnessy, Speech Communications: Human &Machine, 2nd Ed., WileyIEEE Press.

Reference Books:

1. Thomas F. Quatieri, Discrete Time Speech Signal Processing: Principles and Practice, 1st Ed., Pearson Education
2. Ben Gold & Nelson Morgan, Speech and Audio Signal Processing: Processing and Perception of

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Speech and Music, 1st Ed., Wiley.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Gain knowledge on anatomy and physiology of speech organs and the process of Speech Production.
CO2: Understand the methods for extracting of speech using Time domain parameters.
CO3: Learn the Frequency Domain Methods for Speech Processing.
CO4: Interpret LPC Parameters for Speech Processing.
CO5: Analyze LPC Parameters for Speech Processing
CO6: Grasp the concepts of homomorphic Speech Processing.

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B. Tech III Year II semester

DIGITAL IMAGE PROCESSING					
Course Code	**L:T:P:C**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0428T	**3:0:0:3**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To learn the fundamentals of Image Processing with different transforms.
- To understand functions of Intensity Transformations and working fundamentals of Spatial Filters
- To implement various models of Restoring and Reconstruction of Images from filtering projections.
- To study the concepts of image compression using different coding &Wavelets and Multi resolution Processes.
- To design image processing systems using Segmentation techniques for Morphological & Color Images.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms.

Unit-II	**9 Hrs**

Intensity Transformations and Spatial Filtering: Background, some basic intensity transformation functions using Machine Learning, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

Unit -III	**9 Hrs**

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter ,image reconstruction from projections.

Unit -IV	**9 Hrs**

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding, Data transformation and Data Reduction using image compression techniques in Machine Learning

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B. Tech III Year II semester

Wavelets and Multi resolution Processing: Image pyramids, subband coding, Multi resolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

Unit -V	**9 Hrs**

Image segmentation: Fundamentals, point, line, edge detection, thresholding using Machine Learning, region –based segmentation- Region growing – Region splitting and merging

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds, Morphological Image Processing using Machine Learning techniques

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Textbooks:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar,‖ Digital Image Processing‖, Tata McGraw-Hill Education, 2011.

Reference Books:

1. Anil K.Jain, ―Fundamentals of Digital Image Processing‖, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.DuttaMajumder, ―Digital Image Processing and Analysis‖, PHI, 2009

Online Learning Resources:

1. https://nptel.ac.in/courses/117105079
2. https://nptel.ac.in/courses/117105135

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the fundamentals of Image Processing with different Transforms.
CO2: Understand the functions of Intensity Transformations and working fundamentals of Spatial Filters.
CO3: Implement various models of Restoring and Reconstruction of Images from filtering projections.
CO4: Grasp the concepts of image compression using different coding &Wavelets and Multi resolution Processes.
CO5: Design the image processing systems using Segmentation techniques for Morphological & Color Images.
CO6: Apply various morphological operators on images.

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B. Tech III Year II semester

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING					
Course Code	**L:T:P:C**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0544T	**3:0:0:3**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To learn the basics and problems of Artificial Intelligence with rationality and structure of agents.
- To describe the search for solutions using various search strategies & algorithms for optimization.
- To evaluate the representation of Agents with Propositional Logic in Shopping World.
- To understand the concepts of Machine Learning with different Perspectives.
- To analyze Decision Tree Representation with different problems& issues.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Introduction: What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Unit-II	**9 Hrs**

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

Unit -III	**9 Hrs**

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

Unit -IV	**9 Hrs**

Introduction to Machine Learning: Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning.

Concept Learning and The General-to-Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate Elimination, Inductive Bias

Unit -V	**9 Hrs**

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

Textbooks:

1. Stuart Russell and Peter Norvig, ―Artificial Intelligence: A Modern Approach‖ , 3rd Edition, Pearson
2. Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013

Reference Books:

1. Saroj Kaushik, ―Artificial Intelligence‖, Cengage Learning India, 2011
2. Elaine Rich and Kevin Knight, ―Artificial Intelligence‖, Tata McGraw Hill
3. David Poole and Alan Mackworth, ―Artificial Intelligence: Foundations for Computational Agents‖, Cambridge University Press 2010

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B. Tech III Year II semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: To learn the basics and problems of Artificial Intelligence with rationality and structure of agents.
CO2: To describe the search for solutions using various search strategies for optimization.
CO3: To evaluate the representation of Agents with Propositional Logic in Shopping World.
CO4 To understand the concepts of Machine Learning with different Perspectives.
CO5: To analyze Decision Tree Representation with different problems& issues.
CO6: To describe the search for solutions using various algorithms for optimization.

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B. Tech III Year II semester

SATELLITE COMMUNICATIONS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0429T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To learn the principles of orbital mechanics& satellite launch system with performance parameters.
- To describe the elements of communication satellite design for matching reliability.
- To know the working concepts of various multiple access techniques and onboard processing.
- To analyze the satellite links design with communication links.
- To evaluate the working of earth station design with satellite broadcasting.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Basic Concepts of Satellite Communications, Frequency Allocation for Satellite Services, Elements of orbital mechanics. Equations of motion. Tracking and orbit determination. Orbital correction/control. Satellites launch systems. Multistage rocket launchers and their performance

Unit-II	**9 Hrs**

Elements of communication satellite design. Spacecraft subsystems. Satellite Antennas. Equipment Reliability considerations. Spacecraft integration

Unit -III	**9 Hrs**

Multiple access techniques - FDMA, TDMA, CDMA. Random access techniques. Satellite onboard processing, Spread Spectrum Transmission and Reception

Unit -IV	**9 Hrs**

Satellite link design: Performance requirements and standards. System noise temperature and G/T ratio. Design of satellite links – DOMSAT, INSAT, INTELSAT and INMARSAT. Satellite - based personal communication. Links.

Unit -V	**9 Hrs**

Earth station design Configurations. Transmitters. Receivers, Antenna and tracking systems. Satellite broadcasting.

Textbooks:

1. D. Roddy, Satellite Communication (4/e), McGraw- Hill, 2009.
2. T. Pratt & C.W. Bostain, Satellite Communication, Wiley 2000.

Reference Books:

1. B.N. Agrawal, Design of Geosynchrons Spacecraft, Prentice- Hall, 1986.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the principles of orbital mechanics

CO2: Study the Satellite launch system with performance parameters.

CO3: Describe the elements of communication satellite design for matching reliability.

CO4: Gain knowledge on various multiple access techniques and Onboard processing.

CO5: Analyze the satellite links design with communication links.

CO6: Evaluate the working of earth station design with satellite broadcasting.

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B. Tech III Year II semester

DISASTER MANAGEMENT
(CSE, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0150T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
- To analyse the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
- To apply wind engineering principles and computational techniques in designing wind-resistant structures.
- To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
- To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

Syllabus		Total Hours: 48
Unit-I	**Introduction to Natural Disasters**	**8 Hrs**

Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).

Unit-II	**Cyclones and Their Impact**	**10 Hrs**

Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.

Unit -III	**Wind Engineering and Structural Response**	**10 Hrs**

Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas.

Unit -IV	**Seismology and Earthquake Effects**	**10 Hrs**

Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening.

Unit -V	**Planning and Design Considerations for Seismic Safety**	**10 Hrs**

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B. Tech III Year II semester

General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques.

Textbooks:

1. David Alexander, Natural Disasters, 1st Edition, CRC Press, 2017.
2. Edward A. Keller and Duane E. DeVecchio, Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 5th Edition, Routledge, 2019.

Reference Books:

1. Ben Wisner, J.C. Gaillard, andIlanKelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.
3. BimalKanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020

Online Learning Resources:

https://nptel.ac.in/courses/124107010
https://onlinecourses.swayam2.ac.in/cec19_hs20/preview.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.

CO2: Analyse the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.

CO3: Apply wind engineering principles and computational techniques in designing wind-resistant structures.

CO4: Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.

CO5: Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

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B. Tech III Year II semester

SUSTAINABILITY IN ENGINEERING PRACTICES
(CSE, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0151T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
- To analyse sustainable construction materials, their durability, and life cycle assessment.
- To apply energy calculations in construction materials and assess their embodied energy.
- To evaluate green building standards, energy codes, and performance ratings.
- To assess the environmental effects of energy use, climate change, and global warming.

Syllabus		Total Hours: 48
Unit-I	**Introduction and Definition of Sustainability**	**8 Hrs**

Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

Unit-II	Materials Used In Sustainable Construction	10 Hrs

Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.

Unit -III	Energy Calculations	10 Hrs

Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use

Unit -IV	Green Buildings	10 Hrs

Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings – Roleof Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building

Unit -V	Environmental Effects	10 Hrs

Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.

Textbooks:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.

Reference Books:

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practicesin the Built Environment, Butterworth Heinemann Publishers, 2011.

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2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012.

Online Learning Resources:

https://archive.nptel.ac.in/courses/105/105/105105157/

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.

CO2: Analyse sustainable construction materials, their durability, and life cycle assessment.

CO3: Apply energy calculations in construction materials and assess their embodied energy.

CO4: Evaluate green building standards, energy codes, and performance ratings.

CO5: Assess the environmental effects of energy use, climate change, and global warming.

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B. Tech III Year II semester

RENEWABLE ENERGY SOURCES
(All Branches Except EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0232T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Syllabus		Total Hours: 48
Unit-I	**Solar Energy**	**8 Hrs**

Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. Flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

Unit-II	PV Energy Systems	10 Hrs

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.

Unit -III	Wind Energy	10 Hrs

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations

Unit -IV	Geothermal Energy	10 Hrs

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India

Unit -V	Miscellaneous Energy Technologies	10 Hrs

Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations.

Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration.

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Textbooks:

1. G. D. Rai, —Non-Conventional Energy Sources‖, 4th Edition, Khanna Publishers, 2000.
2. Chetan Singh Solanki —Solar Photovoltaics fundamentals, technologies and applications‖ 2nd Edition PHI Learning Private Limited. 2012

Reference Books:

1. StephenPeake, —Renewable Energy Power for a Sustainable Future‖, Oxford International Edition, 2018.
2. S. P. Sukhatme, —Solar Energy‖,3rd Edition, Tata McGraw Hill Education Pvt. Ltd, 2008.
3. B H Khan , — Non-Conventional Energy Resources‖, 2nd Edition, Tata McGraw Hill Education Pvt Ltd, 2011.
4. S. HasanSaeed and D.K.Sharma,—Non-Conventional Energy Resources‖,3rd Edition, S.K.Kataria&

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Sons, 2012.
5. G. N. Tiwari and M.K.Ghosal, ―Renewable Energy Resource: Basic Principles and Applications‖, Narosa Publishing House, 2004.

Online Learning Resources:

- https://nptel.ac.in/courses/103103206
- 2. https://nptel.ac.in/courses/108108078

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand principle operation of various renewable energy sources.

CO2: Identify site selection of various renewable energy sources.

CO3: Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomasss, Tidal Wave and Fuel cell energies.

CO4: Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.

CO5: Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

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B. Tech III Year II semester

AUTOMATION AND ROBOTICS
(CSE, CSE-AIML,CSE-CS,CSE-DS,CE,ECE,EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0334Tb	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.
- Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation.
- Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.
- Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.
- Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

Syllabus		Total Hours: 48
Unit-I	**Introduction to Automation**	**8 Hrs**

Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

Unit-II	Automated flow lines	10 Hrs

Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

Unit -III	Introduction to Industrial Robotics	10 Hrs

Introduction to Industrial Robotics: Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.

Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors

Unit -IV	Manipulator Kinematics & Manipulator Dynamics	10 Hrs

Manipulator Kinematics:

Manipulator Kinematics, Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics.

Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

Unit -V	Robot Programming & Robot Application in	10 Hrs

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B. Tech III Year II semester

	Manufacturing	

Robot Programming: Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages.

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection

Textbooks:

1. M.P.Groover, Automation, Production systems and CIM, Pearson Edu, 2015.
2. M.P.Groover, Industrial Robotics, TMH, 2012

Reference Books:

1. FuKS, Robotics, McGrawHill,4thedition,2010.
2. P.Coiffet and M.Chaironze, An Introduction to Robot Technology, Kogam PageLtd. 1983 London.
3. Richard D.Klafter, Robotic Engineering, Prentice Hall, 1989.
4. Ashitave Ghosal, Robotics, Fundamental Concepts and analysis, OxfordPress,1/e,2006
5. Mittal RK & Nagrath, Robotics and Control, TMH,2003.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.

CO2: Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.

CO3: Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.

CO4: Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.

CO5: Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.

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B. Tech III Year II semester

FUNDAMENTALS OF OPERATING SYSTEMS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0548T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions

Syllabus	Total Hours: 48

Unit-I **8 Hrs**

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

Unit-II **10 Hrs**

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

Unit -III **10 Hrs**

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples.

Virtual Memory Management: Introduction, Demand paging, Copy on write, Page replacement, Frame allocation, Thrashing, Memory mapped files, Kernel memory allocation, Examples.

Unit -IV **10 Hrs**

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation

Unit -V **10 Hrs**

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography as a security,

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User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.

Textbooks:

1. Operating System Concepts, Silber schatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

Reference Books:

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2013 Mittal RK & Nagrath, Robotics and Control, TMH,2003.

Web References:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.

CO2: Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.

CO3: Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.

CO4: Illustrate different conditions for deadlock and their possible solutions.

CO5: Analyze the memory management and its allocation policies.

CO6: Able to design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms

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B. Tech III Year II semester

MACHINE LEARNING
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0529T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Define machine learning and its different types (supervised and unsupervised) and understand their applications
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN)
- Implement unsupervised learning techniques, such as K-means clustering

Syllabus		Total Hours: 48
Unit-I	**Introduction to Machine Learning**	**8 Hrs**

Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

Unit-II	Nearest Neighbor-Based Models	10 Hrs

Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

Unit -III	Models Based on Decision Trees and The Bayes Classifier	10 Hrs

Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

The Bayes Classifier: Introduction to the Bayes Classifier, Bayes‘ Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

Unit -IV	Linear Discriminants for Machine Learning	10 Hrs

Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

Unit -V	Clustering	10 Hrs

Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, KMeans Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Textbooks:

1. “Machine Learning Theory and Practice”, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

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Reference Books:

1. "Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017
2. "Machine Learning in Action",Peter Harrington, DreamTech
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Identify machine learning techniques suitable for a given problem
CO2: Solve real-world problems using various machine learning techniques
CO3: Apply Dimensionality reduction techniques for data preprocessing
CO4: Explain what is learning and why it is essential in the design of intelligent machines
CO5: Evaluate Advanced learning models for language, vision, speech, decision making etc

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B. Tech III Year II semester

OPTIMIZATION TECHNIQUES
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0030T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Syllabus		Total Hours: 48
Unit-I	**Linear programming I**	**8 Hrs**

Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method

Unit-II	Linear programming II: Duality in Linear Programming	10 Hrs

Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

Unit -III	Non-linear programming: Unconstrained optimization techniques	10 Hrs

Introduction: Classification of Unconstrained minimization methods

Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

Unit -IV	Non-linear programming: Constrained optimization techniques	10 Hrs

Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

Unit -V	Geometric Programming	10 Hrs

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

Constrained minimization Problems: Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints

Textbooks:

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi

Reference Books:

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

Web References:

- https://onlinecourses.nptel.ac.in/noc24_ee122/preview
- https://archive.nptel.ac.in/courses/111/105/111105039/
- https://onlinecourses.nptel.ac.in/noc21_ce60/preview

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B. Tech III Year II semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry

CO2: Interpret the transportation models' solutions and infer solutions to the real-world problems

CO3: Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications

CO4: Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives

CO5: Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives

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B. Tech III Year II semester

MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0029T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.
- To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.
- To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.
- To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.
- To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics

Syllabus		Total Hours: 48
Unit-I	**Linear Algebra Foundation for Quantum Mechanics**	**8 Hrs**
Vector spaces definition and examples (R^2, R^3, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigen values, eigenvectors), Finite-dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($\|\psi\rangle$, $\langle \varphi\|$, $\langle \varphi\|\psi\rangle$), Change of basis (transformations, unitary matrices).		
Unit-II	**From Finite to Infinite Dimensions**	**10 Hrs**
Function spaces (L^2 space, square-integrable functions), Inner products for functions ($\int \psi^* \varphi \, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).		
Unit -III	**Quantum Mechanical Formalism**	**10 Hrs**
Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).		
Unit -IV	**Applications and Statistical Interpretation**	**10 Hrs**
Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).		
Unit -V	**Advanced Topics**	**10 Hrs**
Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).		

Textbooks:

1. David J. Griffiths, Darrell F. Schroeter, “Introduction to Quantum Mechanics”, 3rd Edition, Cambridge University Press (2018).

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2. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

Reference Books:

1. George. F. Simmons, "Introduction to Topology and Modern Analysis",MedTech Science Press.
2. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics,Princeton Univ. Press (1996).

WebReference:

- https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf
- https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand vector spaces, inner products, and linear operators with applications to quantum systems

CO2: Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems

CO3: Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution

CO4: Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations

CO5: Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory

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B. Tech III Year II semester

PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0035T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To make the students to understand the concept of crystal growth, defects in crystals and thin films
- To provide insight into various semiconducting materials and their properties
- To develop a strong foundation in semiconductor physics and device engineering
- To elucidate excitonic and luminescent processes in solid-state materials
- To understand the principles, technologies, and applications of modern display systems

Syllabus		Total Hours: 48
Unit-I	**Fundamentals of Materials Science**	**9 Hrs**

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge)

Unit-II	**Semiconductors**	**9 Hrs**

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects

Unit -III	**Physics of Semiconductor Devices**	**9 Hrs**

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Hetero junctions, Transistors, MOSFETs

Unit -IV	**Excitons and Luminescence**	**9 Hrs**

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials.

Photoluminescence : General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot

Electro-luminescence: General Principles of electroluminescence, light emitting diode, diode laser.

Unit -V	**Display devices**	**9 Hrs**

LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays

Textbooks:

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 4th edition, 2021.
2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012

Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition
3. Electronic Materials Science- Eugene A. Irene, Wiley, 2005

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4. Electronic Components and Materials, Grover and Jamwal, DhanpatRai and Co., New Delhi., 2012.
5. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011

NPTEL course links:

- https://nptel.ac.in/courses/113/106/113106062/
- https://onlinecourses.nptel.ac.in/noc20_ph24/preview

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand crystal growth and thin film preparation
CO2: Summarize the basic concepts of semiconductors
CO3: Illustrate the working of various semiconductor devices
CO4: Analyze various luminescent phenomena and the devices based on these concepts
CO5: Explain the working of different display devices

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B. Tech III Year II semester

CHEMISTRY OF POLYMERS AND APPLICATIONS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0041T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand the basic principles of polymers
- To understand natural polymers and their applications
- To impart knowledge to the students about synthetic polymers, their preparation and importance
- To enumerate the applications of hydogel polymers
- To enumerate applications of conducting and degradable polymers in engineering

Syllabus		Total Hours: 48
Unit-I	**Polymers-Basics and Characterization**	**9 Hrs**

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution.

Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers

Unit-II	**Natural Polymers & Modified cellulosics**	**9 Hrs**

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA

Unit -III	**Synthetic Polymers**	**9 Hrs**

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins

Unit -IV	**Hydrogels of Polymer networks**	**9 Hrs**

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels**,** Applications of hydrogels in drug delivery.

Unit -V	**Conducting and Degradable Polymers**	**9 Hrs**

Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping,Applications.

Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications

Textbooks:

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B. Tech III Year II semester

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S.Mishra
3. Polymer Chemistry – Gowarikar

Reference Books:

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
2. 2.Advanced Organic Chemistry, B.Miller, Prentice Hall
3. 3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer

CO2: Describe the physical and chemical properties of natural polymers and Modified cellulosics

CO3: Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers

CO4: Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery

CO5: Explain classification and mechanism of conducting and degradable polymers

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B. Tech III Year II semester

ACADEMIC WRITING AND PUBLIC SPEAKING
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0045T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To encourage all round development of the students by focusing on writing skills
- To make the students aware of non-verbal skills
- To develop analytical skills
- To deliver effective public speeches

Syllabus		Total Hours: 48
Unit-I	**Introduction to Academic Writing**	**9 Hrs**

Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing

Unit-II	**Academic Journal Article**	**9 Hrs**

Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading - Plagiarism

Unit -III	**Essay & Writing Reviews**	**9 Hrs**

Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP

Unit -IV	**Public Speaking**	**9 Hrs**

Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events.

Unit -V	**Public Speaking and Non-Verbal Delivery**	**9 Hrs**

Body Language – Facial Expressions-Kinesics – Oculesics – Proxemics – Haptics – Chronomics - Paralanguage - Signs

Textbooks:

1. Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)
2. Pease, Allan & Barbara. The Definitive Book of Body LanguageRHUS Publishers, 2016

Reference Books:

1. Alice Savage, Masoud Shafiei Effective Academic Writing,**2Ed.,**2014 Oxford University Press.
2. Shalini Verma, *Body Language*, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata,*Communication Skills* 2E 2015, Oxford.
4. Sharon Gerson, Steven Gerson,*Technical Communication Process and Product*, Pearson, New Delhi, 2014
5. *Elbow, Peter. Writing with Power. OUP USA, 1998*

Online Learning Resources:

1. https://youtu.be/NNhTIT81nH8

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2. phttps://www.youtube.com/watch?v=478ccrWKY-A
3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4
5. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-of-delivery/
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
7. https://archive.nptel.ac.in/courses/109/107/109107172/#
8. https://archive.nptel.ac.in/courses/109/104/109104107/

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand various elements of Academic Writing
CO2: Identify sources and avoid plagiarism
CO3: Demonstrate the knowledge in writing a Research paper
CO4: Analyse different types of essays
CO5: Assess the speeches of others and know the positive strengths of speakers
CO6: Build confidence in giving an impactful presentation to the audience

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B. Tech III Year II semester

MICROWAVE AND OPTICAL COMMUNICATIONS LAB

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
23A0423P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	PC

Syllabus

LIST OF EXPERIMENTS: (**Execute any 12 experiments**).

PART-A: Microwave Lab - Any Seven (7) Experiments

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Attenuation Measurement
4. Directional Coupler Characteristics
5. VSWR Measurement
6. Impedance Measurements
7. Frequency and Wavelength measurement
8. Scattering Parameters of Directional coupler
9. Scattering Parameters of Magic TEE
10. Radiation pattern measurement of a Antenna
11. Antenna gain measurement
12. To analyze the characteristics of Simple Dipole λ/2 and λ/4 Antenna
13. To analyze the characteristics and radiation pattern of broad side and end fire arrays.
14. Study of Yagi Uda 3element Folded Dipole, 5element folded dipole.

Part B: Optical Fiber Lab - Any five (5) Experiments

1. Characterization of LED
2. Characterization of Laser Diode
3. Intensity Modulation of Laser output through Optical fiber
4. Measurement of data rate for digital Optical link
5. Measurement of Numerical Aperture.
6. Measurement of Losses for Analog optical link

Course Outcomes:

After the completion of the course students will be able to:

CO1: Understand the working of microwave bench set up and characteristics of microwave sources.
CO2: Verify the characteristics of various microwave components and to draw the radiation pattern of antennas.
CO3: Verify the characteristics of optical sources & detectors and to study about losses in optical fiber.
CO4: Characterize optical sources such as LEDs and Laser Diodes and assess their performance in optical communication systems.
CO5: Demonstrate and experiment with analog and digital optical links to determine data rate, numerical aperture, and transmission losses.
CO6: Design and perform experiments on intensity modulation through optical fiber and interpret results to assess signal transmission behavior.

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B. Tech III Year II semester

VLSI DESIGN LAB

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
23A0424P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	PC

Syllabus

List of Experiments: (Any TEN of the experiments are to be conducted)

1. Design and analysis of CMOS Inverter
- a) Implement CMOS inverter schematic using 180 nm technology and design its symbol.
- b) Implement test bench for CMOS Inverter and check its output response.
- c) Perform DC and AC analysis for CMOS inverter.
- d) Check the performance of CMOS inverter using parametric sweep.

2. Design and analysis of NAND and NOR Logic gates
- a) Implement NAND/NOR schematic using 180 nm technology and design its symbol.
- b) Implement test bench for NAND/NOR and check its output response.
- c) Perform DC and AC analysis for NAND/NOR.
- d) Check the performance of NAND/NOR using parametric sweep.

3.Design and analysis of XOR and XNOR Logic gates
- a) Implement XOR/XNOR schematic using 180 nm technology and design its symbol.
- b) Implement test bench for XOR/XNOR and check its output response.
- c) Perform DC and AC analysis for XOR/XNOR.
- d) Check the performance of XOR/XNOR using parametric sweep.

4. Design of AOI logic
- a) Design Schematic for AB+C_D and check its output response.
- b) Design Schematic for AB_+C_D and check its output response.
- c) Design Schematic for (A+B_)(C+D) and check its output response.
- d) Design Schematic for (A+B_)(C_+D) and check its output response..

5. Design and analysis of Full adder
- a) Design full adder using Full custom IC design.
- b) Design full adder using Semi custom IC design.

6. Analysis of NMOS and PMOS characteristics
- a) Implement test bench for NMOS/PMOS transistor.
- b) Perform DC and AC analysis for NMOS/PMOS transistor
- c) Check the performance of NMOS/PMOS transistor using parametric sweep.

7. Design and analysis of Common source amplifier
- **a**) Implement CS amplifier schematic using 180 nm technology and design its symbol.
- b) Implement test bench for CS amplifier and check its output response.
- c) Perform DC and AC analysis for CS amplifier.
- d) Check the performance of CS amplifier using parametric sweep.

8. Design and analysis of Common drain amplifier
- a) Implement CD amplifier schematic using 180 nm technology and design its symbol.
- b) Implement test bench for CD amplifier and check its output response.

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c) Perform DC and AC analysis for CD amplifier.
d) Check the performance of CD amplifier using parametric sweep.

9. Design of MOS differential amplifier

a) Design differential amplifier schematic using 180 nm technology and its symbol.
b) Implement test bench for differential amplifier and check its output response.
c) Perform DC and AC analysis for differential amplifier.
d) Check the performance of differential amplifier using parametric sweep.

10. Design of differential amplifier using FET/BJT

a) Design differential amplifier using FET/BJT schematic using 180 nm technology and its symbol.
b) Implement test bench for two stage differential amplifier and check its output response.
c) Perform DC and AC analysis for differential amplifier.
d) Check the performance of differential amplifier using parametric sweep.

11. Design of Inverter Layout

a) Design and implement inverter schematic.
b) Design the layout for inverter using 180 nm tech file.
c) Perform LVS for schematic and layout
d) Check and remove all DRC violations.
e) Extract parasitic R and C in layout.

12. Design of NAND/NOR Layout

a) Design and implement NAND/NOR schematic.
b) Design the layout for inverter using 180 nm tech file.
c) Perform LVS for schematic and layout
d) Check and remove all DRC violations.
e) Extract parasitic R and C in layout

Course Outcomes:

At the end of this course, the students will be able to

CO1: Design a logic circuit using CMOS transistor using 180 nm technology in terms of schematic, symbol.
CO2: Evaluate different schematics &output responses for AOI logic by using different software tools.
CO3: Design CMOS circuits using Full & Semi custom IC designs for analyzation.
CO4: Design different layouts using different software tools for analog circuits.
CO5: Design a logic circuit using CMOS transistor using 180 nm technologies in terms of test bench, DC and AC analysis.
CO6: Evaluate output responses for AOI logic by using different software tools.

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B. Tech III Year II semester

MACHINE LEARNING AND DSP

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
23A0430P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	SOC

Syllabus

MACHINE LEARNING (Implement any six concepts)

Implement the following concepts using python with supporting applications.

1. Familiarizing with Anaconda and Jupyter for importing modules and dependencies for ML Familiarization with NumPy, Panda and Matplotlib by Loading Dataset in Python
2. **Linear regression:** Predict the profit of a company/House price from a dataset using the concept of linear regression. Implement the speech recognition model (NLP) from a speech/audio dataset using the concept of linear regression
3. **Logistic regression:**
   a) Identify whether the patient has diabetes or not from diabetes dataset using Logistic regression
   b) Implement the speech to text model (NLP- Speech recognitions system) from a speech dataset using the concept of linear regression
4. Polynomial regression:
   a. Determine the quality of wine using wine dataset with the help of polynomial regression
   b. Implement the speech recognition model (NLP) from a speech / audio data set using the concept of polynomial regression.
5. **K-means clustering:** Apply the concept of K-means clustering for image segmentation problem (Brain tumor and Lung images)/Color quantization
6. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set to demonstrate the working of the decision tree based ID3 algorithm.
7. Write a program to implement the k-Nearest Neighbor algorithm for image classification and distance metric learning for large margin with image classification applications using k nearest neighbor.
8. **PCA/LDA:** Reduce the dimensionality of a dataset for Face recognition system
9. Design an Artificial neural network for Digit classification using Back Propagation Algorithm for MNIST Data set. Train MLP using Gradient descent algorithm by applying Linear, Sigmoid, tanh, and ReLu activation functions
10. **Digit recognition using CNN:** Identify the digit s 0-9 from MNIST data and CIFR 10 set using CNN
11. Image Classification using CNN: Classify cats and dogs using CNN from the given data set
12. LSTM (Long Short-Term Memory Networks)/ARIMA--- Implementation biomedical signals (like EEG, ECG, EMG) classifications and disease prediction.

DIGITAL SIGNAL PROCESSING (Implement any six concepts)

1. Generate the following standard discrete time signals.
   i) Unit Impulse ii) Unit step iii) Ramp iv) Exponential v) Sawtooth
2. Generate sum of two sinusoidal signals and find the frequency response (magnitude and phase).
3. Implement and verify linear and circular convolution between two given signals.
4. Implement and verify autocorrelation for the given sequence and cross correlation between two given signals.

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5. Compute and implement the N-point DFT of a given sequence and compute the power density spectrum of the sequence.
6. Implement and verify N-point DIT-FFT of a given sequence and find the frequency response (magnitude and phase).
7. Implement and verify N-point IFFT of a given sequence.
8. Design IIR Butterworth filter and compare their performances with different orders (Low Pass Filter /High Pass Filter)
9. Design IIR Chebyshev filter and compare their performances with different orders (Low Pass Filter /High Pass Filter).
10. Design FIR filter (Low Pass Filter /High Pass Filter) using windowing technique.
i. Using rectangular window, ii. Using hamming window , iii. Using Kaiser window
11. Design and verify Filter (IIR and FIR) frequency response by using Filter design and Analysis Tool.
12. Compute the Decimation and Interpolation for the given signal.
13. Real time implementation of an audio signal using a digital signal processor

Course Outcomes:

At the end of this course, the students will be able to

CO1: Understand the modules and dependencies for machine learning corresponding to different applications.

CO2: Learn a range of machine learning regression techniques & clustering along with their datasets.

CO3: Write the programs and implement k-Nearest Neighbor algorithm to classify the iris data sets, images & CNN.

CO4: Simulate the basic signal processing operations like convolution and correlation.

CO5: Simulate the DSP operations like DFT, FFT

CO6: Implement IIR and FIR filters using simulation software and verify their frequency responses.

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B. Tech III Year II semester

TECHNICAL PAPER WRITING AND INTELLECTUAL PROPER RIGHTS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0053T	2:0:0:0	-	CIE:30	3 Hours	AC

Course Objectives:

- To enable the students to practice the basic skills of research paper writing
- To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
- To practice the basic skills of performing quality literature review
- To help them in knowing the significance of real life practice and procedure of Patents.
- To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

Syllabus	**Total Hours: 48**

Unit-I — **9 Hrs**

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing

Unit-II — **9 Hrs**

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis

Unit -III — **9 Hrs**

Process of research: publication mechanism: types of journals - indexing- seminars- Conferences - proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion-results- citation rules

Unit -IV — **9 Hrs**

Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

Unit -V — **9 Hrs**

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits

Textbooks:

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. Technical Communication:Principles and practices.Oxford.

Reference Books:

1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli,Intellectual Property Rights Tata Mcgraw Hill, 2001
3. P.Naryan,Intellectual Property Law, 3rd Ed ,Eastern Law House, 2007.
4. Adrian Wallwork. English for Writing Research PapersSecond Edition. Springer Cham Heidelberg

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New York ,2016
5. Dan Jones, Sam Dragga, Technical Writing Style

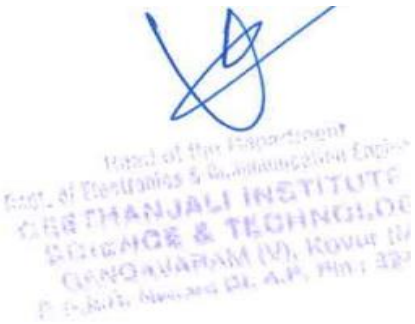
Online Learning Resources:

1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
3. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
4. https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/
5. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
6. https://lawbhoomi.com/intellectual-property-rights-notes/
7. https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Identify key secondary literature related to their proposed technical paper writing
CO2: Explain various principles and styles in technical writing
CO3: Use the acquired knowledge in writing a research/technical paper
CO4: Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc
CO5: Evaluate different forms of IPR available at national & international level
CO6: Develop skill of making search of various forms of IPR by using modern tools and techniques



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B. Tech IV Year I Semester (Theory-6, Lab-2, SEC-1)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	PC	23A0431T	Data Communications and Networking	3	0	0	3
2.	ME		**Management Course-II**	2	0	0	2
3.	PE		**Professional Elective-IV**	3	0	0	3
4.	PE		**Professional Elective-V**	3	0	0	3
5.	OE		**Open Elective-III**	3	0	0	3
6.	OE		**Open Elective-IV**	3	0	0	3
7.	SOC	23A0438P 23A0439P	**Skill oriented course – V** 1.RF System Design tools 2.Industrial IOT & Automation	0	1	2	2
8.	AC	23A0054T	**Audit Course** Gender Sensitization	2	0	0	-
9.		23A0440	Evaluation of Industry Internship	-	-	-	2
Total				**19**	**01**	**02**	**21**

S. No.	Course Code	Name of the Management Course
1	23A0049T	Business Ethics and Corporate Governance
2	23A0050T	E-Business
3	23A0048T	Management Science

S. No.	Course Code	Name of the Professional Elective
1	23A0432T	Radar Engineering
2	23A0433T	DSP Processors & Architectures
3	23A0434T	Cellular & Mobile Communications
4	23A0435T	Low Power VLSI Design
5	23A0436T	Wireless Sensor Networks
6	23A0437T	5G Communications

K. Sravan kumar
MEMBER SECRETARY

Head of the Department
Dept. of Electronics & Communication Engg.
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B. Tech IV Year I semester

S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0152T	Building Materials and Services	CIVIL
2.	23A0121T	Environmental Impact Assessment	
3.	23A0241T	Smart Grid Technologies	EEE
4.	23A0335T	3D Printing Technologies	MECH
5.	23A0512T	Data Base Management Systems	CSE & Allied/IT
6.	23A0532Tb	Cyber Security	
7.	23A0031T	Wavelet transforms and its Applications	Mathematics
8.	23A0036T	Smart Materials And Devices	Physics
9.	23A0037T	Introduction to Quantum Mechanics	
10.	23A0042T	Green Chemistry And Catalysis For Sustainable Environment	Chemistry
11.	23A0046T	Employability Skills	Humanities
12.	23A0153T	Geo-Spatial Technologies	CIVIL
13.	23A0154T	Solid Waste Management	
14.	23A0242T	Electric Vehicles	EEE
15.	23A0334Td	Total Quality Management	MECH
16.	23A0520T	Computer Networks & Internet Protocols	CSE & Allied/IT
17.	23A0450T	Internet of Things	
18.	23A3315a	Introduction to Quantum Computing	
19.	23A0032T	Financial Mathematics	Mathematics
20.	23A0038T	Sensors And Actuators For Engineering Applications	Physics
21.	23A0043T	Chemistry Of Nano materials And Applications	Chemistry
22.	23A0047T	Literary Vibes	Humanities

K. Sravan kumar
MEMBER SECRETARY

Head of the Department
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B. Tech IV Year I semester

DATA COMMUNICATIONS AND NETWORKING					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0431T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PC**

Course Objectives:

- To provide a conceptual understanding of the fundamentals of data communications and computer networks.
- To explore different network architectures, models, and transmission media used in data communication.
- To analyze error detection and correction methods, data link protocols, and medium access techniques.
- To understand the functioning of network and transport layer protocols, including addressing, routing, and congestion control.
- To study application layer protocols, network security mechanisms, and techniques to ensure data integrity.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Overview of Data Communication and Networking: Introduction; Data communications: components, direction of data flow; network criteria, physical structure, categories of network (LAN, MAN, WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Unit-II	**9 Hrs**

Physical Layer: Overview of data (analog & digital), signal (analog& digital), transmission (analog & digital) & transmission media (guided & unguided), queuing theory , its applications in data communication, Data Encoding Techniques, Circuit switching, time division & space division switching.

Unit -III	**9 Hrs**

Data link Layer: Design Issues, Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC

Medium Access sub layer: Channel Allocation Problem, Point to Point Protocol, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet.

Unit -IV	**9 Hrs**

Network layer: Design Issues**,** Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting;

Routing: techniques, static vs. dynamic routing, Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6

Transport layer: Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets;

Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

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B. Tech IV Year I semester

Unit -V	**9 Hrs**

Application Layer: Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls.

Textbooks:

1. B. A. Forouzan – Data Communications and Networking (3rd Ed.) – TMH
2. A.S. Tanenbaum – Computer Networks (4th Ed.) – Pearson Education/PHI

Reference Books:

1. W. Stallings – Data and Computer Communications (5th Ed.) – PHI/ Pearson Education
2. Kurose and Rose – Computer Networking -A top down approach featuring the internet – Pearson Education
3. Leon, Garica, Widjaja – Communication Networks – TMH

Course Outcomes(CO):

After completing the course, the student will be able to,

CO1: Understand of the fundamentals of data communications and computer networks.

CO2: Learn different network architectures, models, and transmission media used in data communication.

CO3: Analyze error detection and correction methods, data link protocols, and medium access techniques

CO4: Grasp the functioning of network layer protocols including addressing, routing.

CO5: Grasp the functioning of transport layer protocols including congestion control.

CO6: Gain knowledge on application layer protocols, network security mechanisms, and techniques to ensure data integrity.

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B. Tech IV Year I semester

BUSINESS ETHICS AND CORPORATE GOVERNANCE					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0049T	**2:0:0:0**	**2**	**CIE:30 SEE:70**	**3 Hours**	**ME**

Course Objectives:

- To make the student understand the principles of business ethics
- To enable them in knowing about the ethics in management
- To facilitate the student' role in corporate culture
- To impart knowledge about the fair-trade practices
- To encourage the student in knowing about the corporate governance

Syllabus		**Total Hours: 48**
Unit-I	**Ethics**	**9 Hrs**

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior.. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management - Corporate Social Responsibility – Issues of Management – Crisis Management

Unit-II	**Ethics In Management**	**9 Hrs**

Introduction- Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics

Unit -III	**Corporate Culture**	**9 Hrs**

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change

Unit -IV	**Legal Frame Work**	**9 Hrs**

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

Unit -V	**Corporate Governance**	**9 Hrs**

Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee - Various committees - Reports - Benefits and Limitations

Textbooks:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

Reference Books:

1. Dr. K. Nirmala, KarunakaraReaddy. Business Ethics and Corporate Governance, HPH
2. H. R. Machiraju: Corporate Governance, HPH, 2013
3. K. Venkataramana, Corporate Governance, SHBP.

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B. Tech IV Year I semester

4. N. M. Khandelwal. Indian Ethos and Values for Managers

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the Ethics and different types of Ethics
CO2: Understand business ethics and ethical practices in management
CO3: Understand the role of ethics in management
CO4: Apply the knowledge of professional ethics & technical ethics
CO5: Analyze corporate law, ethics, codes & principles
CO6: Evaluate corporate governance & corporate scams

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B. Tech IV Year I semester

E-BUSINESS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0050T	**2:0:0:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**ME**

Course Objectives:

- To provide knowledge on emerging concept on E-Business related aspect
- To understand various electronic markets & business models
- To impart the information about electronic payment systems & banking
- To create awareness on security risks and challenges in E-commerce
- To the students aware on different e-marketing channels & strategies

Syllabus		**Total Hours: 48**
Unit-I	**Electronic Business**	**9 Hrs**

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce –E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries

Unit-II	**Electronic Markets and Business Models**	**9 Hrs**

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

Unit -III	**Electronic Payment Systems**	**9 Hrs**

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

Unit -IV	**E-Security**	**9 Hrs**

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms.

Unit -V	**E-Marketing**	**9 Hrs**

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

Textbooks:

1. Arati Oturkar & Sunil Khilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

Reference Books:

1. Debjani, Kamalesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill's, 2005
2. Dave Chaffey. E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan. E-Commerce Fundamentals and Application, Raymond Leatham Wiley India 2007
4. S. Jaiswal. E-Commerce GalgotiaPublication Pvt Ltd., 2003

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B. Tech IV Year I semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Remember E-Business & its nature, scope and functions
CO2: Understand E-market-Models which are practicing by the organizations
CO3: Apply the concepts of E-Commerce in the present globalized world
CO4: Analyze the various E-payment systems & importance of net banking
CO5: Evaluate market research strategies & E-advertisements
CO6: Understand importance of E-security & control

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B. Tech IV Year I semester

MANAGEMENT SCIENCE					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0048T	**2:0:0:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**ME**

Course Objectives:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in modern management

Syllabus		**Total Hours: 48**
Unit-I	**Introduction To Management**	**9 Hrs**

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Elton Mayo's Human relations - Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management

Unit-II	**Operations Management**	**9 Hrs**

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Material Management - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Marketing Management - Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle

Unit -III	**Human Resources Management (HRM)**	**9 Hrs**

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

Unit -IV	**Strategic & Project Management**	**9 Hrs**

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

Unit -V	**Contemporary Issues In Management**	**9 Hrs**

Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge

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B. Tech IV Year I semester

Management – change management –sustainability and corporate social responsibility

Textbooks:

1. Frederick S. Hillier, Mark S. Hillier. *Introduction to Management Science*, October 26, 2023
2. A.R Aryasri, *Management Science*, TMH, 2019

Reference Books:

1. Stoner, Freeman, Gilbert.Management, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich, Management Principles and Guidelines, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. 5. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Remember the concepts & principles of management and designs of organization in a practical world

CO2: Understand the knowledge of Work-study principles & Quality Control techniques in industry

CO3: Apply the process of Recruitment & Selection in organization

CO4: Analyze the concepts of HRM & different training methods

CO5: Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT

CO6: Create awareness on contemporary issues in modern management & technology

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B. Tech IV Year I semester

RADAR ENGINEERING					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0432T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To understand the basic working principle of Radar and target detection procedure.
- To learn about the working and applications of CW and Frequency modulated Radar.
- To comprehend the working and applications of MTI and Pulse Doppler Radar
- To understand different methods of tracking a target and their limitations.
- To analyze the effect of noise at the receiver and uses of phased array antennas and navigational aid

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems. Radar Equation: SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Display types, cross section fluctuations and models Illustrative Problems.

Unit-II	**9 Hrs**

CW and Frequency Modulated Radar: Doppler Effect, Doppler frequency resolution, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

Unit -III	**9 Hrs**

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.

Unit -IV	**9 Hrs**

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers. Introduction to Conopulse - A Hybrid system

Unit -V	**9 Hrs**

Detection of Radar Signals in Noise: Introduction, Noise Figure and Noise Temperature, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver. Introduction to Software Defined Radio, Introduction to Stealth technology.

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B. Tech IV Year I semester

Radar Receivers: Introduction to Phased Array Antennas- Basic Concepts, Electronically Steered Phased Array Antennas, Phase Shifters, Frequency – scan Arrays, Radiation for Phased Array, Architecture for Phased Arrays. Radiation Pattern. Beam Steering and Beam Width changes. Navigational Aids : Direction Finder, VOR,ILS and Loran. Introduction to smart antenna

Textbooks:

1. Merrill I. Skolnik, ―Introduction to Radar Systems‖, 2nd Edition, TMH Special Indian Edition, 2007.
2. Byron Edde, ―Radar Principals, Technology, Applications‖, Pearson Education, 1992.

Reference Books:

1. Peebles, ―Radar Principles‖, Wiley, New York, 1998.
2. G.S.N.Raju, ―Radar Engineering and Fundamentals of Navigational Aids‖, I. K. International Pvt. Ltd.
3. G. SasiBhushanRao, ― Microwave and Radar Engineering‖, Pearson Education, 2014

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the basic working principle of Radar and target detection procedure.
CO2: Know the working and applications of CW and Frequency modulated Radar.
CO3: Gain the knowledge of about MTI and Pulse Doppler Radar.
CO4: Understand different methods of tracking a target and their limitations.
CO5: Analyze the effect of noise at the receiver.
CO6: Know the uses of phased array antennas and navigational aids.

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B. Tech IV Year I semester

DSP PROCESSORS & ARCHITECTURES					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0433T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To describe the unique features and significance of Digital Signal Processing (DSP).
- To demonstrate various computational parameters and accuracy considerations in DSP systems.
- To introduce architectural improvements in programmable DSP devices and their execution models.
- To expose students to basic DSP algorithms, including filtering, FFT, and adaptive processing.
- To outline DSP processor applications and their interfacing with memory and I/O peripherals.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Introduction to Digital Signal Processing: Introduction, a Digital signal-processing system, the sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

Unit-II	**9 Hrs**

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Execution Control and Pipelining: Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, and Pipeline Programming models.

Unit -III	**9 Hrs**

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On- Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Unit -IV	**9 Hrs**

Implementations of Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

Implementation of FFT Algorithms: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

Unit -V	**9 Hrs**

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization,

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External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

Textbooks:

1. Avtar Singh and S. Srinivasan, ―Digital Signal Processing Implementation‖, 1st Edition, Cengage Learning, 2004.
2. Lapsley et al. S. Chand and Co, ―DSP Processor Fundamentals, Architectures & Features‖, 2000.

Reference Books:

1. B. Venkata Ramani and M. Bhaskar, ―Digital Signal Processors, Architecture, Programming and Applications‖, TMH, 2004.
2. Jonatham Stein, ―Digital Signal Processing: A Computer Science Perspective‖, John Wiley, 2000.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Summarize the fundamental features and role of Digital Signal Processing in real-world applications.

CO2: Evaluate dynamic range, precision in DSP implementations.

CO3: Evaluate error sources in DSP implementations.

CO4: Explain the architectural features of DSP processors and their computational efficiency.

CO5: Analyze the performance of DSP algorithms on programmable DSP platforms for specific applications.

CO6: Select and implement DSP processors for real-time applications, including memory and peripheral interfacing.

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B. Tech IV Year I semester

CELLULAR & MOBILE COMMUNICATIONS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0434T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To explain the basic cellular system and its working.
- To understand the impact of multipath fading channels and techniques to mitigate fading effects in cellular communication.
- To explore frequency management, channel assignment strategies, and different types of handoffs in cellular networks.
- To analyze the performance of mobile antennas, interference issues, and cellular system design principles. To study about different types of Digital ICs and their applications.
- To evaluate system performance metrics such as dropped call rates, handoff strategies, and spectrum efficiency.

Syllabus	**Total Hours: 45**
UNIT I	**9 Hrs**

Cellular Mobile Radio Systems: Introduction to Cellular Mobile system, Limitations of Conventional System, basic cellular system, First, second, third and fourth Generation cellular wireless systems, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

UNIT II	**9 Hrs**

Elements of Cellular Radio System Design: General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of cellular system.

Interference: Introduction to Co-channel interference, real time co-channel interference, Co channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT III	**9 Hrs**

Cell Coverage for Signal and Traffic: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation antenna height gain, form of a point-to-point model.

UNIT IV	**9 Hrs**

Cell Site and Mobile Antennas: Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

UNIT V	**9 Hrs**

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B. Tech IV Year I semester

Handoff: Handoff, dropped calls and cell splitting, types of handoffs, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

System Evaluations: Performance evaluation, Signal evaluation, Measurement of average received level and level crossings, Spectrum efficiency evaluation.

Textbooks:

1. W .C. Y. Lee, —Mobile cellular telecommunications, Tata Mc-Graw Hill, 2nd Edition, 2006.
2. Theodore. S. Rapport, —Wireless communications, Pearson Education, 2nd Edn., 2002.

Reference Books:

1. Gordon L. Stuber, - Principles of Mobile communications, Springer International 2nd Edition, 2007.
2. Lee , —Wireless and Mobile Communications, Mc Graw Hills, 3rd Edition, 2006.
3. Jon W.Mark and WeihuaZhqung, —Wireless communications and Networking, PHI, 2005.
4. R.Blake, —Wireless communication Technology, Thompson Asia Pvt. Ltd., 2004.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the basic cellular system and its working.

CO2: Explain the impairments caused by multipath fading and methods to mitigate fading effects in mobile communication.

CO3: Apply concepts of cellular communication to solve problems related to mobile antennas and system design.

CO4: Analyze co-channel and non-co-channel interferences, different types of handoffs, and dropped call rates.

CO5: Evaluate the performance of cellular systems, including signal reception, handoff efficiency, and spectrum utilization.

CO6: Understand the concept of handoff

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B. Tech IV Year I semester

LOW POWER VLSI DESIGN					
Course Code	**L:T:P:C**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0435T	**3:0:0:3**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PE**

Course Objectives:

- To understand the need for low-power circuit design and analyze different power dissipation mechanisms in VLSI circuits.
- To explore various low-power design approaches at the system, circuit, and mask levels.
- To study low-power adder architectures and their role in power-efficient computing.
- To examine different low-power multiplier architectures and their impact on digital design.
- To gain knowledge of low-power memory technologies and their future developments.

Syllabus	**Total Hours: 46**
Unit-I	**9 Hrs**

Fundamentals: Historical background**,** Need for Low Power Circuit Design, Sources of Power Dissipation – Static and Dynamic Power Dissipation, Short Circuit Power Dissipation, switching power dissipation , Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

Unit-II	**9 Hrs**

Low-Power Design Approaches: Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

Unit -III	**10 Hrs**

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder‘s Architectures – Ripple Carry Adders, Carry Look Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

Unit -IV	**9 Hrs**

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

Unit -V	**9 Hrs**

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

Textbooks:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

Reference Books:

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1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.
3. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the need for low-power circuit design and analyze different power dissipation mechanisms in VLSI circuits.
CO2: Learn various low-power design approaches at the system, circuit, and mask levels.
CO3: Understand the concepts of various Low-power and Low adder.
CO4: Analyze the different low power adders its architectures and their role in power-efficient computing.
CO5: Analyze the different low-power multiplier architectures and their impact on digital design.
CO6: Understand the various low-power memory technologies and their future developments.

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B. Tech IV Year I semester

WIRELESS SENSOR NETWORKS
(Common to ECE & Cyber Security)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0436T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE

Course Objectives:

- To introduce the fundamental concepts and architecture of wireless sensor networks.
- To explore various network architectures, optimization techniques, and design principles for wireless sensor networks.
- To study MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.
- To understand the infrastructure establishment of sensor networks, including topology control and synchronization.
- To provide knowledge on sensor network platforms, programming challenges, and simulation tools.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Overview of Wireless Sensor Networks: Single-Node Architecture - Hardware Components Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks- Types of wireless sensor networks. Advantages and limitations of Sensor Networks

Unit-II	**9 Hrs**

Architectures: Network Architecture- Sensor Networks-Scenarios- Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Service interfaces of WSNs, Gateway Concepts.

Unit -III	**9 Hrs**

Networking Sensors: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Contention-based protocols. Wakeup Concepts - SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy-Efficient Routing, Geographic Routing.

Unit -IV	**9 Hrs**

Infrastructure Establishment: Topology Control, Clustering, Time Synchronization, Localization and Localization Services Positioning, Sensor Tasking and Control

Unit -V	**9 Hrs**

Sensor Network Platforms and Tools : Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming

Textbooks:

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao & LeonidasJ.Guibas, "Wireless Sensor Networks-An Information Processing Approach" Elsevier, 2007.

Reference Books:

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1. WaltenegusDargie , Christian Poellabauer, —Fundamentals Of Wireless Sensor Networks Theory And Practice, By John Wiley & Sons Publications, 2011
2. KazemSohraby, Daniel Minoli, &TaiebZnati, —Wireless Sensor Networks-Technology, Protocols, and Applications, John Wiley, 2007.
3. Anna Hac, —Wireless Sensor Network Designs‖, John Wiley, 2003

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Learn the fundamental concepts and architecture of wireless sensor networks.

CO2: Explore various network architectures, optimization techniques.

CO3: Understand various design principles for wireless sensor networks.

CO4: Gain knowledge of MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication

CO5: Understand the infrastructure establishment of sensor networks, including topology control and synchronization.

CO6: Grasp the knowledge on sensor network platforms, programming challenges, and simulation tools

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B. Tech IV Year I semester

5G COMMUNICATIONS

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0437T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE

Course Objectives:

- To introduce the fundamental concepts of 5G spectrum, radio access technologies, and system requirements.
- To understand the architecture and physical layer aspects of 5G networks, including MIMO and beam forming.
- To explore advanced 5G radio-access technologies and their role in multi-user communication.
- To study network slicing, SDN, NFV, and their applications in vehicular communications.
- To analyze mobility management, interference control, and dynamic network reconfiguration in 5G.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

5G Radio Spectrum:5G Communication frequency standards, Spectrum Needs of 5G, 5G spectrum landscape and requirements, Spectrum access modes and sharing scenarios, 5G spectrum technologies.
5G Channel Model: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling.
5G Use Cases and System Concept: Use cases and requirements, 5G system concept.

Unit-II	**9 Hrs**

Radio Interface Architecture: 5G architecture options, core network architecture, RAN architecture. 5G PHYSICAL LAYER: Physical channels and signals, 5G frame structure, physical layer procedures (MIMO, Power control, link adaptation, beam forming).Interworking with LTE

Unit -III	**9 Hrs**

5G Radio-Access Technologies: Access design principles for multi-user communications, multi-carrier with filtering: a new waveform, non-orthogonal schemes for efficient multiple access. Introduction to Multi-operator D2D communication

Unit -IV	**9 Hrs**

Introduction to 5G Network Slicing: Network Slicing, E2E Slicing, SDN and NFV Slicing Vehicular Communications: From V2V to AV2X, key standards, VC architectures, V2X Use cases. Radio access for V2X communication

Unit -V	**9 Hrs**

Mobility and Handoff Management in 5G: Network deployment types, Interference management in 5G, Mobility management in 5G, Dynamic network reconfiguration in 5G.

Textbooks:

1. AfifOsseiran, Jose F Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology", Cambridge University Press, 2016
2. Saad Z. Asif, "5G Mobile Communications Concepts and Technologies", CRC Press, Taylor& Francis Group, First Edition, 2018

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3. HarriHolma, AnttiToskala, Takehiro Nakamura, "5G Technology 3GPP NEW RADIO", John Wiley & Sons First Edition,2020

Reference Books:

1. Gordon L. Stuber, "Principles of Mobile Communication", KLUWER ACADEMIC PUBLISHERS, 2nd Edition, 2002.
2. Joseph C. Liberti, Theodore S. Rappaport, "Smart Antennas for Wireless Communications", Prentice Hall PTR, 1999.
3. Ying Zhang, "Network Function Virtualization Concepts and Applicability in 5G Networks", John Wiley & Sons, 2018

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the 5G radio spectrum and channel models, including spectrum sharing and propagation challenges.

CO2: Analyze the 5G network architecture, including the core network, RAN, and physical layer procedures.

CO3: Evaluate different 5G radio-access technologies, including new waveforms and non-orthogonal multiple access schemes.

CO4: Apply network slicing concepts and vehicular communication techniques for efficient 5G network deployment.

CO5: Develop strategies for mobility and handoff management to optimize network performance and minimize interference.

CO6: Develop methodologies to optimize network performance and minimize interference.

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B. Tech IV Year I semester

BUILDING MATERIALS AND SERVICES
(CSE, AI&ML, CS, DS,ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0152T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
- To Analyse the composition, manufacturing process, and properties of cement and admixtures.
- To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
- To evaluate masonry, mortars, finishing techniques, and formwork systems.
- To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection

Syllabus		Total Hours: 48
Unit-I	**Stones and Bricks, Tiles**	**9 Hrs**

Building Stones – Classifications and Quarrying – Properties – Structural Requirements – Dressing. Bricks – Composition of Brick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, Paints and Plastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, Plastics

Unit-II	**Cement &Admixtures**	**9 Hrs**

Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency – Initial &Final Setting – Soundness. Admixtures – Mineral & Chemical Admixtures – Uses

Unit -III	**Building Components**	**9 Hrs**

Lintels, Arches, Walls, Vaults – Stair Cases – Types of Floors, Types of Roofs – Flat, Curved, Trussed; Foundations – Types; Damp Proof Course; Joinery – Doors – Windows – Materials – Types

Unit -IV	**Mortars, Masonry and Finishing's Mortars**	**9 Hrs**

Lime and Cement Mortars Brick Masonry – Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP. form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning

Unit -V	**Building Services**	**9 Hrs**

Plumbing Services: Water Distribution, Sanitary – Lines &Fittings;
Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials and Types; **Acoustics** – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of FireResistant Materials and Constructions

Textbooks:

1. Building Materials and Construction – Arora&Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.

Reference Books:

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1. Building Construction by B. C. Punmia, Ashok Kumar Jain andArun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
2. P. C. Varghese, Building Materials, Prentice Hall of India, 2015.
3. N.Subramanian ,‖Building Materials Testing and Sustainability‖, Oxford Higher Education, 2019.
4. R. Chudley, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/105/102/105102088/

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics

CO2: Analyse the composition, manufacturing process, and properties of cement and admixtures

CO3: Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery

CO4: Evaluate masonry, mortars, finishing techniques, and formwork systems

CO5: Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection

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B. Tech IV Year I semester

ENVIRONMENTAL IMPACT ASSESSMENT
(CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0121T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
- Analyse the impact of developmental activities on land use, soil, and water resources.
- Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
- Develop environmental audit procedures and assess compliance with environmental regulations.
- Understand and apply environmental acts, notifications, and legal frameworksin EIA studies

Syllabus		Total Hours: 48
Unit-I	**Concepts and methodologies of EIA**	**9 Hrs**

Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis

Unit-II	Impact of Developmental Activities and Land Use	9 Hrs

Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I Ain Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts On Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact

Unit -III	Assessment of Impact On Vegetation, Wildlife and Risk Assessment	9 Hrs

Introduction - Assessment of Impact of Development Activities On Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing An Environmental Risk Assessment- Advantages of Environmental Risk Assessment

Unit -IV	Environmental Audit	9 Hrs

Introduction - Environmental Audit &Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report

Unit -V	Environmental Acts and Notifications	9 Hrs

The Environmental Protection Act, The Water Preservation Act, The Air (Prevention &Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, ConceptofISO and ISO 14000

Textbooks:

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1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

Reference Books:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/124/107/124107160/

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Apply various methodologies for conducting Environmental Impact Assessments
CO2: Analyse the impact of land-use changes on soil, water, and air quality
CO3: Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments
CO4: Develop environmental audit reports and assess compliance with environmental policies
CO5: Interpret and apply environmental acts and regulations related to EIA

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B. Tech IV Year I semester

SMART GRID TECHNOLOGIES
(All Branches Except EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0241T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Syllabus — **Total Hours: 48**

Unit-I	Introduction to Smart Grid	9 Hrs

Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture

Unit-II	Wide Area Monitoring System	9 Hrs

Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchro phasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.

Unit -III	Smart Meters	9 Hrs

Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management.

Unit -IV	Information and Communication Technology	9 Hrs

Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid

Unit -V	Smart Grid Applications and Cyber Security	9 Hrs

Applications: Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model.

Textbooks:

1. James Momoh, "SMART GRID: Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.
2. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012.

Reference Books:

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1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013. *B.Tech - CSE R23 Regulation* 149
2. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.
3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.
4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understanding the Concept and Evolution of Smart Grids
CO2: Analyzing Wide Area Monitoring System and Synchrophasor Technology
CO3: Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts
CO4: Evaluating Information and Communication Technology (ICT) Systems in Smart Grids
CO5: Designing Smart Grid Applications and Cybersecurity Measures

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3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
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B. Tech IV Year I semester

3D PRINTING TECHNOLOGIES
(CSE, CSE-AIML,CSE-CS,CSE-DS,CE,ECE,EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0335T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Understand the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods.
- Demonstrate the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems.
- Define the processes and classifications of rapid tooling and reverse engineering techniques.
- Identify common errors in 3D printing and evaluate pre-processing, processing, and post-processing issues.
- Familiarize RP-related software and its role in applications such as design, manufacturing, and medical fields

Syllabus		**Total Hours: 48**
Unit-I	**Introduction to 3D Printing**	**10 Hrs**
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP		
Unit-II	**Solid and Liquid Based RP Systems**	**9 Hrs**
Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC)		
Unit -III	**Powder Based & Other RP Systems**	**9 Hrs**
Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM). **Other RP Systems**: Working Principle, Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).		
Unit -IV	**Rapid Tooling & Reverse Engineering**	**9 Hrs**
Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods. **Reverse Engineering (RE):** Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development		
Unit -V	**Errors in 3D Printing and Applications**	**9 Hrs**
Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. **Software:** Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.		

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B. Tech IV Year I semester

Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP

Textbooks:

1. Chee Kai Chua and Kah Fai Leong, 3D Printing and Additive Manufacturing Principles and Applications 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing‖, Springer, 2/e, 2010

Reference Books:

1. Frank W.Liou, Rapid Prototyping & Engineering Applications‖, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing‖, John Wiley&Sons, 2006

Online Learning Resources:

- https://nptel.ac.in/courses/112/104/112104265/
- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdfcompressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Define and explain the evolution and need for rapid prototyping in modern product development

CO2: Compare and contrast various 3D printing technologies based on working principles, materials, and limitations

CO3: Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications

CO4: Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions

CO5: Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions

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B. Tech IV Year I semester

DATABASE MANAGEMENT SYSTEMS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0512T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Syllabus		Total Hours: 48
Unit-I	**Introduction**	**10 Hrs**

Introduction: Data base system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams

Unit-II	Relational Model	9 Hrs

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Data base schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

Unit -III	SQL	9 Hrs

Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

Unit -IV	Schema Refinement	9 Hrs

Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce- Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

Unit -V	Transaction Concept	9 Hrs

Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic,

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concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing

Textbooks:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

Reference Books:

1. Introduction to Database Systems, 8thedition, C J Date, Pearson.
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Online Learning Resources:

- https://nptel.ac.in/courses/106/105/106105175/
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the basic concepts of database management systems
CO2: Analyze a given database application scenario to use ER model for conceptual design of the database
CO3: Utilize SQL proficiently to address diverse query challenges
CO4: Employ normalization methods to enhance database structure
CO5: Assess and implement transaction processing, concurrency control and database recovery protocols in databases

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B. Tech IV Year I semester

CYBER SECURITY
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0532Tb	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**OE**

Course Objectives:

- The course is designed to provide awareness on different cyber-crimes, cyber offenses, tools and methods used in cybercrime.

Syllabus		**Total Hours: 48**
Unit-I	**Introduction to Cybercrime**	**8 Hrs**
Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes		
Unit-II	**Cyber Offenses: How Criminals Plan Them**	**9 Hrs**
Introduction, How Criminals plans the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.		
Unit -III	**Cybercrime: Mobile and Wireless Devices**	**9 Hrs**
Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.		
Unit -IV	**Tools and Methods Used in Cybercrime**	**8 Hrs**
Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.		
Unit -V	**Cyber Security: Organizational Implications**	**8 Hrs**
Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations		

Textbooks:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan- Hwa(john) Wu,J. David Irwin.CRC Press T&F Group

Online Learning Resources:

- http://nptel.ac.in/courses/106105031/40
- http://nptel.ac.in/courses/106105031/39
- http://nptel.ac.in/courses/106105031/38

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B. Tech IV Year I semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Classify the cybercrimes and understand the Indian ITA 2000

CO2: Analyse the vulnerabilities in any computing system and find the solutions

CO3: Predict the security threats of the future

CO4: Investigate the protection mechanisms

CO5: Design security solutions for organizations

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B. Tech IV Year I semester

WAVELET TRANSFORMS AND ITS APPLICATIONS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0031T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Syllabus **Total Hours: 48**

Unit-I	Wavelets	8 Hrs

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms

Unit-II	Multiresolution Formulation of Wavelet Systems	9 Hrs

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

Unit -III	Filter Banks and the Discrete Wavelet Transform	9 Hrs

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

Unit -IV	Time-Frequency and Complexity	8 Hrs

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

Unit -V	Bases and Matrix Examples	8 Hrs

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example

Textbooks:

1. C. Sidney Burrus, Ramesh A. Gopinath, "Introduction to Wavelets and Wavelets Transforms", Prentice Hall, (1997).
2. James S. Walker, "A Primer on Wavelets and their Scientific Applications", CRC Press, (1999)

Reference Books:

1. RaghuveerRao, "Wavelet Transforms", Pearson Education, Asia
2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc

Online Learning Resources:

- http://users.rowan.edu/~polikar/WAVELETS/WTtutorial.html
- http://www.wavelet.org/
- http://www.math.hawaii.edu/~dave/Web/Amara's%20Wavelet%20Page.htm
- https://jqichina.wordpress.com/wp-content/uploads/2012/02/ten-lectures-of waveletsefbc88e5b08fe6b3a2e58d81e8aeb2efbc891.pdf

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B. Tech IV Year I semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms

CO2: Illustrate the multi resolution analysis ad scaling functions

CO3: Implement discrete wavelet transforms with multirate digital filters

CO4: Understand multi resolution analysis and identify various wavelets and evaluate their time-frequency resolution properties

CO5: Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields

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B. Tech IV Year I semester

SMART MATERIALS AND DEVICES
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0036T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To explain the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

Syllabus		Total Hours: 48
Unit-I	**Introduction to Smart Materials**	**8 Hrs**
Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics)		
Unit-II	**Properties of Smart Materials**	**9 Hrs**
Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.		
Unit -III	**Synthesis of Smart Materials**	**9 Hrs**
Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.		
Unit -IV	**Characterization Techniques**	**8 Hrs**
Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).		
Unit -V	**Smart Materials based Devices**	**8 Hrs**
Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices		

Textbooks:

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005

Reference Books:

1. Gauenzi,P.,Smart Structures, Wiley, 2009.
2. MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014
3. Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0,Chaudhery
4. MustansarHussain, Paolo Di Sia, Springer,2022.
5. Fundamentals of Smart Materials,Mohsen Shahinpoor, Royal Society of Chemistry, 2020

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc22_me17/preview

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B. Tech IV Year I semester

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys

CO2: Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties

CO3: Summarize various types of synthesis of smart materials

CO4: Analyze various characterization techniques used for smart materials

CO5: Interpret the importance of smart materials in various devices

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B. Tech IV Year I semester

INTRODUCTON TO QUANTUM MECHANICS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0037T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand the fundamental differences between classical and quantum mechanics
- To study wave-particle duality, uncertainty principle, and their implications
- To learn and apply Schrödinger equations to basic quantum systems
- To use operator formalism and mathematical tools in quantum mechanics
- To explore angular momentum, spin and their quantum mechanical representations

Syllabus		**Total Hours: 48**
Unit-I	**Principles Of Quantum Mechanics**	**8 Hrs**

Introduction: Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation. Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle. Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions

Unit-II	**One Dimensional Problems And Solutions**	**9 Hrs**

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

Unit -III	**Operator Formalism**	**9 Hrs**

Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

Unit -IV	**Mathematical Tools For Quantum Mechanics**	**8 Hrs**

The concept of row and column matrices, Matrix algebra, Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

Unit -V	**Angular Momentum And Spin**	**8 Hrs**

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half (1/2), Spin angular momentum, Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values

Textbooks:

1. Quantum Mechanics. Vol 1, A. Messaia Noth-Holland Pub. Co., Amsterdam,(1961).
2. A Text Book of Quantum Mechanics. P. M. Mathews and K. Venkatesam, Tata McGraw Hill, New Delhi,(1976).

Reference Books:

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1. Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).
2. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003

Online Learning Resources:

- https://archive.nptel.ac.in/courses/115/101/115101107/
- https://archive.nptel.ac.in/courses/122/106/122106034/
- https://nptel.ac.in/courses/115106066

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Explain the key principles of quantum mechanics and wave-particle dua
CO2: Apply Schrödinger equations to solve one-dimensional quantum problems
CO3: Solve quantum mechanical problems using operator and matrix methods
CO4: Evaluate quantum states using Dirac notation and expectation values
CO5: Analyze angular momentum and spin systems using Pauli matrices and operators

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B. Tech IV Year I semester

GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0042T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand principle and concepts of green chemistry
- To understand the types of catalysis and industrial applications
- To apply green solvents in chemical synthesis
- To enumerate different sourced of green energy
- To apply alternative greener methods foe chemical reactions

Syllabus		Total Hours: 48
Unit-I	**Principles And Concepts Of Green Chemistry**	**8 Hrs**
Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling		
Unit-II	**Catalysis And Green Chemistry**	**9 Hrs**
Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo-catalysis with examples		
Unit -III	**Green Solvents In Chemical Synthesis**	**9 Hrs**
Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbondioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recyling of green solvents.		
Unit -IV	**Emerging Greener Technologies**	**8 Hrs**
Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock's, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.		
Unit -V	**Alternative Greener Methods**	**8 Hrs**
Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications		

Textbooks:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

Reference Books:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and Ackmez Mudhoo, CRC Press, 2010.

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2. Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2013

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Apply the Green chemistry Principles for day to day life as well as synthesis, describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling

CO2: Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis

CO3: Demonstrate Green solvents and importance, Discuss Supercritical carbondioxide, Explain Supercritical water, recycling of green solvents

CO4: Describe importance of Biomass and Solar Power, Illustrate Sonochemistry, Apply Green Chemistry for Sustainable Development; discuss the importance of Renewable resources, mechanochemical synthesis

CO5: Discuss Alternative green methods like Photoredox catalysis, single electron transfer reactions (SET), Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications

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B. Tech IV Year I semester

EMPLOYABILITY SKILLS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0046T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To encourage all round development of the students by focusing on productive skills
- To make the students aware of Goal setting and writing skills
- To enable them to know the importance of presentation skills in achieving desired goals.
- To help them develop organizational skills through group activities
- To function effectively with heterogeneous teams

Syllabus		Total Hours: 48
Unit-I	**Goal Setting and Self-Management**	**8 Hrs**
Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis		
Unit-II	**Writing Skills**	**9 Hrs**
Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)		
Unit -III	**Technical Presentation Skills**	**9 Hrs**
Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation.		
Unit -IV	**Group Presentation Skills**	**8 Hrs**
Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation-Group Discussion-Debate –Corporate Etiquette.		
Unit -V	**Job Cracking Skills**	**8 Hrs**
Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews		

Textbooks:

1. Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills,2014.Cambridge Publisher.
2. Alka Wadkar. Life Skills for Success, Sage Publications, 2016

Reference Books:

1. Gangadhar Joshi. Campus to Corporate Paperback , Sage Publications. 2015
2. Sherfield Montogomery Moody,Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008
3. Shikha Kapoor. *Personality Development and Soft Skills - Preparing for Tomorrow* .1 Edition, Wiley, 2017.
4. M. Sen Gupta, *Skills for Employability*, Innovative Publication, 2019.
5. Steve Duck and David T McMahan, *The Basics f Communication Skills A Relational Perspective,* Sage press, 2012

Online Learning Resources:

- https://youtu.be/gkLsn4ddmTs

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B. Tech IV Year I semester

- https://youtu.be/2bf9K2rRWwo
- https://youtu.be/FchfE3c2jzc
- https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
- https://www.youtube.com/c/skillopedia/videos
- https://onlinecourses.nptel.ac.in/noc25_hs96/preview
- https://onlinecourses.nptel.ac.in/noc21_hs76/preview
- https://archive.nptel.ac.in/courses/109/107/109107172/#
- **https://archive.nptel.ac.in/courses/109/104/109104107/**

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the importance of goals and try to achieve them
CO2: Explain the significance of self-management
CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes
CO4: Analyse various forms of Presentation skills
CO5: Judge the group behaviour appropriately
CO5: Develop skills required for employability

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B. Tech IV Year I semester

GEO-SPATIAL TECHNOLOGIES
(CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A00153T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
- To Analyse vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
- To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
- To evaluate surface andgeostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
- To assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications

Syllabus		**Total Hours: 48**
Unit-I	**Raster Analysis**	**8 Hrs**

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path

Unit-II	**Vector Analysis**	**9 Hrs**

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co-Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering

Unit -III	**Network Analysis**	**9 Hrs**

Network – Introduction - Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path in A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis

Unit -IV	**Surface And Geostatistical Analysis**	**8 Hrs**

Surface Data – Sources of X,Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.

Unit -V	**Customization, Web GIS, Mobile Mapping**	**8 Hrs**

Customization of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications- Location Based Services: Emergency and Business Solutions - Big Data Analytics.

Textbooks:

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill

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Edition, 2008.
2. Lo, C.P. andYeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

Reference Books:

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley,2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, ―An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub.,2008

Online Learning Resources:

- https://archive.nptel.ac.in/courses/105/105/105105202/
- **https://onlinecourses.nptel.ac.in/noc19_cs76/preview**
- **https://archive.nptel.ac.in/courses/109/104/109104107/**

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis

CO2: Analyse vector-based spatial analysis techniques such as topology, overlay, and proximity analysis

CO3: Apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems

CO4: Evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation

CO5: Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications

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B. Tech IV Year I semester

SOLID WASTE MANAGEMENT
(CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A00154T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
- To Analyse engineering systems for solid waste collection, storage, and transportation.
- To apply resource and energy recovery techniques for sustainable solid waste management.
- To evaluate landfill design, construction, and environmental impact mitigation strategies.
- To assess hazardous waste management techniques, including biomedical and e-waste disposal

Syllabus		Total Hours: 48
Unit-I	**Solid Waste**	**8 Hrs**
Definitions, Types of Solid Wastes, Sources of Solid Wastes, Characteristics, and Perspectives; Properties of Solid Wastes, Sampling of Solid Wastes, Elements of Solid Waste Management - Integrated Solid Waste Management, Solid Waste Management Rules 2016		
Unit-II	**Engineering Systems for Solid Waste Management**	**9 Hrs**
Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning - Transfer and Transport; Processing Techniques		
Unit -III	**Engineering Systems for Resource and Energy Recovery**	**9 Hrs**
Processing Techniques; Materials Recovery Systems; Recovery of Biological Conversion Products – Composting, Pre and Post Processing, Types of Composting, Critical Parameters, Problems With Composing - Recovery of Thermal Conversion Products; Pyrolisis, Gasification, RDF - Recovery of Energy From Conversion Products; Materials and Energy Recovery Systems		
Unit -IV	**Landfills**	**8 Hrs**
Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills – Types of Liners – Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation		
Unit -V	**Hazardous Waste Management**	**8 Hrs**
Sources and Characteristics, Effects On Environment, Risk Assessment – Disposal of Hazardous Wastes – Secured Landfills, Incineration - Monitoring – Biomedical Waste Disposal, E-Waste Management, Nuclear Wastes, Industrial Waste Management		

Textbooks:

1. Tchobanoglous G, Theisen H and Vigil SA _Integrated Solid Waste Management, Engineering Principles and Management Issues‘ McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, _Solid Waste Engineering‘ Brooks/Cole Thomson Learning Inc., 2002.

Reference Books:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, _Environmental Engineering‘, McGraw Hill Inc.,

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B. Tech IV Year I semester

New York, 1985.
2. Qian X, Koerner RM and Gray DH, _Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.

Online Learning Resources:

- https://archive.nptel.ac.in/courses/105/103/105103205/
- **https://archive.nptel.ac.in/courses/120/108/120108005/**

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the types, sources, and characteristics of solid waste, along with Regulatory frameworks
CO2: Analyze engineering systems for solid waste collection, storage, and transportation
CO3: Apply resource and energy recovery techniques for sustainable solid waste Management
CO4: Evaluate landfill design, construction, and environmental impact mitigation strategies
CO5: Assess hazardous waste management techniques, including biomedical and e-waste

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B. Tech IV Year I semester

ELECTRIC VEHICLES
(All Branches Except EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0242T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
- Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics.
- Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems.
- Design and analyze the various control structures for Electric vehicle

Syllabus		Total Hours: 48
Unit-I	**Introduction to EV Systems and Energy Sources**	**10 Hrs**

Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems

Unit-II	EV Propulsion and Dynamics	9 Hrs

Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi- motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration

Unit -III	Fuel Cells	9 Hrs

Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

Unit -IV	Battery Charging and Control	9 Hrs

Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction. Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller‘s designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

Unit -V	Energy Storage Technologies	9 Hrs

Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical- Electrical - Efficiency of energy storage systems- Super capacitors-Superconducting Magnetic Energy Storage(SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA

Textbooks:

3. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition

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4. Ali Emadi, ―Advanced Electric Drive Vehicles‖, CRC Press, 2017,1st Edition

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, OriolGomis-Bellmunt,‖ Energy Storage in Power Systems‖ Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition
3. A.G.Ter-Gazarian, ―Energy Storage for Power Systems‖, the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, ―Modern Elelctric, Hybrid Elelctric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2004,1st Edition
5. James Larminie, John Lowry, ―Electric Vehicle Technology Explained‖, Wiley, 2003,2nd Edition.

Online Learning Resources:

- https://nptel.ac.in/courses/108/102/108102121/
- https://nptel.ac.in/syllabus/108103009

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: To understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs

CO2: Understand Various dynamics of Electric Vehicles

CO3: To remember and understand various configurations in parameters of EV system and dynamic aspects of EV

CO4: To analyze fuel cell technologies in EV and HEV systems

CO5: To analyze the battery charging and controls required of EVs

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B. Tech IV Year I semester

TOTAL QUALITY MANAGEMENT
(CSE, CSE-AIML,CSE-CS,CSE-DS,CE,ECE,EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0334Td	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Familiarize the basic concepts of Total Quality Management.
- Expose with various quality issues in Inspection.
- Gain Knowledge on quality control and its applications to real time.
- Understand the extent of customer satisfaction by the application of various quality concepts.
- Demonstrate the importance of Quality standards in Production.

Syllabus		Total Hours: 48
Unit-I	**Introduction**	**10 Hrs**

Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management

Unit-II	**Historical Review**	**9 Hrs**

Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies

Unit -III	**TQM Principles**	**9 Hrs**

Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures Basic Concepts, Strategy, Performance Measure Case studies

Unit -IV	**TQM Tools**	**9 Hrs**

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

Unit -V	**Quality Systems**	**9 Hrs**

Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies

Textbooks:

1. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education,2015.
2. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005.
3. Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017.

Reference Books:

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B. Tech IV Year I semester

1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.
2. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.
3. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015
4. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.

Online Learning Resources:

- https://www.youtube.com/watch?v=VD6tXadibk0
- https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
- https://blog.capterra.com/what-is-total-quality-management/
- https://nptel.ac.in/courses/110/104/110104080/
- https://onlinecourses.nptel.ac.in/noc21_mg03/preview
- https://nptel.ac.in/courses/110/104/110104085/
- https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Define and develop on quality Management philosophies and analyze quality costs frameworks

CO2: Understanding of the historical development of Total Quality Management (TQM), implementation, and real-world applications through case studies

CO3: Evaluate the cost of poor quality, process effectiveness and efficiency to analyze areas for improvement

CO4: Apply benchmarking and business process reengineering to improve management processes

CO5: Demonstrate the set of indications to evaluate performance excellence of an organization

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B. Tech IV Year I semester

COMPUTER NETWORKS & INTERNET PROTOCOLS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0520T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Syllabus		Total Hours: 48
Unit-I	**Computer Networks and the Internet**	**10 Hrs**

What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission (Textbook 1)

Unit-II	The Data Link Layer, Access Networks, and LANs	9 Hrs

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1)

Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)

Unit -III	The Network Layer	9 Hrs

Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1).

Unit -IV	The Transport Layer	9 Hrs

Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1).

Unit -V	The Application Layer	9 Hrs

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet‘s Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2).

Textbooks:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, ―Computer Networking: A Top-Down Approach‖, 6th edition, Pearson, 2019.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, ―Networks for Computer Scientists and Engineers‖, Oxford Publishers, 2016.

Online Learning Resources:

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B. Tech IV Year I semester

- https://nptel.ac.in/courses/106105183/25
- http://www.nptelvideos.in/2012/11/computer-networks.html
- https://nptel.ac.in/courses/106105183/3

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Identify the software and hardware components of a computer network
CO2: Design software for a computer network
CO3: Develop new routing, and congestion control algorithms
CO4: Assess critically the existing routing protocols
CO5: Explain the functionality of each layer of a computer network
CO5: Choose the appropriate transport protocol based on the application requirements

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B. Tech IV Year I semester

INTERNET OF THINGS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0450T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

Syllabus		Total Hours: 48
Unit-I	**Introduction to IoT**	**10 Hrs**
Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates		
Unit-II	**Prototyping IoT Objects using Microprocessor/Microcontroller**	**9 Hrs**
Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi		
Unit -III	**IoT Architecture and Protocols**	**9 Hrs**
Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.		
Unit -IV	**Device Discovery and Cloud Services for IoT**	**9 Hrs**
Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.		
Unit -V	**UAV IoT**	**9 Hrs**
Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase		

Textbooks:

1. Vijay Madisetti and Arshdeep Bahga, ― Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press,

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2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Online Learning Resources:

- https://www.arduino.cc/
- https://www.raspberrypi.org/
- https://nptel.ac.in/courses/106105166/5
- https://nptel.ac.in/courses/108108098/4

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand general concepts of Internet of Things
CO2: Apply design concept to IoT solutions
CO3: Analyze various M2M and IoT architectures
CO4: Evaluate design issues in IoT applications
CO5: Create IoT solutions using sensors, actuators and Devices

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B. Tech IV Year I semester

INTRODUCTION TO QUANTUM COMPUTING
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A3315a	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization

Syllabus		Total Hours: 48
Unit-I	**Fundamentals of Quantum Mechanics and Linear Algebra**	**10 Hrs**

Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems

Unit-II	**Quantum Gates and Circuits**	**9 Hrs**

Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits

Unit -III	**Quantum Algorithms and Complexity**	**9 Hrs**

Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

Unit -IV	**Quantum Programming and Simulation Platforms**	**9 Hrs**

Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

Unit -V	**Applications and Future of Quantum Computing**	**9 Hrs**

Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions

Textbooks:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019

Reference Books:

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1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.

Online Learning Resources:

- IBM Quantum Experience and Qiskit Tutorials
- Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
- edX – The Quantum Internet and Quantum Computers
- YouTube – Quantum Computing for the Determined by Michael Nielsen
- Qiskit Textbook – IBM Quantum

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Explain the fundamental concepts of quantum mechanics used in computing.
CO2: Construct and analyze quantum circuits using standard gates
CO3: Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's
CO4: Develop simple quantum programs using Qiskit or similar platforms
CO5: Analyze applications and challenges of quantum computing in real-world domains

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B. Tech IV Year I semester

FINANCIAL MATHEMATICS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0032T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To provide mathematical foundations for financial modelling, risk assessment and asset pricing.
- To introduce stochastic models and their applications in pricing derivatives and interest rate modelling.
- To develop analytical skills for fixed-income securities, credit risk, and investment strategies.
- To equip students with computational techniques for pricing financial derivatives

Syllabus		Total Hours: 48
Unit-I	**Asset Pricing and Risk Management**	**10 Hrs**

Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis

Unit-II	**Stochastic Models in Finance**	**9 Hrs**

Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito's Lemma, Ito Integral, and Ito Isometry

Unit -III	**Interest Rate and Credit Modelling**	**9 Hrs**

Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

Unit -IV	**Fixed-Income Securities and Bond Pricing**	**9 Hrs**

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.

Unit -V	**Exotic Options and Computational Finance**	**9 Hrs**

Stochastic volatility models and the Feynman-Kac theorem. Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications

Textbooks:

1. Ales Cerny, *Mathematical Techniques in Finance: Tools for Incomplete Markets*, Princeton University Press.
2. S.R. Pliska, *Introduction to Mathematical Finance: Discrete-Time Models*, Cambridge University Press

Reference Books:

1. IoannisKaratzas& Steven E. Shreve, Methods of Mathematical Finance, Springer, New York.
2. John C. Hull, Options, Futures, and Other Derivatives, Pearson.

Online Learning Resources:

- MIT– Mathematics for Machine Learning https://ocw.mit.edu
- Coursera – Financial Engineering and Risk Management (Columbia University)

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https://www.coursera.org/

- National Stock Exchange (NSE) India – Financial Derivatives https://www.nseindia.com/

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Explain fundamental financial concepts, including arbitrage, valuation, and risk.

CO2: Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts

CO3: Analyze mathematical techniques for pricing options and financial derivatives

CO4: Evaluate interest rate models and bond pricing methodologies

CO5: Utilize computational techniques such as Monte Carlo simulations for financial modeling

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B. Tech IV Year I semester

SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0038T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To provide exposure to various kinds of sensors and actuators and their engineering applications.
- To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators.
- To explain the operating principles of various sensors and actuators.
- To educate the fabrication of sensors
- To explain the required sensor and actuator for interdisciplinary application

Syllabus		Total Hours: 48
Unit-I	**Introduction to Sensors and Actuators**	**10 Hrs**

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators

Unit-II	Temperature and Mechanical Sensors	9 Hrs

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP)

Unit -III	Optical and Acoustic Sensors	9 Hrs

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

Unit -IV	Magnetic and Electromagnetic Sensors	9 Hrs

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

Unit -V	Chemical and Radiation Sensors	9 Hrs

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

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1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc21_ee32/preview

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Classify different types of Sensors and Actuators along with their characteristics.
CO2: Summarize various types of Temperature and Mechanical sensors
CO3: Illustrates various types of optical and mechanical sensors
CO4: Analyze various types of Optical and Acoustic Sensors
CO5: Interpret the importance of smart materials in various devices

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B. Tech IV Year I semester

CHEMISTRY OF NANOMATERIALS AND APPLICATIONS
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0043T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To understand basics and characterization of nanomaterials.
- To understand synthetic methods of nanomatrials.
- To apply various techniques for charterization of nanomaterials.
- To understand Studies of Nano-structured Materials
- To enumerate the applications of advanced nanomaterials in engineering

Syllabus		Total Hours: 48
Unit-I	**Basics and Characterization of Nanomaterials**	**10 Hrs**

Introduction**,** Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.

Unit-II	Synthesis of nanomaterials	9 Hrs

Top-Down approach**,** Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, highenergy ball milling method.

Synthetic Methods: Bottom-Up approach**,** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

Unit -III	Techniques for characterization	9 Hrs

Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination

Unit -IV	Studies of Nano-structured Materials	9 Hrs

Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

Unit -V	Advanced Engineering Applications of Nanomaterials	9 Hrs

Applications of Nano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation

Textbooks:

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012.

Reference Books:

1. Concepts of Nanochemistry; LudovicoCademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-

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VCH, 2011.
2. Nanostructures &Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Classify the nanostructure materials; describe scope of nanoscience and importance technology.

CO2: Describe the top-down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapor deposition method and electrode position method, Discuss about highenergy ball milling

CO3: Discuss different technique for characterization of nanomaterial, Explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis

CO4: Explain synthesis and properties and applications of nanaomaterials, Discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, nonlinear optical materials

CO5: Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation

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B. Tech IV Year I semester

LITERARY VIBES
(Common to All)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0047T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE

Course Objectives:

- To inculcate passion for aesthetic sense and reading skills.
- To encourage respecting others' experiences and creative writing.
- To explore emotions, communication skills and critical thinking.
- To educate how books serve as the reflection of history and society
- To provide practical wisdom and duty of responding to events of the times

Syllabus		Total Hours: 48
Unit-I	**Poetry**	**10 Hrs**

1. Ulysses- Alfred Lord Tennyson
2. Ain't I woman?-Sojourner Truth
3. The Second Coming-W.B. Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

Unit-II	Drama: Twelfth Night- William Shakespeare	9 Hrs

1. Shakespeare -life and works
2. Plot & sub-plot and Historical background of the play
3. Themes and Criticism
4. Style and literary elements
5. Characters and characterization

Unit -III	Short Story	9 Hrs

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wild
3. Three Questions – Leo Tolstoy
4. Grief –Antony Chekov

Unit -IV	Prose: Essay and Autobiography	9 Hrs

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston
3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly

Unit -V	Novel: Hard Times- Charles Dickens	9 Hrs

1. Charles Dickens-Life and works
2. Plot and Historical background of the novel
3. Themes and criticism
4. Style and literary elements
5. Characters and characterization

Textbooks:

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1. Charles Dickens.*Hard Times.*(Sangam Abridged Texts) Vantage Press, 1983
2. DENT JC.William Shakespeare. Twelfth Night. Oxford University Press,2016

Reference Books:

1. WJ Long.History of English Literature, Rupa Publications India; First Edition (4 October
2. 2015)
3. RK Kaushik And SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University
4. Press .2018.
5. Dhanvel, SP. English and Soft Skills, Orient Blackswan,2017.
6. New Horizon, Pearson publications, New Delhi 2014
7. Vimala Ramarao, Explorations Volume-II, Prasaranga Bangalore University,2014.
8. Dev Neira, Anjana & Co. Creative Writing: A Beginner's Manual.Pearson India, 2008

Online Learning Resources:

- https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses
- https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis
- https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette
- https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/
- https://www.litcharts.com/lit/twelfth-night/themes
- https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Identify genres, literary techniques and creative uses of language in literary texts.

CO2: Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces

CO3: Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments

CO4: Analyze the underlying meanings of the text by using the elements of literary texts

CO5: Evaluate their own work and that of others critically

CO6: Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance

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B. Tech IV Year I semester

RF SYSTEM DESIGN TOOLS

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0438P	0:1:2	2	CIE:30 SEE:70	3 Hours	SOC

Course Objectives:

- To introduce RF design software and tools for designing and simulating RF systems.
- To understand impedance matching techniques and the role of scattering parameters in RF circuit design.
- To explore the design of RF power amplifiers, filters, oscillators, mixers, and voltage controlled oscillators (VCOs).
- To analyze micro strip transmission lines, their discontinuities, and their applications in RF systems.
- To study the design, simulation, and measurement of antennas and microwave integrated circuits.

Syllabus

Basic Concepts in RF Design: Introduce any RF design software and orient students with the tools of the laboratory. Practice the tool to use it for significant design. Introduction to RF Design, Time Variance and Nonlinearity, Effects of nonlinearity, Passive impedance transformation, Scattering parameters, impedance matching, L match,Pi match, T match, Passive IC Components Resistors, capacitors Inductors, Schottky Diode, RF Switch.

RF Power Amplifiers and Filters: RF Power amplifier design examples, Gain equalizers, Voltage controlled oscillators, Phase locked loops, Linearized PLL models, PLL design examples, High frequency oscillators, Loop filters, lumped filter. LPF, HPF and BPF.

LNA, VCO and Mixers: General considerations, Problem of input matching, Low Noise Amplifiers design in various topologies, Gain Switching, Band Switching, Voltage Controlled Oscillators, Mixers-General considerations, Passive down conversion mixers, Active down conversion mixers, Up conversion mixers.

Microstrip transmission lines and discontinuities: S parameters of a Microstrip Transmission Line, Smith Chart, Analysis of Microstrip Transmission Line standing wave patterns at various frequencies, Different types of Transmission lines like CPW, Microstrip and Co-axial cable. Different types of Microstrip discontinuities like Bend, T, Via, Gap etc., Microstrip Ring Resonator.

Antennas and Microwave Integrated Circuits: Radiation Pattern, Gain, S Parameters, Return loss and VSWR. Design considerations of Microstrip Patch Antenna and Microstrip Array, Yagi Uda Antenna and Horn Antenna. Hybrid Microwave Integrated Circuits, Monolithic Microwave Integrated Circuits, Microwave Integrated Circuits: MMIC Amplifier.

Practice Exercises: (Any twelve experiments)

Any twelve experiments are to be done:

1. Design and simulate Impedance matching circuits like L-Matching, Pi Matching and T Matching.
2. Design and Simulate a Schottky Diode and RF Switch.
3. Design and simulate a RF BJT Amplifier and LNA.
4. Design and simulate a Power Amplifier and Gain Equalizer.
5. Analyse and measure the gain of a Power Amplifier and equalise its gain using an Equalizer.
6. Design and simulate a High Frequency Oscillator and Lumped Filter.
7. Measurement of insertion loss, -3dB Cut of frequency of LPF, HPF and BPF.
8. Design and Simulate a VCO and RF Mixer.
9. Measure the S parameters of a Micro strip Transmission Line and plot the normalised impedance on a

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smith chart
10. Analysis of Microstrip Transmission Line standing wave pattern at various frequencies.
11. Study of different types of Transmission lines like CPW, Microstrip and Co-axial and find/measure its Insertion Loss (S21 and S12)
12. Study of different types of Microstrip discontinuities like Bend, T, Via , Gap etc and find/measure its Insertion loss.
13. Determine the Bandwidth and Quality Factor of a Microstrip Ring Resonator.
14. Design and simulate the Radiation Pattern,gain, S11and VSWRof a Microstrip Patch Antenna and Microstrip Array.
15. Design and simulate the Radiation Pattern, gain, S11and VSWR of a Yagi Uda Antenna and Horn Antenna.
16. Design and Simulate a MMIC Amplifier

Equipment Required

1. RF Circuit Design and Simulation Software
2. RF Training System
3. Antenna Measurement System with Antenna Design Software.

Course Outcomes(CO):

CO1: Utilize RF design software and tools to simulate and analyze RF circuits and components.

CO2: Design and implement impedance matching networks such as L-match, Pi-match, and Tmatch circuits.

CO3: Develop RF amplifiers, filters, oscillators, and mixers for high-frequency applications.

CO4: Analyze microstrip transmission lines and measure their characteristics using S-parameters and Smith charts.

CO5: Design and simulate various types of antennas, including microstrip patch antennas, YagiUda antennas, and horn antennas

CO6: Evaluate RF amplifiers, filters, oscillators, and mixers for high-frequency applications

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B. Tech IV Year I semester

INDUSTRIAL IOT & AUTOMATION					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0439P	0 – 1 – 2	**2**	**CIE:30** **SEE:70**	**3 Hours**	**SOC**

Course Objectives:

- To introduce the fundamentals of Industrial IoT (IIoT),its architecture, and its differences from traditional IoT.
- To understand the components of IIoT, including sensors, actuators, and control systems, and their integration with embedded platforms.
- To explore communication technologies such as ZigBee, Bluetooth, NFC, RFID, and MQTT for IIoT applications.
- To study data visualization techniques, dashboard creation, and web-based connectivity for IIoT systems.
- To learn data retrieval techniques, machine-to-machine (M2M) communication, and cloud integration for IIoT applications.
- To implement automation using PLCs, SCADA, and real-time control systems for industrial applications.

Syllabus	**Total Hours: 42**
MODULE 1: Introduction & Architecture	**7 Hrs**

Introduction & Architecture

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT.

Practice

1.Introduction to Arduino, Introduction to raspberry Pi.
https://www.youtube.com/watch?v=AQdLQV6vhbk

MODULE 2: IIOT Components	**7 Hrs**

Fundamentals of Control System: introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro Mechanical switches.

Practice

1. Measurement of temperature & pressure values of the process using raspberry pi / node mcu.
2. Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi / node mcu.
3. Module sand Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi / node mcu.

MODULE3: Communication Technologies of IIoT	**7 Hrs**

Communication Protocols: IEEE802.15.4, ZigBee, Bluetooth, BLE, NFC, RFID Industry standards communication technology (MQTT), wireless network communication.

Practice

1. Demonstration of MQTT communication.

MODULE4: Visualization and Data Types of IIoT	**7 Hrs**

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi

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development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

Practice

1. Visualization of diverse sensor data using dashboard(part of IoT's control panel')
2. Sending alert message to the user. ways to control and interact with your environment)

MODULE5: Retrieving Data	**7Hrs**

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

Practice

1. Device control using mobile Apps or throughWebpages.
2. Machine to Machine communication.

MODULE6: Control & Supervisory Level of Automation	**7Hrs**

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA).

Practice

1. Digital logic gates programming using ladder diagram.
2. Implementation of Boolean expression using ladder diagram.
3. Simulation of PLC to understand the process control concept.

Projects

- IIoT based smart energy meter
- Smart Agriculture system
- Automation using controller via Bluetooth
- Temperature controlled Fan/cooler using controller
- Automatic streetlight
- Smart Baggage Tracker

Textbooks:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham(Ed.) (Springer Publication)
2. Industrial Internet of Things: Cyber manufacturing System**,** Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industria lIoT Challenges, Design Principles, Applications, and Security by IsmailButun (editor)

Course Outcomes(CO):

CO1: Explain the fundamental concepts of IIoT, its architecture, and the challenges associated with industrial automation.

CO2: Demonstrate the integration of sensors and actuators with Raspberry Pi/Node MCU for real-time monitoring and control.

CO3: Implement communication protocols such as MQTT, ZigBee, and Bluetooth to enable seamless IIoT connectivity.

CO4: Develop web-based dashboards for real-time visualization and remote monitoring of IIoT devices.

CO5: Retrieve, analyze, and transmit industrial data using web-based interactions and M2M communication.

CO6: Implement PLC-based automation, ladder logic programming, and SCADA for supervisory control in industrial environments.

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B. Tech IV Year I semester

GENDER SENSITIZATION

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0054T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	AC

Course Objectives:

- To enable students to understand the gender related issues, vulnerability of women and men
- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace

Syllabus		Total Hours: 48
Unit-I	**Understanding Gender**	**9 Hrs**

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste

Unit-II	**Gender Roles And Relations**	**9 Hrs**

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio-Demographic Consequences-Gender Spectrum

Unit -III	**Gender And Labour**	**9 Hrs**

Division and Valuation of Labour -Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work - Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit -IV	**Gender-Based Violence**	**9 Hrs**

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit -V	**Gender And Culture**	**9 Hrs**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature-Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships

Textbooks:

1. A.Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender", Telugu Akademi, Telangana, 2015.
2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990

Reference Books:

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002

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B. Tech IV Year I semester

3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the basic concepts of gender and its related terminology

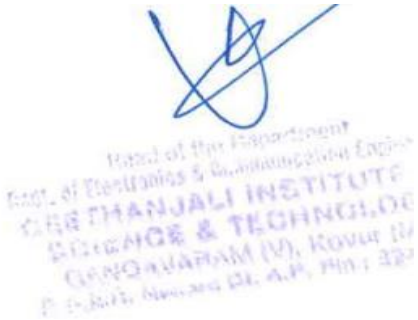
CO2: Identify the biological, sociological, psychological and legal aspects of gender

CO3: Use the knowledge in understanding how gender discrimination works in our society and how to counter it

CO4: Analyze the gendered division of labour and its relation to politics and economics

CO5: Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups

CO6: Develop students' sensibility with regard to issues of gender in contemporary India



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B. Tech IV Year II Semester							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.		23A0441	Internship	-	-		4
			Project				8
Total							12

K. Sravan kumar
MEMBER SECRETARY

Head of the Department
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