DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG –R22

B. TECH –ELECTRONICS & COMMUNICATION ENGINEERING

(Applicable for batches admitted from 2022-2023)

ST.ANN'S COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

COURSE STRUCTURE

Year: I Semester: I

Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
BS	22UMT01	Mathematics – I	3	1	--	--	4	30	70	100	3
HS	22UEN01	Communicative English	3	1	--	--	4	30	70	100	3
BS	22UCH01	Applied Chemistry	3	1	-	--	4	30	70	100	3
ES	22UEE05	Basic Electrical Engineering	3	1	--	--	4	30	70	100	3
ES	22UCS01	Programming for Problem Solving using C	3	1	--	--	4	30	70	100	3
HS	22UEN02	English Communication Skills Laboratory	--	--	3	--	3	15	35	50	1.5
BS	22UCH02	Applied Chemistry Laboratory	--	--	3	--	3	15	35	50	1.5
ES	22UCS02	Programming for Problem Solving Using C Laboratory	--	--	3	--	3	15	35	50	1.5
MC	22UCH03	Environmental Science	2	--	--	--	2	--	--	--	0
TOTAL			17	5	9	-	31	195	455	650	19.5

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course, PC-Professional Core, PE-Professional Elective, OE-Open Elective, OC-Online Course

Year: I Semester: II

Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
BS	22UMT02	Mathematics - II	3	1	--	--	4	30	70	100	3
BS	22UPH01	Applied Physics	3	1	--	--	4	30	70	100	3
ES	22UEC01	Digital Logic Design	3	1	--	--	4	30	70	100	3
ES	22UEE06	Network Analysis	3	1	--	--	4	30	70	100	3
ES	22UCS03	IT Workshop	1	-	4	-	5	15	35	50	3
BS	22UPH02	Applied Physics Laboratory	--	--	3	--	3	15	35	50	1.5
ES	22UEC02	Electronic Workshop	--	--	3	--	3	15	35	50	1.5
ES	22UEE07	Basic Electrical Engineering Laboratory	--	--	3	--	3	15	35	50	1.5
MC	22UEN03	Constitution of India	2	--	--	--	2	--	--	--	0
OC	22UOC01	SWAYAM, NPTEL, Spoken Tutorials	-	-	-	2	2	-	-	-	0
TOTAL			15	4	13	2	34	180	420	600	19.5

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course, PC-Professional Core, PE-Professional Elective, OE-Open Elective, OC-Online Course

Year: II Semester: III

S.No	Category	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int	Ext	Total	C
1	PC	22UEC03	Electronic Devices and Circuits	3	1	0	30	70	100	3
2	ES	22UCS05	Python Programming	3	1	0	30	70	100	3
3	BS	22UMT03	Mathematics - III	3	1	0	30	70	100	3
4	PC	22UEC07	Signals & Systems	3	1	0	30	70	100	3
5	PC	22UEC08	Random Variables and Stochastic Processing	3	1	0	30	70	100	3
6	LC	22UCS07	Python Programming Lab	0	0	3	15	35	50	1.5
7	LC	22UEC04	Electronic Devices Circuits Lab	0	0	3	15	35	50	1.5
8	LC	22UEC06	Switching Theory and Logic Design Lab	0	0	3	15	35	50	1.5
9	SC	22UEN06	Soft Skills - I	0	0	4	-	50	50	2
Community Service Project				**Community Service Project (Mandatory) (to be evaluated during IV semester)**						
Total Credits										**21.5**

Year: II Semester: IV

S.No	Category	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int	Ext	Total	C
1	PC	22UEC09	Electronic Circuit Analysis	3	1	0	30	70	100	3
2	ES	22UCS04	Data Structures	3	1	0	30	70	100	3
3	PC	22UEC10	Analog Communications	3	1	0	30	70	100	3
4	PC	22UEC11	Electromagnetic Waves and Transmission Lines	3	1	0	30	70	100	3
5	PC	22UEC12	Linear Control Systems	3	1	0	30	70	100	3
6	LC	22UEC13	Electronic Circuit Analysis Lab	0	0	3	15	35	50	1.5
7	LC	22UEC14	Analog Communications Lab	0	0	3	15	35	50	1.5
8	LC	22UCS06	Data Structures Lab	0	0	3	15	35	50	1.5
9	SC	22UEN07	Soft Skills-II	0	0	4	--	50	50	2
10	MC	22UEN04	Essence of Indian Traditional Knowledge	3	0	0	--	--	--	0
11			**Community Service Project**	**Community Service Project (Mandatory) (to be evaluated during IV semester)**			100	--	100	4
12	**Internship-II for 2 Months (Mandatory) during summer vacation**									
Total Credits										**25.5**
13	Minor		Electronics Devices and Basic Circuits	3	1	0	30	70	100	4
14	Honors		Any course from the Pool, as per the opted track	3	1	0	30	70	100	4

Year: III Semester: V

S.No	Category	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int	Ext	Total	C
1	PE1	22UEC34	Antenna & Wave Propagation	3	1	0	30	70	100	3
2	PC	22UEC15	Digital Communication	3	1	0	30	70	100	3
3	PC	22UEC16	Analog and Digital Integrated Circuits	3	1	0	30	70	100	3
4	PC	22UEC17	Digital Signal Processing	3	1	0	30	70	100	3
5	OE1	22UME25	Sustainable Energy Technologies	3	1	0	30	70	100	3
6	LC	22UEC37	Digital Communication Lab	0	0	3	15	35	50	1.5
7	LC	22UEC38	Analog and Digital Integrated Circuits Lab	0	0	3	15	35	50	1.5
8	SC	22UCS30	Oops through JAVA Lab	0	0	3	15	35	50	2
9	MC		Indian Traditional Knowledge	3	0	2	--	--	--	0
10	PROJ	22UOC02	**Internship**	0	0	0	--	--	--	1.5
Total Credits										**21.5**

Year: III Semester: VI

S.No	Category	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int	Ext	Total	C
1	PC	22UEC39	VLSI Design	3	1	0	30	70	100	3
2	PC	22UEC40	Internet of Things(IOT) & its Applications	3	1	0	30	70	100	3
3	PC	22UEC41	Microprocessors and Microcontrollers	3	1	0	30	70	100	3
4	PE2	22UEC42	Microwave Engineering	3	1	0	30	70	100	3
5	OE2		Open Elective Course-2	3	1	0	30	70	100	3
6	LC	22UEC45	Microprocessors and Microcontrollers Lab	0	0	3	15	35	50	1.5
7	LC	22UEC46	Microwave & Optical Communications Lab	0	0	3	15	35	50	1.5
8	LC	22UEC47	Digital Signal Processing Lab	0	0	3	15	35	50	1.5
9	SC	22UEC48	IoT and its applications Lab	0	0	3	--	--	--	2
10	MC	22UEn12	Research Methodology	0	0	3	--	--	--	--
Total Credits										**21.5**

Year &Sem	I Year – I Semester					
Course Code	22UMT01	L	T	P	SS	C
Course Name	MATHEMATICS-I	3	1	0	0	3

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations.
- To assist the students to learn the concepts of partial differentiation.
- To enlighten the learners in the concept of differential equations.
- 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-worldproblems and their applications.
- To make clear the students in the concepts of Multiple Integrals.

Course Outcomes:

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

CO1: Apply matrix techniques to model and solve system of linear equations.
CO2: To apply the mean value theorems to real life problems.
CO3: Solve the differential equations related to various engineeringfields.
CO4: Apply double integration techniques in evaluating areasbounded by region.
CO5: Student will learn important tools of calculus in higherdimensions. Students will become familiar with 2-dimensinaland 3-dimensional coordinate systems.

UNIT-I:System of Linear Equations, Eigen Values, Eigen Vectors (12 Hours)

Rank of a matrix by echelon form and normal form – Solving system ofhomogeneous and non-homogeneous linear equations – Gauss Elimination method – Eigen values and Eigen vectors andproperties.Cayley-Hamilton theorem(without proof) – Reduction of a matrix to Diagonal form.Applications –Finding the inverse and power of a matrix by CayleyHamilton theorem.

Learning Resources: Text Book-1

UNIT-II: Differential Calculus (12 Hours)

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem–Taylor's and Mac Laurin's theorems with remainders, Problems and applications on the above theorem.Partial Differentiation: Introduction–Homogeneous function–Euler's theorem–Total derivative – Chain rule – Jacobian – Functional dependence –Taylor's and Mac Laurin's series expansion of functions of two variables.Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

Learning Resources: Text Book-1

UNIT-III: Differential Equations of First Order and First Degree (12 Hours)

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 decay – Orthogonal trajectories.

Learning Resources: Text Book-1

UNIT-IV: Differential Equations of Second and Higher Order (14 Hours)

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients –

withnon-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.
Applications: LCR circuits.
Learning Resources: Text Book-1

UNIT-V: Multiple Integrals (14 Hours)

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.Applications: Finding Areas and Volumes.
Learning Resources: Text Book-1

Text Books:

1. **B.S.Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference Books:

1. **Dr.T.K.V.Iyengar, Dr. B.Krishna Gandhi, S.Ranganadham, Dr. M.V.S.S.N. Prasad**, a text book of Engineering Mathematics, S.Chand Publications.
2. **N.P.Bali, Manish Goyal**, A text book of Engineering Mathematics, Lakshmi Publications
3. **B.V.Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education.
4. **Erwin Kreyszig,**Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO and PSO MAPPINGS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	3
CO2	2	2	2	2	-	-	-	-	-	-	-	3
CO3	2	2	2	2	-	-	-	-	-	-	-	3
CO4	3	3	2	2	-	-	-	-	-	-	-	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3

Year &Sem	I Year – I Semester					
Course Code	22UEN01	L	T	P	SS	C
Course Name	COMMUNICATIVE ENGLISH	3	1	0	0	3

Introduction

With the growing importance of English for global communication and the emphasis on training the learners to gain communicative competence, the syllabus is designed to develop linguistic and communicative competence of the engineering students. The major focus of the syllabus is to enhance the communicative ability, with the focus on the language skills, grammar, vocabulary of the learners and to improve the learner's ability to use English language effectively in social, academic and professional contexts. There is a shift from learning about the language to using the language. Thereby enables the learner to appear confidently for international language qualification tests like IELTS, TOEFL, BEC Etc.

Course Objectives:

- Help students develop effective listening skills so that they can understand academic lectures and native English speakers' speech.
- Encourage the development of speaking abilities by taking part in exercises like role-playing, dialogues, and organized talks / oral presentations.
- Pay special attention to effective reading techniques for understanding a range of academic literature and real-world resources.
- Introduce useful writing techniques and illustrate them by summarizing, composing essays with a clear structure, recording and reporting relevant information.
- Increase vocabulary and grammatical knowledge, and promote proper use of words both in speech and writing.

Course Outcomes:

Attheendofthemodule, thelearnerswillbeableto

- Comprehend social or transactional discussions presented by native English speakers and recognize the context, subject, and specific information.
- Introduce one self and others and engage in general conversation about well-known subjects.
- Employsuitablestrategiesforskimmingandscanningtogetthegeneralideaofatextandlocate specificinformation.
- Recognizeparagraphstructureandbeabletomatchbeginnings/endings/headingswithparagraphs
- Formsentencesusingpropergrammaticalstructuresandcorrectwordforms.

Unit- 1

Lesson-1: The Scare Crow by Satyajit Ray from Panorama, a course on reading, Oxford publications. Listening: Listening to short audio texts and identifying the topic.Listening toproseandconversations.**Speaking:**Askingandanswering generalquestionsonfamiliartopicssuchashome,family, work studiesandinterests. Self-introductionandintroducingothers.**Reading:** Skimming text to get the main idea. Scanning to look for specific pieces of information.**Writing:** Paragraph writing (specific topics) using suitable cohesive devices, linkers, signpostsandtransitionsignals;mechanicsofwriting-punctuation,capitalletters.

Vocabulary: Synonyms and Antonyms,Affixes.

Grammar: Content words and function words, word forms.

Unit-2

Lesson-1:Nehru'slettertohisdaughterIndiraonherbirthdayfrom "**InfotechEnglish**",MaruthiPublications.

Listening: Answering a series of questions about the main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs / small groups on specific topics followed by short structured talks.Functional English: Greetings and leave takings. **Reading**: Identifying sequence of ideas; recognizingverbaltechniquesthathelptolinktheideasinaparagraphtogether. **Writing**: Summarizing - identifying main idea and rephrasing what is read; avoidingredundanciesandrepetitions.**Vocabulary**:Synonyms and Antonyms, Root words**Grammar**: Parts of Speech.

Unit-3

Lesson-1: Telephone Conversation by Wole Soyinka

Listening: Listening for global comprehension and summarizing what is listened to, both in speakingandwriting.**Speaking:**Discussingspecifictopicsinpairsorsmallgroupsandreportingwhatisdiscussed. FunctionalEnglish: ComplainingandApologizing.**Reading**: Reading a text in detail by making basic inferences - recognizing and interpreting specificcontextclues;strategiestousetextcluesforcomprehension. Criticalreading.**Writing**: Letterwriting-types,formatandprinciplesofletterwriting. E-mailetiquette,WritingCV's. **Vocabulary**: Synonyms and Antonyms, Word Formation

Grammar: **Verbs, Subject Verb agreement, Common Errors.**

Unit4

Lesson-1: Water the Elixir of life by C.V.Raman

Listening: Making predictions while listening to conversations/ transactional dialogues without video(onlyaudio);listeningtoaudio-visualtexts.**Speaking:**RoleplaysforpracticeofconversationalEnglishinacademiccontexts(formalandinformal) - asking for and giving information/directions. Functional English: Permissions, Requesting,Inviting.**Reading**:Studyingtheuseofgraphicelementsintextstoconveyinformation,revealtrends/patterns /relationships,communicative processordisplaycomplicateddata.
Writing: Information transfer; describe, compare, contrast, identify significance/trendsbasedoninformationprovidedinfigures/charts/graphs / tables, writingformedia.**Vocabulary**: Synonyms and Antonyms, Phrasal verbs.

Grammar:Tenses, correction of sentences.

Unit5

Lesson-1:StayHungry-Stayfoolishfrom"**InfotechEnglish**", MaruthiPublications

Listening: Identifyingkeyterms,understandingconceptsandinterpretingtheconceptsbothinspeakingandwriting, TEDX Videos.**Speaking:**FormaloralpresentationsontopicsfromacademiccontextsFunctionalEnglish:Suggesting/Opiniongiving.**Reading**:Readingforcomprehension.RAPStrategy IntensivereadingandExtensivereadingtechniques.**Reading for Writing**: Writing academic proposals- writing research articles: format and style.**Vocabulary**:Synonyms and Antonyms, Idioms and

Phrases.**Grammar**:Voices, Degrees of comparison & Reported speech.

Suggestedbooks:

1. **InfotechEnglish**",MaruthiPublications.
2. **"Panorama, a course on reading", Oxford publications**
3. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
4. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
5. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
6. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012
7. https://onlinecourses.nptel.ac.in/noc20_hs19/preview
8. https://nptel.ac.in/courses/109106094
9. https://news.stanford.edu (Steve Jobs' Speech)

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's)) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	1	3	1	1
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	-

Year &Sem	I Year – I Semester					
Course Code	22UCH01	L	T	P	SS	C
Course Name	APPLIED CHEMISTRY	3	1	0	0	3

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

COURSE OBJECTIVES

1. Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
2. Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented
3. Explain the preparation of nanomaterials, engineering applications of nanomaterials, superconductors, preparation of semiconductors and applications of Hall effect.
4. Importance of Non-conventional Energy Resources, its design and working along with Fuel cells and Spectroscopic techniques.
5. Outline the basics of computational chemistry and molecular switches.

COURSE OUTCOMES:

1. Analyzetypes of plastics, methods of fabrication, the differenttypesofcompositeplasticmaterialsandinterpretthemechanismof conduction inconductingpolymers.
2. Understand the theory of construction of electrodes, batteries in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
3. Understand synthesis of nanomaterials for modern advances of engineering technology analyze the applications of super conductors. Summarize the preparation of semiconducting; analyse the applications of Hall effect.
4. Analyze different models of energy harnessing from different natural sources and also working and applications of Fuel cells and Spectroscopic Techniques.
5. Understand the knowledge of computational chemistry and molecular machines.

UNIT I: POLYMER TECHNOLOGY **(8hrs)**

Polymerization: -Introduction, types and methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Types, Compounding, Fabrication (compression, injection, blowing and extrusion moldings), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers: -Introduction, vulcanization of rubber, advantages of vulcanized rubber, preparation, properties and applications (BunaS, Thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable and biomedical polymers.

Course Outcomes: At the end of this unit, the students will be able to **Analyze**types of plastics, methods of fabrication, the differenttypesofcompositeplasticmaterialsandinterpretthemechanismof conduction inconductingpolymers.

UNIT II: ELECTRO CHEMICAL CELLS AND CORROSION **(10hrs)**

Electrochemical cell, Single electrode potential, standard hydrogen electrode, calomel electrode, construction of glass electrode, electrochemical series and uses of series, galvanic series, differentiation between electrochemical series and galvanic series, batteries (Dry cell, Li ion battery and zinc air cells).**Corrosion**: -Definition, factors influencing rate of corrosion, theories of corrosion (direct chemical attack and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, corrosion

control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]),Paints(constituents and special paints).

Course Outcomes: At the end of this unit, the students will be able to **Utilize**the theory of construction of electrodes, batteries in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

UNIT III: MATERIAL CHEMISTRY **(10hrs)**

PART I:

NANOMATERIALS:

Introduction, sol-gel method, characterization by (BrunauerEmmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerences, carbon nanotubes (types, preparation and applications).

Super conductors: TypeI, TypeII, characteristics and applications

PART II:

Non–elemental semiconducting materials:

Stoichiometric, controlled valency&chalcogen photo / semiconductors-preparation of semi conducting (distillation, zone refining, czochralski crystal pulling, epitaxy, diffusion, ion implantation) – semiconducting devices (p-n junction diode as rectifier, junction transistor).

Magnetic materials: ferro and ferri magnetism – Hall effect and its applications.

Course outcomes: at the end of this unit, the students will be able to

- **Synthesis** nanomaterials for modern advances of engineering technology analyze the applications of superconductors.
- **Summarize** the preparation of semiconducting; analyze the applications of Hall effect.

UNIT IV: NON–CONVENTIONAL ENERGY SOURCES & FUEL CELLS **(8hrs)**

NON–CONVENTIONAL ENERGY SOURCES:

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Fuel cells: Construction, Working and Applications (H2-O2, CH3OH-O2, phosphoric acid and molten carbonate).**Spectroscopic techniques:** Electromagnetic spectrum, UV laws of absorption, instrumentation, chromophores and auxochromes, intensity shifts and applications. FTIR instrumentation and applications.

Course outcomes: At the end of this unit, the students will be able to

- **Design** models for energy by different natural sources.
- **Analyze** the working of and applications of Fuel cells.

UNIT V: ADVANCED CONCEPTS / TOPICS IN CHEMISTRY **(8 hrs)**

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies, **Molecular switches:** characteristics of molecular motors and machines, rotaxanes and catenanes as Artificial molecular machines, prototypes – linear motions in rotaxanes, an acid – base controlled molecular shuttle, a molecular elevator, an autonomous light -powered molecular motor.

Course out comes: At the end of this unit, the students will be able to

- **Obtain** the knowledge of computational chemistry and molecular machines.

Standard books:

1. P.C.JainandM.Jain "**Engineering Chemistry**", 15/e, DhanpatRai& Sons, Delhi, (Latest edition).
2. ShikhaAgarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi, (2019).
3. ShashiChawla, "**Engineering Chemistry**", DhanpatRai Publication Co. (Latest edition).

Reference Books:

1. K.SeshaMaheshwaramma and MridulaChugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G.Palana, "**Engineering Chemistry**", Tata Mc.Graw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "**Preparation and characterization of materials**" Academic press, NewYork (latest edition).
4. B.S.Murthy, P.Shankar and others, "**Text book of Nano science and Nano technology**", University press (latest edition).

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	2	-	-	-	-	-	-	1

Year &Sem	I Year – I Semester					
Course Code	22UEE05	L	T	P	SS	C
Course Name	BASIC ELECTRICAL ENGINEERING	3	1	0	0	3

Course Educational Objectives:

- To understand the principle of operation, constructional details and operational characteristics of DC generators.
- To understand the principle of operation, characteristics of DC motor. Methods of starting and speed control methods of DC motors.
- To learn the constructional details, principle of operation and performance of transformers.
- To study the principle of operation, construction and details of synchronous generators.
- To learn the principle of operation, constructional details, performance, torque – slip characteristics and starting methods of 3-phaseinductionmotors.
- To understand the principle of operation of different measuring instruments

Course Outcomes:

CO1. Able to explain the operation of DC generator and analyze the characteristics of DC generator.
CO2. Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the starting and speed control methods of DC motors.
CO3. Ability to analyze the performance and speed – torque characteristics of a3- phase induction motor and understand starting methods of 3- phase induction motor.
CO4. Able to explain the operation of Synchronous generators
CO5. Capability to understand the operation of various electrical measuring instruments.

UNIT I

DC MACHINES: Principle of operation of DC Machines- EMF equation – Types of generators –Magnetization and load characteristics of DC generators

D.C. MOTORS: Types of DC Motors – Torque Equation, Characteristics of DC motors – startersforDC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

UNIT II

TRANSFORMERS: Principle of operation of single-phase transformer– Types and Constructional features, EMF Equation– No load and on load Phasor diagrams –Equivalent circuit-Losses and Efficiency of transformer and Regulation–OC and SC tests–Predetermination of efficiency and regulation.

UNIT III

SINGLE PHASE INDUCTION MOTORS: Principle of operation- Double Filed Revolving Theory - Shaded pole motors – Capacitormotors, AC servomotor, AC tachometers, Synchros, Stepper Motors – Characteristics.

ALTERNATORS: Alternators – Types and Constructional features – Principle of operation – EMF Equation– Distribution and Coil span factors–Predetermination of regulation of Alternator by OC and SC tests (Synchronous Impedance Method).

UNIT IV

THREE PHASE INDUCTION MOTOR: Principle of operation of three-phase induction motors– Constructional features Squirrel cage and Slip ring motors– Concepts of Slip, Slip-Torque characteristics–Star-Delta starting method.

UNIT V

ELECTRICAL INSTRUMENTS: PMMC, Moving iron type and electrostatic instruments, Construction, Torque equation, Range extension (Ammeters and Voltmeters).

TEXT BOOKS:

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering - T.K. Nagasarkar and M.S.Sukhija, Oxford University Press, 2005

REFERENCES:

1. Principles of Electrical Engineering - V. K Mehta, S.Chand Publications.
2. Theory and Problems of basic electrical engineering - I.J. Nagarathamd D.P Kothari, PHI Publications
3. Essentials of Electrical and Computer Engineering - David V. Kerns, JR. J. David Irwin

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	2	2	-	-	-	-	-	-	-	-	-	3
CO3	2	2	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

Year &Sem	I Year – I Semester					
Course Code	22UCS01	L	T	P	SS	C
Course Name	PROGRAMMING FOR PROBLEM SOLVING USING C	3	1	0	0	3

CourseObjectives:

Theobjectives of ProgrammingforProblemSolvingUsingC are

- Tolearnaboutthecomputersystems,computingenvironments,developingofacomputerprogramandStructureofaC Program
- Togainknowledgeoftheoperators, selection,controlstatementsandrepetitioninC
- Tolearnaboutthedesignconceptsofarrays,strings
- Toassimilateaboutpointers,dynamicmemoryallocation
- ToassimilateaboutFile, I/Oandsignificanceoffunctions

CourseOutcomes:

Uponthecompletionofthecoursethestudentwill learn

CO1: To write algorithms and to draw flowcharts for solving problems and to convert flowcharts/algorithms to C Programs, compile and debug programs

CO2: To use different operators, data types and write programs that use two-way/ multi-way selection

CO3: To select the best loop construct for a given problem

CO4: To design and implement programs to analyze the different pointer applications

CO5: To decompose a problem into functions and to develop modular reusable code and to apply File I/O operations

UNIT-I

IntroductiontoComputers: ComputerSystems–BlockDiagramofComputer,Hardware,Software,Algorithms, Flow Charts, Pseudocode**IntroductiontotheCLanguage:**Background,CPrograms,Identifiers,Types,Variable,Constants,Input/output, ProgrammingExamples.**Structure of a C Program:** Expressions, types of expressions, Precedence and Associativity, Evaluating Expressions, Type Conversion Statements, Simple Programs.

UNIT-II

Bitwise Operators: Logical Bitwise Operators, Shift Operators, Programming Examples.**Selection&MakingDecisions:**LogicalDataandOperators,TwoWaySelection,MultiwaySelection,Programmingexamples.**Repetition:** Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Looping Applications, Programming Examples.

UNIT-III

Arrays: Concepts,UsingArrayinC,ArrayApplication,TwoDimensionalArrays,MultidimensionalArrays, ProgrammingExamples.**Strings:**StringConcepts,CString,StringInput/OutputFunctions,ArraysofStrings,StringManipulationFunctions, ProgrammingExamples.

UNIT-IV

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Types offunctions, Standard Functions, Passing Array to Functions and Passing Pointers to Functions,Recursion,Scope–GlobalScope,LocalScope, FunctionScope, andStorageClasses.**Pointers:** Introduction - Definition, Declaration, Initialization, Accessing, Benefits of Pointers,WhyPointers,Pointerstopointers,Arrays,andPointers,PointerArithmeticandArrays, MemoryAllocationFunction, ArrayofPointers, ProgrammingApplication.

UNIT-V

Structures and Union: Structure- Definition, Declaration, Accessing, Initialization, Arrays inStructures,ArrayofStructures,StructurePointers,structuresandfunctions,UnionsandProgrammingExamples.
Files: Files, Streams, Types of Files- Text and Binary Files, Standard Library Input / OutputFunctions,FormattingInput/OutputFunctions,CharacterInput/OutputFunctions,ProgrammingExamples

TextBooks:

1) ProgrammingforProblemSolving,BehrouzA.Forouzan,RichardF.Gilberg,CENGAGE.
2) TheCProgramming Language, BrianW.Kernighan, DennisM.Ritchie,2e,Pearson.

ReferenceBooks:

1) ComputerFundamentalsandProgramming,SumithabhaDas,McGrawHill.
2) ProgramminginC,AshokN.Kamthane,AmitKamthane,Pearson.
3) ComputerFundamentalsandProgramminginC,PradipDey,ManasGhosh,OXFORD.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3	1	2									
CO3	3		1									
CO4		2	3	2	3							
CO5		1		2	3							

Year &Sem	I Year – I Semester					
Course Code	22UEN02	L	T	P	SS	C
Course Name	ENGLISH COMMUNICATION SKILLS LAB	0	0	3	0	1.5

Course Objectives

- Learners learn the basics of phonetics- recognize phonetic symbols and facilitates the learners' use of dictionary for pronunciation.
- To enhance the articulation of the sounds and pronunciation of words.
- To improvethe communication skills and clarity of speech.
- To enhance effective communication skills.
- Enables learners to speak and communicate confidently.

CourseOutcomes:

Bythe end of the semester the learners develop

1. Proper and accurate articulation of the sounds by following standard pronunciation of words and communicate intelligibly.
2. Speaking fluently with neutral accent.
3. Clarity of speech.
4. To communicate in various contexts using choice of appropriate expressions.
5. To acquire several communicative functions. Thereby enable to interact in different social and work situations.

The course material is divided into five units.

Unit1:

Introduction and importance of phonetics. Letters and Sounds, Sounds of English (Consonant Sounds, Vowel Sounds)

Unit2

Pronunciation and pronunciation rules, Plural and past tense marker rules.

Unit3:

Syllable, word stress, stress in mono, di, and poly syllabic words, stress in compound words, contrastive, word stress, Rhythm and Intonation.

Unit4:

Just A Minute (JAM)

Unit5:

Group Discussions and Interview Skills

Suggested books:

1. Infotech English, Maruthi Publications (with Compact Disc).
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
4. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
5. Strengthen your communication skills by Dr M Hari Prasad, DrSalivendraRaju

6. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
7. Cornerstone, Developing soft skills, Pearson Education Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
8. https://nptel.ac.in/courses/109106067

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	1
CO5	-	-	-	-	-	-	-	-	-	3	-	-

Year &Sem	I Year – I Semester					
Course Code	22UCH02	L	T	P	SS	C
Course Name	APPLIED CHEMISTRY LABORATORY	0	0	3	0	1.5

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of Mn+2 using standard oxalic acid solution.
4. Determination of ferrous iron using standard K2Cr2O7 solution.
5. Determination of Cu+2 using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe+3 by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metrymethod).
9. Determination of pH by using pH-meter.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg+2 present in an antacid.
13. Determination of CaCO3 present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes:

The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus, at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO and PSO MAPPINGS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	3	1	2	-	-	-	-	-	-	2
CO4	3	3	3	1	2	-	-	-	-	-	-	2
CO5	3	3	3	1	2	-	-	-	-	-	-	2

Year &Sem	I Year – I Semester					
Course Code	22UCS02	L	T	P	SS	C
Course Name	PROGRAMMING FOR PROBLEM SOLVING USING C LAB	0	0	3	0	1.5

CourseObjectives:

- Applythe principles ofClanguageinproblem solving.
- Todesignflowcharts,algorithmsandknowinghowtodebugprograms.
- Todesign&developofCprogramsusingarrays,stringspointers&functions.
- Toreviewthefileoperations.

CourseOutcomes:

Bythe end of the Lab, thestudent

CO1:Gains Knowledge on various concepts of a C language.
CO2:Able to draw flowcharts and write algorithms.
CO3:Able design and development of C problem solving skills.
CO4:Able to design and develop modular programming skills.
CO5:Able to trace and debug a program

Exercise1:

1. WriteaCprogramtoprintablockFusinghash(#),wheretheFhasaheightofsixcharacters andwidthoffiveandfour characters.
2. WriteaCprogramtocomputetheperimeterandareaofarectanglewithaheightof7inches andwidthof 5inches.

Exercise2:

1. WriteaCprogramtocalculatethedistancebetweenthetwopoints.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positiveand p is even. If q is greater than r and s is greater than p and if the sum of r and s is greaterthan the sumofpandqprint"Correct values",otherwiseprint"Wrongvalues".

Exercise3:

1. Write a program in C which is a Menu-Driven Program to compute the area of the variousgeometricalshape.
2. WriteaCprogram to calculate thefactorialofagivennumber.

Exercise4:

1. WriteaprograminCtodisplaythentermsofharmonicseriesandtheirsum.1+1/2+1/3 +1/4 + 1/5 ... 1/n terms.
2. WriteaCprogramto check whethera given numberis an Armstrongnumberornot.

Exercise5:

1. Writeaprogramtodisplayallprimenumberslessthann
2. Writeaprogramtodisplaythefollowingoutputformat

```
1
2   2
3   3   3
4   4   4   4
5   5   5   5   5
```

Exercise6:

1. Write a program in C to separate odd and even integers in separate arrays.
2. Writea program in C to sort elements of arrayinascendingorder.

Exercise7:

1. WriteaprograminCformultiplicationoftwosquareMatrices.
2. WriteaprograminC to findtranspose of a given matrix

Exercise8:

1. Writeaprogram in Ctocomparetwostringswithoutusingstringlibraryfunctions.
2. Writeaprogram in C to copyonestringto another string.

Exercise9:

1. Writeacprogramtoread and displaythedetailsof an employeeusingstructure
2. Writeacprogram to demonstrate arrayof structures

Exercise10:

1. WriteaprograminCtodemonstratetheuseof&(addressof)and*(valueataddress)operator.
2. WriteaC program to find sum of n elements entered byuserusingpointers
3. WriteaCProgramtoStoreInformationUsingStructureswithDynamicallyMemoryAllocation

Exercise11:

1. Writeaprogramin C toswap elements usingcallbyreference
2. Findfactorialofgivennumberusingrecursion
3. WriteaprograminC to get thelargest element ofanarrayusingthe function

Exercise12:

1. WriteaprograminCtoappendmultiplelinesattheendofatext file.
2. Writeaprogram in C to copyafilein another name.
3. WriteaprograminCtoremoveafilefrom the disk

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2							1
CO2	3			2	3							1
CO3		3		2	3							1
CO4	3	2		2	3							1
CO5	3		2	2	3							1

Year &Sem	I Year – I Semester					
Course Code	22UCH03	L	T	P	SS	C
Course Name	ENVIRONMENTAL SCIENCE	2	0	0	0	0

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

COURSE OBJECTIVES

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned Anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

COURSE OUTCOMES

CO1: The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources

CO2: The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web

CO3: The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity

CO4: Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices

CO5: About environmental assessment and the stages involved in EIA and the environmental audit.

UNIT-I:

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects; Role of information technology in environment and human health.

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 Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II:

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – 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. Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of

resources for sustainable lifestyles.

UNIT-III:

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man- wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution,nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e
– waste management.

UNIT – V:

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting - Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Environmental 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. **Environmental Management**: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and green politics. The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers,Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress.
3. EnvironmentalStudies,P.N.Palanisamy,P.Manikandan,A.Geetha,andK.Manjula Rani; PearsonEducation,Chennai

eference:

1. TextBookofEnvironmentalStudies,DeeshitaDave&P.UdayaBhaskar,CengageLearning.
2. A Textbook of Environmental Studies, ShaashiChawla, TMH, NewDelhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi
4. Perspectives in Environment Studies, AnubhaKaushik, C P Kaushik, NewAge InternationalPublishers,2014

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPINGS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			3			2	3					
CO2			3			2	3					
CO3			3			2	3					
CO4			3			2	3					
CO5			3			2	3					

Year &Sem	I Year – II Semester					
Course Code	22UMT02	L	T	P	SS	C
Course Name	MATHEMATICS-II	3	1	0	0	3

Course Objectives:

- To illuminate the different numerical methods to solve nonlinear algebraic equations.
- To give a definition of Interpolation as it relates to mapping / surveying.
- To familiarize the Laplace, transform techniques in solving the Differential Equations.
- To familiarize the Fourier Series expansions for periodic functions.
- To furnish the learners with basic concepts Fourier Transform techniques to lead them into advanced level by handling various real-world applications.

Course Outcomes:

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

CO1: Evaluate the approximate roots of polynomial andTranscendental equations by different algorithms

CO2: Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals.

CO3: Apply the Laplace transform for solving differential equations.

CO4: Find or compute the Fourier series of periodic signals.

CO5: Apply integral expressions for the forwards and inverse Fourier transform to arrange of non - Periodic wave forms.

UNIT-I Iterative Methods **(12 Hours)**

Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton - Raphson method (One variable only) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

Learning Resources: Text Book – 1

UNIT-II Interpolation **(12 Hours)**

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with un equal intervals –Lagrange's interpolation formula – Newton's divide difference formula.

Learning Resources: Text Book - 1

UNIT-III Laplace Transforms and Inverse Laplace Transforms (14 Hours)

Laplace transforms –Definition and Laplace transforms of some certain functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function –Dirac's delta function Periodic function – Inverse Laplace transforms – Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

Learning Resources: Text Book – 1

UNIT IV Fourier Series **(12 Hours)**

Introduction– Periodic functions – Fourier series of periodic function – Dirichlet's conditions– Even and odd functions–Change of interval– Half - range sine and cosine series.

Learning Resources: Text Book – 1

UNIT V Fourier Transforms **(14 Hours)**

Fourier integral theorem (without proof) – Fourier sine and cosine integrals –Sine and cosine transforms – Properties – inverse transforms –Convolution theorem (without proof) – Finite Fourier transforms.

Learning Resources: Text Book - 1

Text Books:

1. **B.S.Grewal,**Higher Engineering Mathematics, 44thEdition, Khanna Publishers.

Reference Books:

1. **Dr.T.K.V.Iyengar, Dr. B.Krishna Gandhi, S.Ranganadham, Dr. M.V.S.S.N. Prasad**, A text book of Engineering Mathematics, S.Chand Publications.
2. **B.V.Ramana,** Higher Engineering Mathematics, 2007 Edition,TataMc.Graw Hill Education.
3. **N.P.Bali, ManishGoyal**, A text book of Engineering Mathematics, Lakshmi Publications
4. **ErwinKreyszig,** Advanced Engineering Mathematics, 10thEdition, Wiley-India.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	3
CO2	3	2	3	2	-	-	-	-	-	-	-	3
CO3	2	2	2	2	-	-	-	-	-	-	-	2
CO4	2	3	3	2	-	-	-	-	-	-	-	2
CO5	3	3	2	2	-	-	-	-	-	-	-	3

Year &Sem	I Year – II Semester					
Course Code	22UPH01	L	T	P	SS	C
Course Name	APPLIED PHYSICS	3	1	0	0	3

This course centers on unifying essential theoretical concepts of Physics governing the physical properties of materials to interpret them from the perspective of engineering and technical applications.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides seamless consolidation of basic principles of Physics and applications. It emphasizes on modern technological advancement relevant to the latest developments in the fields of science, engineering, and technology and to have an insight into Dielectric and magnetic materials, principles of quantum mechanics, and electron dynamics of solids from the perspective of optoelectronic devices.

1. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
2. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
3. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals- Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
4. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
5. To Understand the physics of optoelectronic devices and working mechanism of display devices.

Course Outcomes:

1. Select the concepts of Physical Optics in view of engineering applications. Apply the knowledge of dielectric and magnetic materials to analyze them.
2. Grade the wavelengths of Lasers for suitable applications in the field of industry, medicine and communication and foster the knowledge on optical fibers.
3. Appraise electron dynamics based on quantum principles.
4. Choose dielectric and magnetic material to demonstrate the functioning of electric and electronic devices.
5. Judge the performance of optoelectronic devices based on their construction.

Unit-I: Wave Optics **12hrs**

Interference:

Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index. **Diffraction:**Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative). **Polarization:** Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:

- The students will be able to Explain the need of coherent sources and the conditions for sustained interference (L2)
- Identify engineering applications of interference (L3)
- Analyze the differences between interference and diffraction with applications (L4)
- Illustrate the concept of polarization of light and its applications (L2)
- Classify ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics **8hrs**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.**Fiberoptics:**Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes:

- The students will be able to Understand the basic concepts of LASER light Sources (L2)
- Apply the concepts to learn the types of lasers (L3)
- Identifies the Engineering applications of lasers (L2)
- Explain the working principle of optical fibers (L2)
- Classify optical fibers based on refractive index profile and mode of propagation (L2)
- Identify the applications of optical fibers in various fields (L2)

Unit III: Quantum Mechanics, Free Electron Theory and Band theory **10hrs**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.**Free Electron Theory:**Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory-Fermi-Dirac distribution- Density of states (3D) - Fermi energy. **Band theory of Solids:**Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Unit Outcomes:

- The students will be able to explain the concept of dual nature of matter (L2)
- Understand the significance of wave function (L2)
- Interpret the concepts of classical and quantum free electron theories (L2)
- Explain the importance of K-P model¬ Classify the materials based on band theory (L2)
- Apply the concept of effective mass of electron (L3)

Unit-IV:Dielectric and Magnetic Materials **8hrs**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossottiequation.**MagneticMaterials:**Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, anti-ferro&Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Ferrites-Engineering applications.

Unit Outcomes:

- The students will be able to Explain the concept of dielectric constant and polarization in dielectric materials (L2)
- Summarize various types of polarization of dielectrics (L2)
- Interpret Lorentz field and Claussius- Mosotti relation in dielectrics(L2)¬
- Classify the magnetic materials based on susceptibility and their temperature dependence (L2)
- Explain the applications of dielectric and magnetic materials (L2)
- Apply the concept of magnetism to magnetic data storage devices (L3)

Unit V: Semiconductors, Opto Electronic Devices and Nano Materials **10 hrs**

Semiconductors: Bands in solids- Valence and conduction band, effective mass (Qualitative), Intrinsic and extrinsic semiconductors-P type and N type, Donor and acceptor levels (Qualitative), Determination of energy gap in semiconductors. Drift and Diffusion currents, Einstein relations, Direct and indirect semiconductors,**Opto electronic Devices:**Photo voltaic effect, Solar cell, Photo detectors, Photodiodes-PIN and APD, Principle and working of LED, Liquid crystal display (LCD), Applications of opto electronic devices.

Text books:

1. M.N.Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and PoonamTandon, Oxford press (2015).
3. Applied Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Shatendra Sharma, Jyotsna Sharma, "Engineering Physics", Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, McGraw Hill
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	3	-	-
CO3	3	-	3	3	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	3	-	-	-	-	-	3	-	-

Year &Sem	I Year – II Semester					
Course Code	22UEC01	L	T	P	SS	C
Course Name	DIGITAL LOGIC DESIGN	3	1	0	0	3

Course Learning Objectives: This course will enable the students to

- Study about the number systems, complements, signed binary numbers and binary codes.
- Study about Boolean algebra; illustrate map method for minimization of switching functions.
- Design combinational logic circuits like Adders, Subtractors, Decoders, and Encoders.
- Describe Latches and Flip-Flops
- Learn about counters and registers.

Course Outcomes:

After completion of this course, the students will be able to

CO1: Define different number representation and conversion from one radix to other.
CO2: Explain the minimization techniques using Boolean algebra and K-map method.
CO3: Analyze and design the combinational logic circuits.
CO4: Design the sequential circuits using Flip-Flops.
CO5: Design the registers and counters.

UNIT- I: Number Systems

Number Systems: Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit binary codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc.

UNIT -II: **Boolean algebra**

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical Forms, Minterms and Maxterms, Karnaugh Maps-3,4 variables, don't – Care terms, POS and SOP Simplification, NAND/ NOR Implementation, Logic gates.

UNIT –III: **Combinational Logic**

Analysis and design procedure for combinational logic, Adders and Subtractors, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator.
Programmable logic devices: PROM, PAL, PLA

UNIT- IV: Synchronous Sequential Logic

Introduction to Sequential Circuits: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

UNIT -V: Registers and Counters

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

TEXT BOOKS:

1. Digital Design, M.Morris Mano, Michael D Ciletti, PEA.
2. Switching and finite automata theory Zvi.KOHAVI, Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCE BOOKS:

1. Modern Digital Electronics, R.P. Jain, TMH.
2. Switching Theory and Logic Design by A.Anand Kumar, PHI Learning pvtltd, 2016.
3. Digital fundamentals by Thomas L.Floyd, Pearson EDU India.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	3	1	2	-	-	-	-	-	-	2
CO4	3	3	3	1	2	-	-	-	-	-	-	2
CO5	3	3	3	1	2	-	-	-	-	-	-	2

Year &Sem	I Year – II Semester					
Course Code	22UEE06	L	T	P	SS	C
Course Name	NETWORK ANALYSIS	3	1	0	0	3

COURSE OBJECTIVES

- To understand the different types of sources, network reductiontechniques.
- To understand the various network topologies and network theorems
- To solve the AC circuits using steady stateanalysis
- To define the resonance and resonanceparameters
- To introduce the concepts of transients for series RL RC and RLCcircuits.
- To analyze the two portnetworks.

COURSE OUTCOMES

Student will be able to

CO1: To understand the different types of sources, network reductiontechniques.

CO2: To solve the AC circuits using steady stateanalysis

CO3: To define the resonance and resonanceparameters

CO4: To introduce the concepts of transients for series RL RC and RLCcircuits

CO5: To analyze the two portnetworks.

UNIT I:

INTRODUCTION TO ELECTRICAL CIRCUITS

Network elements classification, Voltage and Current sources – Independent and dependent sources, Ohm's law, Kirchhoff's laws, problem solving with independent source only. Network reduction techniques - Source transformation, star-to-delta and delta-to-startransformation,Voltageandcurrentdivision,series,parallelandseriesparallelnetworks-Nodalanalysisandmeshanalysis with independent and dependentsources – Numerical Problems

NETWORK THEOREMS: Superposition, Thevenin's, Norton's, and Maximum Power Transfer theorems, Reciprocity and Compensation (without Proof only statements) - problem solving using independent Sources.

UNIT II:

STEADY STATE ANALYSIS OF A.C CIRCUITS

Rms and Average Values, Phase and phase difference –Response of R, L and C elements for sinusoidal excitation, Steady state analysis of RL, RC and RLC circuits for sinusoidal excitation, Pharos diagrams, Concept of reactance,impedance,susceptanceandadmittance,Active&reactivepower,Powerfactor,power triangle, Numerical problems.

UNIT III:

RESONANCE: Series Resonance, Parallel resonance, Bandwidth, Quality factor and Selectivity

COUPLED CIRCUITS: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Ideal transformer, Dot Convention in coupled circuits, conductively coupled equivalent circuits.

UNIT IV:

TRANSIENTS

Introductiontotransientanalysis,initialconditions,transientresponseofSeriesRL,RCandRLC circuits using DC and sinusoidal excitations, Solution using differential equation approach and Laplace transforms.

UNIT V:

TWO PORT NETWORKS

Two Port Network parameters: Z-parameters,Y-parameters,ABCDparameters,h-parameters, Inverse h - parameters, Inverse ABCD parameters, Relationship between parameter sets, Interconnection of two port networks.

TEXT BOOKS

1. WilliamH.Hayt&JackE.Kemmerly&StevenM.Durbin,**EngineeringCircuitAnalysis,**6th Edition, TATA McGrawHill Company,2009.
2. A. Chakrabarthi, **Circuits Theory**, DhanpatRai& Co, New Delhi,2009.
3. A. Sudhakar&Shyam Mohan**, Electric Circuits**, 3rd Edition, C,2007.
4. Ravish R Singh, **Network Analysis & Synthesis**, McGraw Hill (India) Education Private Limited,2013.
5. B. Subramanyam, **Circuit analysis**, IK Publications,2006.
6. Charles K. Alexander, M. N. O. Sadiku- **Fundamentals of Electric Circuits**.

REFERENCEBOOKS

1. M. E. Schultz, Grob's B**asic Electronics**, 10th Edition, McGrawHill.
2. M.E.VanValkenburg, **Network Analysis**, Third Edition, Low PriceEdition.
3. John. D. Ryder, **Network lines and Fields,** 2nd Edition, Asia Publishinghouse.
4. DR Cunninghan, **Basic Circuit Analysis,** JaicoPublishers.

WEB LINKS:

1. https://books.google.com/
2. www.nptel.ac.in/
3. www.Electrical4u.com

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	-	-	-	-	-	2
CO2	3	2	1	2	1	1	-	-	-	-	-	3
CO3	2	2	2	2	1	1	-	-	-	-	-	2
CO4	3	3	1	2	1	1	-	-	-	-	-	2
CO5	3	3	2	2	1	2	-	-	-	-	-	3

Year &Sem	I Year – II Semester					
Course Code	22UCS03	L	T	P	SS	C
Course Name	IT WORKSHOP	1	0	4	0	3

CourseObjectives:
Theobjectiveofthislabis to

- Explaintheinternalpartsofacomputer,peripherals,I/Oports,connectingcables
- DemonstratebasicDOScommands
- DescribeaboutAntivirustools
- DemonstrateOfficeToolssuchasWordprocessors,SpreadsheetsandPresentationtools

CourseOutcomes:
CO1: By the end of this lab the student is able to Assemble and disassemble components of a Personal Computer
CO2: By the end of this lab the student is familiar with DOS commands
CO3: By the end of this lab the student is familiar Viruses
CO4: By the end of this lab the student is able to work on Word, Power Point and MS Excel

ListofExperiments:

UNIT-1
Block diagram of a computer, Identification of peripherals of a PC, Laptop, Server, Smartphones, prepare a report containing the block diagram along with the configuration of eachcomponentanditsfunctionality,Input/Outputdevices,I/OportsandInterfaces,MainMemory,CachememoryandSecondaryStorageDevices, DigitalStorageBasics,NetworkingComponents and Speeds.
Experiment -1: Identification of peripherals.
Experiment-2: Assembling,Dissemblingofacomputer.

UNIT-2
Software:Definition,Softwaretypes,ApplicationSoftware,SystemSoftware**.**
Experiment-1:DOS Commands.

UNIT-3
MSWord: Creating a Document, Formatting, Bullets and Numbering, Page Settings, HeaderandFooter,InsertWordArt,ClipArt,Tables.
Experiment -1: Demonstrate and practice on wordFormatting(Bold, Italic, Underline, Alignments, Fonts, Sizes,Headingsetc.,)
Experiment-2: DemonstrateandPracticeonPageSettings,Margins,Headerand Footer**.Experiment-3:**Demonstrate andPracticeonWordArt,ClipArt.
Experiment-4: DemonstrateandPracticeonTableCreation.

UNIT-4
MS Excel: Create work sheet and work book, Search for data with in aWeb, InsertRows,Columns, Hiding of Rows and Columns, Renaming of Worksheet, Adjust Row Height andColumnWidth, Create Tables.
Experiment-1: CreateaTable,Performsumandaverageofasheet.
Experiment-2: AdjustRowheightandColumnwidthofaTableaspertheRequirements

UNIT-5
MS PowerPoint: Create and Manage Presentation, Slide transition and Animation, WWW,WebBrowser, Virus, Antivirus, Creatingmails.

Experiment-1: CreateaPPTonaTopicofyour Choice.
Experiment-2: CreateamailidwithyourRollNumber

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									1
CO2	3	1	1									1
CO3	3	1	1	2	3							2
CO4	3	3	3	2	3							2

Year &Sem	I Year – II Semester					
Course Code	22UPH02	L	T	P	SS	C
Course Name	APPLIED PHYSICS LABORATORY	0	0	3	0	1.5

(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart &Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method &Meissner effect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017

Course learning objectives

1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory. 2. To learn the usage of electrical and optical systems for various measurements.
3. Apply the analytical techniques and graphical analysis to the experimental data.
4. To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

Course Outcomes (COs)

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

1. Apply the various procedures and techniques for the experiments.
2. Use the different measuring devices and meters to record the data with precision.
3. Apply the mathematical concepts/equations to obtain quantitative results.
4. Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	-	3	-	-	-	-	-	-	-
CO4	3	-	-	-	3	-	-	-	-	-	-	-

Year &Sem	I Year – II Semester					
Course Code	22UEC02	L	T	P	SS	C
Course Name	ELECTRONIC WORKSHOP LAB	0	0	3	0	1.5

COURSES OBJECTIVES:

- To study basic electronic components of various types
- To study basics of CRO
- To familiarize the student with the principle operation of Active and Passive elements,
- To provide the students with hands on experience on PCB by using different components.
- To study basics of house wiring and soldering.
- To study basics of PC Hardware i.e Identify the peripherals of a computer, components in a CPU and its functions.

COURSE OUTCOMES:

CO1. At the end of the course the students can able to Measure voltage, frequency and phase of any waveform using CRO.
CO2. Generation of sine, square and triangular waveforms with required frequency and amplitude using function generator.
CO3. Analyze the characteristics of different electronic devices such as diodes, transistors etc., and simple circuits
CO4. The students can able to Know about the PC hardware
CO5. The students can able to verify the theorems

Identification of components

I. Laboratory equipment
II. Soldering practice
III. PCB Layout
IV. Testing of Components
V. CRO

I. Identification of components:

- Resistors: Types of Resistors, Value of Resistance using color code, DRBS.
- Capacitors: Types of capacitors, value of capacitance using color code, DCBS.
- Inductors: Types of Inductors, DLB
- Rheostats: Types of Rheostats, Types of potentiometers, Relays.
- Switches: Types of Switches.
- Cables: Types of Cables.
- Types of Instruments used.

Identification of active elements & Testing of Components
(Two Terminal, Three Terminal Devices)

- (SC diode, Zener diode)
- Three Terminal Device: BJT.
- Testing of above components using Multimeter.

II. Laboratory Equipment: & CRO

A) Meters:

- Types of Voltmeters, Types of Ammeters both Analog and Digital.
- Types of Multi meters (Analog & Digital)
- AVO Meters.

B) Laboratory Function Generators and Audio Oscillators.
C) Power Supplies.

D) RF generators.
E) Different Types of Transformers. (Power, AF, RF,etc.)
F) Acquaintance with CRO
G) Finding of Amplitude & frequency of a signal (Measurements on CRO)
III. Soldering practice
Tools kit including soldering iron Tools Kit:
- Insulated nose player
- Insulated cutting player
- Screw driver kit
- Electrical tester
- Soldering iron,Lead,Flex
- Soldering practice with different components

IV. PCB layout and Design.
PCB fabrication of simple circuit with components (Two terminal &Three terminal components)
Materials required, centimeter graph sheets, marker.
V. Verification of Thevenin's Theorem/Maximum power Theorem
VI. Verification of Kirchhoff's Law
VII Study of PC Hardware

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's)) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2	2	2	2	1	2	1	1	2	2	1	1
CO2	2	2	2	2	1	2	1	1	2	2	1	1
CO3	2	2	2	2	1	2	1	1	2	2	1	1
CO4	2	2	2	2	1	2	1	1	2	2	1	1
CO5	2	2	2	2	1	2	1	1	2	2	1	1

Year &Sem	I Year – II Semester					
Course Code	22UEE07	L	T	P	SS	C
Course Name	BASIC ELECTRICAL ENGINEERING LAB	0	0	3	0	1.5

CourseObjectives:

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Todemonstratetheusageofmeasuringequipment

- Totrainthestudentsinsettingupsimplewiringcircuits
- Toimpartmethodsinelectricalmachinewiring

ListofExperiments: (Any Ten Experiments)

1. Magnetization characteristics of D.C. Shunt generator
2. Speed control of D.C. shunt motor.
3. Brake test on DC shunt motor.
4. Swinburne's test on DC machine
5. Load test on DC shunt generator
6. Load test on DC series generator
7. Separation of losses in DC Shunt motor
8. OC & SC tests on single- phase transformer
9. Sumpner's test on single phase transformer
10. Brake test on 3-phase Induction motor.
11. Regulation of alternator by synchronous impedance method.

CO1: DetermineandpredeterminetheperformanceofDCmachinesandtransformers

CO2:ControltheDCshuntmachines

CO3: Computetheperformanceof1-phasetransformer

CO4:Performtestson3-phaseinductionmotor andalternatorto Determinetheirperformancecharacteristics.

Contribution of Course Outcomes (CO's) towards the achievement of programme

Outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

Year &Sem	I Year – II Semester					
Course Code	22UEN03	L	T	P	SS	C
Course Name	CONSTITUTION OF INDIA	2	0	0	0	0

CO – PO MAPPINGS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	2	-	-	-	2	-	3
CO2	1	2	-	-	-	1	-	-	-	-	-	1
CO3	2	2	-	-	-	2	-	-	-	-	-	3
CO4	2	2	-	-	-	2	-	-	-	-	-	2

Course Objectives:

- To Enable the student to understand the importance of Constitution
- To understand the structure of Executive, Legislature and Judiciary
- To understand philosophy of Fundamental Rights and Duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and High Court Controller and Auditor General of India and Election Commission of India.
- To understand the Central and State relation Financial and Administrative.

Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

CO1. Understand Historical Background of the Constitution Making and its importance for building a Democratic India.

CO2. Understand the functioning of three wings of the Government i.e., Executive, Legislative and Judiciary.

CO3. Understand the value of the Fundamental Rights and Duties for becoming good citizen of India.
CO4. Analyze the decentralization of power between Central, State and local Self-Government.
CO5. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining Democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State Government and its Administration.
3. Get acquainted with Local Administration and Panchayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on Roles and Functioning of Election Commission.

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and Constitutional History, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:

After completion of this unit student will
- Understand the concept of Indian Constitution
- Apply the knowledge on Directive Principle of State Policy
- Analyze the History, Features of Indian Constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, Power and Position, PM and Council of Ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions

Learning outcomes: -After completion of this unit student will
- Understand the structure of Indian Government
- Differentiate between the State and Central Government
- Explain the role of President and Prime Minister
- Know the Structure of Supreme Court and High court

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of Ministers, State Secretariat: Organization, Structure and Functions

Learning outcomes: -After completion of this unit student will
- Understand the structure of State Government
- Analyze the role of Governor and Chief Minister
- Explain the role of State Secretariat
- Differentiate between Structure and Functions of State Secretariat

UNIT-IV

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: ZillaPanchayat, Elected Officials and their roles, CEO ZillaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root Democracy

Learning outcomes: -After completion of this unit student will
- Understand the Local Administration

- Compare and contrast District Administration role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organization

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: -After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election Commissioner and Commissionerate
- Analyze role of State Election Commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd..NewDelhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice –Hall of India Pvt. Ltd. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	-
CO2	-	-	-	-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	1	-	-	-	-
CO5	-	-	-	-	-	1	-	-	-	-	-	-

Programme	Common to all B.Tech. ECE					
Year &Sem	II Year – I Semester					
Course Code	22UEC03	L	T	P	SS	C
Course Name	ElectronicDevicesandCircuits	3	1	0	0	3

Course Objectives:

The mainobjectivesof thiscourse are

- Tolearnand understandthebasic conceptsofsemi-conductorphysics.
- Studythephysicalphenomenasuchasconduction, transport mechanismand electrical characteristics of different diodes.
- To learnand understandtheapplicationofdiodesasrectifierswiththeir operationand characteristics with and without filters are discussed.
- Acquireknowledgeabouttheprincipleofworking andoperationofBipolarJunction Transistor and Field Effect Transistor and their characteristics.Tolearnandunderstand the purposeoftransistorbiasing anditssignificance.
- Smallsignalequivalent circuit analysisofBJTand FETtransistor amplifiersand compare different configurations.

Course Outcomes:

At the end of this course the student will be able to

CO1: Apply the basic concepts of semiconductor physics.

CO2: Understand theformation of p- n junction and how it can be used as a p-n junctionas diode in different modes of operation.

CO3: Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.

CO4: Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics indifferent configurations.

CO5: KnowtheneedoftransistorbiasingvariousbiasingtechniquesforBJTand FET and stabilization concepts with necessary expressions.

UNIT-I:

Review of Semiconductor Physics: law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors, Hall effect

Junction Diode Characteristics :energy band diagram of PN junction Diode, Opencircuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode

capacitance.

UNIT-II:

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT

Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, inputand output waveforms, Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π- Filter, comparison of various filter circuits in terms of ripple factors.

UNIT-III: Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations,Ebers-Moll model of a transistor, punch through/reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics μ, g_m, r_d parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT-IV:TransistorBiasingandThermalStabilization:

Needforbiasing, operating point, loadlineanalysis,BJTbiasing-methods,basicstability,fixedbias,collector tobase bias, selfbias, Stabilization against variations in V_{BE}, Ic, and β ,Stability factors,(S,S',S''), Bias compensation, Thermal runaway, Thermal stability.FET Biasing- methods and stabilization.

UNIT-V:SmallSignalLowFrequencyTransistorAmplifierModels:

BJT: Two port network, Transistor hybrid model, determination ofh-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model FET, Analysis CS amplifier.

Text Books:

ElectronicDevicesandCircuits-J.Millman,C.Halkias,Tata Mc-Graw Hill, Second Edition, 2007

Electronicsdevices&circuit theory-RobertL.BoylestadandLouiNashelsky, Pearson / Prenticehall, tenthedition, 2009

ElectronicDevicesandCircuits-K.LalKishore,BSPublications,FourthEdition,2016.

References:

Microelectronic circuits Theory and applications.-Adel S.Sedra,KennethC.Smith,OXFORD international student Edition,Sixth Edition,2013

ElectronicDevicesandIntegratedCircuits–B.P.Singh,Rekha,Pearson publications

ElectronicDevicesandCircuits-Salivahanan,Kumar,Vallavaraj,TataMc-GrawHill,4th Edition, 2008.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	3
CO2	3	2	3	2	-	-	-	-	-	-	-	3
CO3	2	2	2	2	-	-	-	-	-	-	-	2
CO4	2	3	3	2	-	-	-	-	-	-	-	2
CO5	3	3	2	2	-	-	-	-	-	-	-	3

Programme	ECE, CSE, AIML, DS, CS, IOT					
Year &Sem	II Year – I Semester					
Course Code	22UCS05	L	T	P	SS	C
Course Name	PYTHON PROGRAMMING	3	1	0	0	3

Course Objectives:

The Objectives of Python Programming are

- To learn about Python programming languagesyntax, semantics, and the runtime environment
- Tobefamiliarizedwithuniversalcomputerprogrammingconceptslikedatatypes,containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- Tobefamiliarizedwithgeneralcodingtechniquesandobject-orientedprogramming

Course Outcomes:

CO1: Develop essential programming skills in computer programming concepts like data types, containers

CO2: Apply the basics of programming in the Python language

CO3: Solve coding tasks related conditional execution, loops

CO4: Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

CO5: Design applications using GUI and Handle Exceptions

UNITI

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, andOutput,Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Typeconversions, Expressions, MoreaboutData Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets,Using functions and Modules.

DecisionStructuresandBooleanLogic:if,if-else,if-elif-elseStatements,NestedDecisionStructures,ComparingStrings,LogicalOperators,BooleanVariables.

RepetitionStructures: Introduction, whileloop, forloop, Calculatinga Running Total, Input Validation Loops, Nested Loops

UNIT II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings andNumberSystems, StringMethods Text Files.

UNIT III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, ManagingaProgram's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.

UNITIV

File Operations: Reading config files in python, Writing log files in python, Understanding readfunctions, read(), readline() and readlines(), Understanding write functions, write() and writelines(),Manipulatingfilepointerusingseek, Programmingusingfileoperations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributesanddestructors,Realtimeuseofclassinliveprojects,Inheritance,overlappingandoverloadingoperators, Adding and retrieving dynamic attributes of classes, Programming using Oops support.
DesignwithClasses: ObjectsandClasses,DatamodelingExamples,CaseStudyAnATM,StructuringClasses withInheritanceand Polymorphism

UNITV
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-definedExceptions, DefiningClean-upActions, Redefined Clean-upActions.
Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs,CodingSimple GUI-Based Programs, OtherUseful GUIResources.
Programming: IntroductiontoProgrammingConceptswithScratch.

TextBooks
1) FundamentalsofPythonFirstPrograms,Kenneth.A.Lambert,Cengage.
2) PythonProgramming: AModernApproach,VamsiKurama,Pearson.

ReferenceBooks:
1) IntroductiontoPython Programming,Gowrishankar.S,VeenaA,CRCPress.
2) IntroductiontoProgrammingUsingPython,Y. DanielLiang,Pearson.

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2							1
CO2	2	2	1	1	2							1
CO3	2	2	1	1	2							1
CO4	3	2	1	1	2							1
CO5	2	2	1	1	2							1

Programme	**CIVIL, EEE, ECE, CSE, AIML, IOT, CYS, DS**					
Year &Sem	**II Year – I Semester& II Semester**					
Course Code	22UMT03	**L**	**T**	**P**	**SS**	**C**
Course Name	**MATHEMATICS-III (Partial Differential Equations and Vector Calculus)**	**3**	**1**	**0**	**0**	**3**

CourseObjectives:

- ❖ To develop the students to solve real time engineering problems using partial differential equations.
- ❖ To familiarize the techniques in partial differential equations to describe a wide range of natural processes and other areas of mathematics such as analysis and differential geometry.
- ❖ To understand the properties of Beta and Gamma functions with their integral representations.
- ❖ To prepare the students to learn the concepts of Vector Calculus.
- ❖ To spread out the use of different numerical techniques for carrying out numerical integration.

Course Outcomes:

Attheendofthecourse,thestudentwillbeable to

CO1:Solve problems related to basic linear and non-linear partialdifferential equations.

CO2: Identifysolutionmethodsforpartialdifferentialequationsthatmodelphysicalprocesses.

CO3: Explain the applications and the usefulness of the Beta andGamma functions by their integral representations and symmetries.

CO4: Interpretthephysicalmeaningofdifferentoperatorssuchasgradient,curl, divergence and estimates theworkdoneagainstafield,circulationandfluxusingvectorcalculus.

CO5: Apply Numerical Integration techniques to different engineering problems.

UNIT-I First Order PDE (12 Hours)

Formationofpartialdifferentialequationsbyeliminationofarbitraryconstantsandarbitraryfunctions– Solutionsoffirstorderlinear(Lagrange)equationandnon-linear(standardtypes)equations.

[Test Book (1) : Sections – 17.2, 17.3, 17.5, 17.6]

UNIT II Higher Order Linear PDE and Applications (14 Hours)

Solutionsof linepartial differential equationswithconstantcoefficients–non-homogeneoustermofthetype e^{ax+by},sin(ax+by),cos(ax+by),$x^m y^n$.

ApplicationsofPDE:MethodofseparationofVariables–SolutionofOne – dimensionalWave,Heat andtwo – dimensionalLaplaceequation.

[Test Book (1): Sections – 17.8, 17.9, 17.10, 17.11, 18.2, 18.5, 18.6, 18.7]

UNIT III Beta and Gamma Functions (10 Hours)

Beta and Gamma functions – Properties – Relation between Beta and Gamma functions – Evaluation of improper integrals.

[Test Book (1) : Sections – 7.14, 7.15, 7.16]

UNIT IV: Vector Calculus (16 Hours)

VectorDifferentiation:Gradient–Directionalderivative–Divergence–Curl–ScalarPotential

Vector Integration: Line integral – Work done – Area– Surface and volume integrals – Vectorintegral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and problems onabove

theorems.
[Test Book (1): Sections – 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.11, 8.12, 8.13, 8.14, 8.15, 8.16]

UNIT-V

Numerical Integration and Solutionof OrdinaryDifferentialEquations (12 Hours)

Numerical Integration - Trapezoidal rule– Simpson's $1/3^{rd}$and$3/8^{th}$ rules – Solution of initial value problems by Taylor's series– Picard's method of successiveapproximations– Euler'smethod–Runge-Kutta method(fourthorder only).

[Test Book (1) : Sections –30.4, 30.6, 30.7, 30.8, 32.2, 32.3, 32.4, 32.5, 32.6, 32.7

TextBooks:

1) **B.S.Grewal,**HigherEngineeringMathematics,44^{th}Edition,KhannaPublishers.

ReferenceBooks:

1) **Dr.T.K.V.Iyengar, Dr. B. Krishna Gandhi, S. Ranganadham, Dr. M.V.S.S.N. Prasad**, A text book of Engineering Mathematics, S.Chand Publications.
2) **B.V.Ramana,** HigherEngineeringMathematics,2007Edition,TataMc. GrawHillEducation.
3) **Erwin Kreyszig,**Advanced Engineering Mathematics, 10^{th} Edition, Wiley - India.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) and Programme Specific Outcomes (PSO's)

(Strong – 3, Moderate – 2, Weak – 1)

CO – PO and PSO MAPPINGS

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	-	-	-	-	-	-	-	1	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO3	2	3	3	1	-	-	-	-	-	-	-	2	-	-	-
CO4	2	3	3	1	-	-	-	-	-	-	-	3	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	2	-	-	-

Year &Sem	II Year – ISemester					
Course Code	22UEC07	L	T	P	SS	C
Course Name	SIGNALS & SYSTEMS	3	1	0	0	3

Course Learning Objectives: This course will enable the students to

- Study about basics of signals and systems.
- Analyze the spectral characteristics of signal using Fourier series and Fourier transforms.
- Understand the characteristics of systems.
- Introduce the concept of Laplace Transforms and Sampling process.
- know transform technique to analyze the discrete time signals and systems.

Course Outcomes: After completion of this course, the students will be able to

CO1: Differentiate the various classifications of signals and systems.
CO2: Analyze the frequency domain representation of signals using Fourier concepts.
CO3: Classify the systems based on their properties and determine the response of LTI Systems.
CO4: Know the sampling process, various types of sampling techniques and Laplace Transforms.
CO5: Apply Z-Transformstoanalyze discrete timesignalsandSystems.

UNIT- I: BASICS OF SIGNALS AND SYSTEMS

Definition of Signals and Systems, Classification of Signals, Classification of Systems, Basic Operations on signals. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function, signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions.

UNIT -II: **FOURIER SERIES AND FOURIER TRANSFORM**

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Introduction to Hilbert Transform.

UNIT –III: **ANALYSIS OF LINEAR SYSTEMS**

Introduction**,** Linear system, impulse response, Responseofalinear system, Lineartime invariant (LTI)system, Linear time variant (LTV)system, Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time

CONVOLUTION AND CORRELATION

Concept of convolution in time domain andfrequency domain, Graphical representation of convolution, Transfer function of a LTI system.Auto-correlation and cross-correlation of functions, properties of correlation function, Relation between Convolution and correlation.

UNIT- IV: LAPLACE TRANSFORMS

Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal.

SAMPLING THEOREM

Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Introduction to Band Pass sampling.

UNIT -V: Z–TRANSFORMS

Concept of Z-Transform of a discrete sequence.Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

.

TEXT BOOKS:

1. Signals,Systems & Communications-B.P.Lathi,BSPublications,2003.
2. SignalsandSystems-A.V.Oppenheim,A.S.WillskyandS.H.Nawab, PHI,2nd Edn,1997.
3. Signals&Systems – SimonHaykin andVanVeen,Wiley,2nd Edition, 2007.

REFERENCE BOOKS:

1. Linear Systems and Signals–BPLathi,OxfordUniversityPress,2015.
2. Signals and Systems–TKRawat, OxfordUniversitypress,2011.
3. Signals and Systems-H P HSU,Second Edition, Schaum's outlines.

Contribution of Course Outcomes (CO's) towards the achievement of programmeoutcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	-	-	-	-	-	-	1
CO2	3	3	1	1	-	-	-	-	-	-	-	1
CO3	2	2	1	1	-	-	-	-	-	-	-	1
CO4	3	3	1	1	-	-	-	-	-	-	-	1
CO5	2	2	2	2	-	-	-	-	-	-	-	2

Year &Sem	IIYear – I Semester					
Course Code	22UEC08	L	T	P	SS	C
Course Name	RANDOM VARIABLES AND STOCHASTIC PROCESS	3	1	0	0	3

Course Learning Objectives: This course will enable the students to

1. To expose the students to the basics of probability theory and random processes essential for their subsequent study of analog and digital communication.
2. To understand the basic concepts of probability, single and multiple random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon
3. To understand the basic concepts of random processes.
4. To understand the concept of correlation and spectral densities.
5. To understand the significance of linear systems with random inputs.

Course Outcomes:
After completion of this course, the students will be able to

CO1: Mathematically modeltherandom phenomena and solve simple probabilistic problems.
CO2: Identify different types of random variables and compute statistical averages of the several random variables.
CO3: Characterize the random processes in the time domain.
CO4: Characterize the random processes in the frequency domain.
CO5: Analyze the LTI systems with random inputs

UNIT- I: PROBABILITY AND RANDOM VARIABLE

Probability: Set theory, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, and Independent Events, Bernoulli's trials.

The Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous. Distribution and Density functions, Properties, Binomial,Poisson, Uniform, Gaussian, Exponential, Rayleigh Distributions and Conditional Distribution and Conditional Density function and its properties, problems.

UNIT-IIOPERATION ON ONE RANDOM VARIABLE-EXPECTATION:

Introduction,ExpectedValueofaRandomVariable,FunctionofaRandomVariable,Momentsaboutthe Origin, Central Moments, Variance. Mean and Variance of Binomial,Poisson, Uniform, Gaussian, Exponential, Rayleigh Distributions,CharacteristicFunction, MomentGeneratingFunction, Transformations of a

RandomVariable: Monotonic Transformations for a ContinuousRandomVariable. Non – monotonicTransformations of Continuous RandomVariable.

UNIT-III MULTIPLE RANDOM VARIABLES AND OPERATIONS ON MULTIPLE RANDOM VARIABLESMULTIPLERANDOMVARIABLES: JointDistributionFunction and Properties, Joint density Function and Properties,MarginalDistribution and DensityFunctions,ConditionalDistribution and Density functions, Statistical Independence, Sum of Two Random Variables, CentralLimitTheorem:UnequalDistribution, EqualDistributions.

OPERATIONSONMULTIPLERANDOMVARIABLES:JointMomentsabouttheOrigin,JointCentral Moments, JointCharacteristicFunctions, Jointly Gaussian RandomVariables:Two RandomVariablescase,NRandomVariablescase,Properties,Transformations of Multiple Random Variables, Linear Transformations of Gaussian RandomVariables.

UNIT-IV

RANDOMPROCESSES–

TEMPORALCHARACTERISTICS: TheRandomProcessConcept,ClassificationofProcesses,DeterministicandNon-deterministicProcesses,DistributionandDensityFunctions,Conceptof StationarityandStatisticalIndependence.First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, Nth-order and Strict – SenseStationarity, Time Averages and Ergodicity,Autocorrelation Function andits Properties,Cross-CorrelationFunctionanditsProperties,CovarianceFunctions.

UNIT-V

RANDOM PROCESSES – SPECTRALCHARACTERISTICS: ThePowerDensitySpectrum: Properties, Relationship between Power Density Spectrum and Auto correlation Function,The Cross-Power Density Spectrum, Properties, and Relationship between Cross-Power Density SpectrumandCross – CorrelationFunction.

LINEARSYSTEMSWITHRANDOMINPUTS: Random Signal Responseof LinearSystems:SystemResponse–Convolution,MeanandMean-squaredValueofSystemResponse, Auto correlation Function of Response, Cross-Correlation Functions of Input andOutput, Spectral Characteristics of System Response: Power Density Spectrum of Response,Cross-Power Density Spectra of Input and Output of a linear system.

TEXTBOOKS:

1. Probability, RandomVariables&RandomSignal Principles,PeytonZ.Peebles,TMH,4th Edition,2001.
2. Probability,RandomVariablesandStochasticProcesses,AthanasiosPapoulisand S.Unnikrisha, PHI,4th Edition,2002.
3. ProbabilityandRandomProcesseswithApplicationstoSignalProcessing,HenryStarkandJohnW.Woods,PearsonEducation,3rd Edition,2001.

REFERANCEBOOKS:

1. Schaum'sOutlineofProbability,RandomVariables,andRandomProcesses,1997.
2. AnIntroductiontoRandomSignalsandCommunicationTheory,B.P.Lathi,InternationalTextboo

k,1968.

Year &Sem	II Year – ISemester

3. ProbabilityTheoryandRandomProcesses,P.RameshBabu,McGrawHill,2015.

Contribution of Course Outcomes (CO's) towards the achievement of programmeoutcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	3	1	2	-	-	-	-	-	-	2
CO4	3	3	3	1	2	-	-	-	-	-	-	2
CO5	3	3	3	1	2	-	-	-	-	-	-	2

Course Code	22UCS07	L	T	P	SS	C
Course Name	PYTHON PROGRAMMING LAB	0	0	3	0	1.5

Course Objectives:

The Objectives of Python Programming are

- TolearnaboutPythonprogramminglanguagesyntax,semantics,andtheruntimeenvironment.
- Tobefamiliarizedwithuniversalcomputerprogrammingconceptslikedatatypes,containers.
- Tobefamiliarizedwithgeneralcomputerprogrammingconceptslikeconditionalexecution, loops &functions
- Tobefamiliarizedwithgeneral codingtechniques andobject-orientedprogramming

CourseOutcomes:

CO1: Develop essential programming skills in computer programming concepts like data types, containers
CO2: Apply the basics of programming in the Python language
CO3: Solve coding tasks related conditional execution, loops
CO4: Solve coding tasks related to the fundamental notions and techniques used in Object-oriented programming

ListofExperiments:

1) Write a program that asks the user for a weight in kilograms and converts it to pounds.Thereare2.2 pounds in a Kilogram.
2) Write a program that asks the user to enter three numbers (use three separate inputstatements). Create variables called totaland average that hold the sum and average ofthethree numbers and print out the values oftotal andaverage.
3) Writeaprogram thatuses aforloop to print the numbers 8, 11,14, 17, 20, .. . ,83,86, 89.
4) Write a programthatasktheuserfortheirnameandhowmanytimestoprintit.Theprogramshould print out theuser'snamethespecified numberof times.
5) Useaforloop to print a triangle like theonebelow. Allowtheuser to specifyhowhighthe triangle should be.

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****
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6) Generatearandomnumberbetween1and10.Asktheusertoguessthenumberandprintamessagebased onwhethertheyget it rightor not.
7) Write a programthatasksthe user fortwonumbers andprintsClose ifthe numbersarewithin.001 ofeach otherand Not close otherwise.
8) Writeaprogramthatasktheusertoenterawordandprintsoutwhetherthatword containsanyvowels.
9) Write a program thatasktheusertoentertwostringsofthesame length.Theprogram should then check to see if the strings are of the same length. If they are not theprogram should print an appropriate message and exit. If they are of the same length, theprogram should alternate the characters of the two strings. For example, if the user entersabcde and ABCDE theprogramshould print out AaBbCcDdEe.
10) Write a program that asks the user for a large integer and inserts commas into itaccordingtothestandardAmericanconventionforcommasinlargenumbers.Forinstance,if theuser enters 1000000, theoutput should be 1,000,000.
11) Inalgebraicexpressions,thesymbolformultiplicationisoftenleftout asin3x+4yor 3(x+5). Computers prefer those expressions to include the multiplication symbol, like3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expressionandtheninserts multiplication symbols whereappropriate.
12) Writeaprogramthatgeneratesalistof20randomnumbersbetween1and100.

(a) Printthelist.
(b) Printtheaverageof theelements inthe list.
(c) Printthelargest and smallest values in thelist.
(d) Printthesecondlargest andsecond smallestentries inthelist
(e) Print how manyevennumbers arein thelist.

13) Write a program that asks the user for an integer and creates a list that consists of thefactorsofthat integer.
14) Write a program that generates 100 random integers that are either 0 or 1. Then findthe longest run of zeros, the largest number of zeros in a row.For instance, the longestrunof zeros in [1,0,1,1,0,0,0,0,1,0,0]is 4.
15) Write a program that removes any repeated items from a list so that each item appearsatmost once. For instance,the list [1,1,2,3,4,3,0,0]wouldbecome [1,2,3,4,0].
16) Write a program that asks the user to enter a length in feet. The program should thengive the userthe optiontoconvertfromfeetintoinches,yards, miles,millimeters,centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts toinches, if they enter a 2, then the program converts to yards, etc. While this can be donewith if statements,it is much shorter with lists and it is also easier to add new conversionsif you uselists.
17) Write a function called sum digits that is given an integer num and returns the sum of thedigits of num.
18) Write a function called first diff that is given two strings and returns the first locationinwhich thestrings differ.Ifthestrings areidentical, itshould return-1.
19) Write a function called number of factors that takes an integer and returns howmanyfactors the numberhas.
20) Write a function called is sorted that is given a list and returns True if the list issortedand False otherwise.
21) Write a function called root that is given a number x and an integer n and returns$x^{1/n}$.In the function definition, set thedefault value ofn to 2.
22) Write a function called primes that is given a number n and returns a list of the first nprimes.Let thedefault value ofn be100.

Write a function called merge that takes two already sorted lists of possibly differentlengths,and merges theminto asingle sorted list.

(a) Do thisusingthesort method
(b) Dothis without usingthe sort method.

23) Write a program that asks the user for a word and finds all the smaller words that canbe made from the letters of that word. The number of occurrences of a letter in a smallerwordcan't exceed the numberof occurrencesof theletterin theseuser'sword.
24) Write a program that reads a file consisting of email addresses, each on its own line.Your program should print out a string consisting of those email addresses separated bysemicolons.
25) Write a program that reads a list of temperatures from a file called temps.txt, convertsthosetemperatures toFahrenheit, andwrites theresults toa filecalled ftemps.txt.
26) Write a class called Product. The class should have fields called name, amount, andprice, holding the product's name, the number of items of that product in stock, andtheregular price of the product. There should be a method get price that receives the numberof items to be bought and returns a the cost of buying that many items, where the regularprice is charged for orders of less than 10 items, a 10% discount is applied for orders ofbetween 10 and 99 items, and a 20% discount is applied for orders of 100 or more items.There should also be a method called makepurchase that receives the number of items tobeboughtand decreasesamount bythat much.
27) Write a class called Time whose only field is a time in seconds. It should have amethod called *convert_to_minutes* that returns a string of minutes and seconds formattedas in the following example: if seconds is 230, the method should return '5:50'. It shouldalso have a method called *convert_to_hours*that returns a string of hours, minutes, andsecondsformattedanalogouslyto theprevious method.
28) Write a class called Converter. The user will pass a length and a unit when declaringan object from the class—for example, c = Converter(9,'inches'). The possible units areinches, feet, yards, miles,

kilometers, meters, centimeters, and millimeters. For each ofthese units there should be a method that returns the length converted into those units. Forexample, using the Converter object created above, the user could call c.feet() and shouldget0.75as the result.

Year &Sem	II Year – ISemester					
Course Code	22UEC04	L	T	P	SS	C
Course Name	ELECTRONIC DEVICESCIRCUITS LABORATORY	0	0	3	0	1.5

29) WriteaPythonclasstoimplement pow(x,n).
30) WriteaPython classto reverse astringword byword.
31) Write a program that opens a file dialog that allows you to select a text file. The
32) Program then displays thecontents of thefileinatextbox.
33) WriteaprogramtodemonstrateTry/except/else.
34) Writeaprogramto demonstrate try/finallyand with/as.

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2							1
CO2	2	2	1	1	2							1
CO3	2	2	1	1	2							1
CO4	3	2	1	1	2							1

Electronic Workshop Practice:

1) Identification, Specifications, Testing ofR, L, C Components (Colour Codes), Potentiometers,Coils, Gang Condensers, Relays, Breadboards.
2) Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs,UJT.
3) Soldering Practice- Simple circuits using active and passive components.
4) Study and operation of Ammeters, Voltmeters, Transformers, Analog and DigitalMultimeter,Function Generator, Regulated Power Supply and CRO.

List of Experiments (Any 10 of the following listed experiments)

1. P-N Junction Diode Characteristics.
2. Zener Diode Characteristics.
3. Zener Diode as Voltage Regulator (Design).
4. CRO Operation and its Measurements.
5. Half Rectifier (without and with c-filter)
6. Full Rectifier (without and with c-filter)
7. BJT characteristics (CB-input, output characteristics and measurement of device parameters).
8. BJT Characteristics (CE-input, output characteristics and measurement of device parameters)

9. FET Characteristics (CS Configuration)
10. UJT Characteristics
11. Transistor Self Biasing
12. BJT-CE Amplifier
13. Emitter Follower-CC Amplifier
14. FET-CS Amplifier

Course learning objectives

1. To study basic electronic components.
2. To observe characteristics of electronic devices

Course Outcomes (COs)

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

1) Measure voltage, frequency and phase of any waveform using CRO.
2) Generate sine, square and triangular waveforms with required frequency and amplitude usingfunction generator.
3) Analyze the characteristics of different electronic devices such as diodes, transistors etc.
4) Analyze and design simple circuits like rectifiers, power supplies and amplifiers etc.,

Contribution of Course Outcomes (CO's) towards the achievement of programmeoutcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	-	3	-	-	-	-	-	-	-
CO4	3	-	-	-	3	-	-	-	-	-	-	-

Year &Sem	II Year – I Semester					
Course Code	22UEC06	L	T	P	SS	C
Course Name	SWITCHING THEORY AND LOGIC DESIGN LAB	0	0	3	0	1.5

List of Experiments: (Minimum of Ten Experiments has to be performed)

1) Verification of truth tables of Logic gates
2) Two input (i) OR (ii) AND (iii) NOR
   (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
3) Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
4) Verification of functional table of 3 to 8 line Decoder/De-multiplexer
5) Design BCD Adder Circuit and Test the Same using Relevant IC
6) Four variable logic function verification using 8 to1 multiplexer.
7) Design full adder circuit and verify its functional table.
8) Verification of functional tables of
9) (i) JK Edge triggered Flip–Flop (ii) JK Master Slav Flip–Flop (iii) D Flip-Flop
10) Design a four bit ring counter and Johnson's counter using D Flip–Flops/JK Flip Flop and verify output
11) Verify the operation of decade counter using relevant IC
12) Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
13) 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 wave forms.
14) Design MOD–8 synchronous counter using T Flip- Flop and verify the result and Sketch the output wave forms.
    (a) Draw the circuit diagram of a single bit comparator and test the output
    (b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.

COURSE OBJECTIVES:

1. To study about basic IC's and verification of their truth table.
2. To know about relevant IC's and designing combinational and sequential circuits.

COURSE OUTCOMES:

At the end of the course, students will able to

1. Know how to handle with 74 IC family and verification
2. How to design combinational circuit with IC's
3. How to design sequential circuits with IC's
4. And analyzing each IC with their functional table.

Contribution of Course Outcomes (CO's) towards the achievement of programmeoutcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	-	3	-	-	-	-	-	-	-
CO4	3	-	-	-	3	-	-	-	-	-	-	-

Year &Sem	II Year – I Semester					
Course Code	22UEN06	L	T	P	C	L
Course Name	SOFT SKILLS-I (SKILL ORIENTED COURSE)	0	0	4	2	0

Course Outcomes:

At the end of the Course, the Student will be able to:

CO1 : Learn and use new vocabulary.
CO2 :Use language fluently, accurately and appropriately in different situations.
CO3: Use their skills of listening comprehension to communicate effectively in cross-cultural contexts.
CO4:Developing the overall personality
CO5: Learn writing skills for different situations.

1. Vocabulary building, Synonyms and Antonyms, One- word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.
2. Inter-personal Communication - Starting a Conversation – Responding Appropriately and Relevantly – Role Play in Different Situations
3. Listening comprehension – Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English, and American English.
4. Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management &PositiveThinking.
5. Writing Skills–Letter writing, Email etiquette; Essays for competitive examinations, Analyzingnews paper articles.

REFERENCES:

1. M. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Ltd.2005.
2. Andrea J. Rutherford, "Basic Communication Skills for Technology", 2nd Edition, Pearson Education, 2007.
3. Meenakshi Raman &Sangeeta Sharma, "Technical Communication", Oxford UniversityPress, 2011.
4. DELTA's key to the Next Generation TOEFL Test: "Advanced Skill Practice," New Age

Mapping of Course Outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	-	-	-	-	-	-	-	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-

Year &Sem	II Year – II Semester					
Course Code	22UEC09	L	T	P	SS	C
Course Name	ELECTRONIC CIRCUIT ANALYSIS	3	1	0	0	3

Course Learning Objectives: This course will enable the students to

- To learn hybrid-pi parameters at high frequency and compare with low frequency parameters.
- Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
- Analyze the effect of negative feedback on amplifier characteristics and derive the characteristics.
- Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits.
- Compare and analyze different Power amplifiers and tuned amplifier circuits.

Course Outcomes:

After completion of this course, the students will be able to

CO1: Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
CO2: Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT.
CO3: Know the classification of the power and tuned amplifiers and their analysis with performance comparison
CO4: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
CO5: Know the classification of the power and tuned amplifiers and their analysis with performance comparison

UNIT- I: Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid πconductance, Hybrid π capacitances, validity of hybrid π model, determination of high- frequency parameters in terms of low-frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.
FET: Analysis of common Source Amplifiercircuits at high frequencies

UNIT -II
Multistage Amplifiers: Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascade amplifier, Boot-strap emitter follower.

UNIT –III
Feedback Amplifiers: Concepts of feedback, Classification of feedback amplifiers, General characteristics of Negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations**.**

UNIT- IV
Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC- phase shift and Wien bridge oscillators with BJT and FET and their analysis, generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT, Frequency and amplitude stability of oscillators, Crystal Oscillator.

UNIT -V
Power Amplifier: Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class C Amplifiers.

Tuned Amplifiers: Introduction, single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

TEXT BOOKS:

1. Integrated Electronics- J.Millman and C.C.Halkias, Tata McGraw-Hill, 1972.
2. Electronic Devices and CircuitsTheory –Robert L.Boylestad and Louis Nashelsky, Pearson/PrenticeHall, TenthEdition, 2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications,2006.

REFERENCE BOOKS:

1. Electronic Circuit Analysis and Design –Donald A.Neaman, McGrawHill, 2010.
2. Micro electronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press,Sixth Edition, 2011.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R.Murthy, PearsonPublications.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	3	1	2	-	-	-	-	-	-	2
CO4	3	3	3	1	2	-	-	-	-	-	-	2
CO5	3	3	3	1	2	-	-	-	-	-	-	2

Programme	ECE, CSE, AIML, DS, CS, IOT					
Year &Sem	II Year – II Semester					
Course Code	22UCS04	L	T	P	SS	C
Course Name	DATA STRUCTURES	3	1	0	0	3

CourseObjectives:

The objective of the course is to

1. Introducethefundamentalconcept ofdatastructuresandabstractdatatypes
2. Emphasizetheimportanceofdatastructuresindevelopingandimplementingefficientalgorithms
3. Describehowarrays,records,linkedstructures,stacks,queues,trees,andgraphsarerepresentedinmemoryandused byalgorithms

Course Outcomes:

Aftercompletingthiscourse,astudentwillbeableto:

CO1: Discuss various sorting & searching Techniques
CO2: Use linked structures in writing programs
CO3: Use Stacks and Queues in Writing Programs
CO4: Use Trees in writing programs and demonstrate different methods for traversing trees
CO5: Demonstrate Graphs and Graph Traversals.

UNIT-I

DataStructures-

Definition,ClassificationofDataStructures,OperationsonDataStructures,AbstractDataType(ADT),Preliminariesofalgorithms.TimeandSpacecomplexity.

Searching– Linearsearch, Binarysearch, Fibonaccisearch.

Sorting – Insertionsort,Selectionsort,Exchange(Bubblesort,quicksort),distribution(radixsort), merging

(Mergesort) algorithms.

UNIT -II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal, Reversing Single Linkedlist,ApplicationsonSingleLinkedlist-PolynomialExpressionRepresentation, Addition, SparseMatrix Representation using Linked List, Advantages and Disadvantages of Single Linked list,Double Linked list-Insertion,Deletion, CircularLinkedlist-Insertion,Deletion.

UNIT-III

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked listRepresentationofStacks,OperationsonLinked StackApplicationsReversing list,FactorialCalculation,Infixto PostfixConversion,EvaluatingPostfixExpressions.

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list,Implementation of Queues-using Arrays and using Linked list, Application of Queues – CircularQueues,Deques,PriorityQueues.

UNITIV

Trees:BasicTerminologyinTrees,BinaryTrees-Properties,RepresentationofBinaryTreesusingArraysandLinkedlists.TreeTraversal–Inorder,Preorder,Postorder.Heaps–Definition,Max Heap, Min Heap, Insertion and Deletion from MaxHeap, Heap sort,BinarySearch Trees –BasicConcepts,BSTOperations:InsertionandDeletion.

UNITV

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, GraphTraversals(BFT&DFT),Applications-MinimumSpanningTreeUsingPrims&KruskalsAlgorithm,Dijkstra'sshortest path,Transitiveclosure, Warshall'sAlgorithm.

TextBooks:

1) DataStructuresUsingC.2nd Edition.ReemaThareja,Oxford.
2) DataStructuresandalgorithmanalysis inC,2nd ed, MarkAllenWeiss.

ReferenceBooks:

1) FundamentalsofDataStructuresinC,2nd Edition,Horowitz,Sahni,UniversitiesPress.
2) Data Structures:A PseudoCodeApproach,2/e,RichardF.Gilberg,BehrouzA. Forouzon,Cengage.
3) DataStructureswithC,SeymourLipschutzTMH

e-Resources:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3							2
CO2	3	1	2	2	3							1
CO3	3	1	2	2	3							2
CO4	3	3	2	2	3							2
CO5					1							2

Programme	ECE						
Year &Sem	II Year – II Semester						
Course Code	22UEC10	L	T	P	SS	C	

Course Name	ANALOG COMMUNICATIONS	3	1	0	0	3

Course Objectives:

- Familiarize with the fundamentals of analog communication systems
- Familiarize with various techniques for amplitude modulation and demodulation of signals
- Familiarize with various techniques for angle modulation and demodulation of signals
- Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.
- Distinguish the figure of merits of various analog modulation methods. Familiarize with basic techniques for generating and demodulating various pulse modulated signals.

Course Outcomes:

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

CO1: Acquired knowledge on Analog communication system and elements
CO2: Differentiate various Amplitude modulation and demodulation schemes and their spectral characteristics
CO3: Differentiate various Angle modulation and demodulation schemes and their spectral characteristics
CO4: Analyze various functional blocks of radio transmitters and receivers
CO5: Analyze noise characteristics of various analog modulation methods.
Design pulseanalog systems for various modulation techniques

.

UNIT-I AMPLITUDE MODULATION

Introduction to communication system,Need for modulation, Frequency Division Multiplexing, AmplitudeModulation, Definition, Time domain and frequency domain description,power relations in AM waves, Generation of AMwaves, square law Modulator, Switching modulator, Detection of AMWaves; Square law detector, Envelope detector.

UNIT-II DSB & SSB MODULATION

Double side band suppressed carriermodulators, time domain and frequency domain description, Generation ofDSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detectionof DSB-SC Modulated waves,Frequency domain Description,Frequency discrimination method for generation of AM SSBModulated Wave, Time domain description, Phase discrimination method forgenerating AM SSB Modulated waves. Demodulation of SSB Waves,Vestigial side band modulation: Frequency description, Generation of VSBModulated wave, Time domain description, Comparison of AM Techniques, Applications ofdifferent AM Systems

UNIT-III ANGLE MODULATION

Basic concepts, Frequency Modulation: Singletone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave,Narrow band FM, Wide band FM, Constant Average Power, Transmissionbandwidth of FM Wave - Generation of FM Waves, Direct & Indirect FM, Detection ofFM Waves: Balanced Frequency discriminator, Zero crossing detector, Phaselocked loop, Comparison of FM & AM.

UNIT IV TRANSMITTERS & RECEIVERS

Radio Transmitter – Classificationof Transmitter, Low level and High level AM Transmitters, FM Transmitter – Variable reactance type and phase modulatedFM Transmitter, frequency stability in FM Transmitter.

Radio Receiver – Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver,Frequency changing and tracking,Intermediate frequency, Image Frequency, AGC, FM Receiver.

UNIT V NOISE

Noise in Analog communication System, Noise in DSB & SSBSystem, Noise in AM System, Noise in Angle Modulation System, Pre-emphasis & de-emphasis.

PULSE MODULATION

Time Division Multiplexing, Types of Pulsemodulation, PAM (Single polarity, double polarity) PWM: Generation &demodulation of PWM, PPM, Generation and demodulation of PPM, comparison of TDMand FDM

Text Books:

1) Principles of Communication Systems – H Taub& D. Schilling, GautamSahe,TMH, 3rd Edition,2007.
2) Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition, 2007
3) Modern Digital and Analog Communication Systems –B.P.Lathi,ZhiDing,Hari Mohan Gupta, Oxford University Press,4th Edition,2017

Reference Books:

1. Essentials of Analog Communications – Dr Sanjay Sharma, Narosa Book Distributors PvtLtd.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.
4. Electronic Communication systems – Tomasi, Pearson, fourth Edition,2007.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) and Programme Specific Outcomes (PSO's)
(Strong – 3, Moderate – 2, Weak – 1)
CO – PO and PSO MAPPINGS

Mapping Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	-----	2	2	-----	------	------	2
CO2	3	3	2	2	3	-----	-----	2	-----	------	------	2
CO3	2	2	1	2	3	-----	2	-----	-----	------	------	1
CO4	2	3	1	2	1	3	2	-----	-----	------	------	1
CO5	2	2	2	3	2	3	-----	3	-----	3	------	2

Year &Sem	II Year – II Semester					
Course Code	22UEC11	L	T	P	SS	C
Course Name	ELECTROMAGNETIC WAVES AND TRANSMISSION LINES	3	1	0	0	3

Course Learning Objectives: This course will enable the students to

- To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations.
- Model and design the transmission lines at high frequencies.
- To apply Smith chart, use for solution of transmission line problems and impedance matching.

Course Outcomes:

After completion of this course, the students will be able to

CO1: Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential.

CO2: Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential.

CO3: Apply the Maxwell equations to analyze the time varying behavior of EM waves. Gain the knowledge in uniform plane wave concept and characteristics of uniform plane.

CO4: Wave in various media and to calculate Brewster angle, critical angle, and total internal reflection.

CO5: Understand the concepts of transmission lines and its applications. And to derive the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc.

UNIT-I Electrostatics

Coulomb's Law, Electric Field Intensity, Electric Field Intensity due to line and a surface charge, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Relaxation Time, Poisson's, and Laplace's Equations.

UNIT -II: **Magnetostatics**

Introduction – Biot-Savart Law, Ampere's Circuital Law, and Applications, point form of Ampere's circuital law, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Magnetic Energy.

Maxwell's Equations (Time Varying Fields): Faraday's Law and Lenz's law, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Maxwell's Equations for free space and good conductor, Conditions at a Boundary Surface, Illustrative Problems.

UNIT –III: **EM Wave Characteristics**

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Wave Propagation in Good Conductors and Good Dielectrics, skin depth, Polarization & Types

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, Pointing Vector and Pointing Theorem.

UNIT- IV: Transmission Lines-I

Types, Transmission Line Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concept, Lossless /Low Loss Characterization, distortion less lines, Condition for Distortion less and Minimum Attenuation.

UNIT -V: Transmission Lines -II

Loading - Types of Loading, Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR.$\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations. Smith Chart – Construction and Applications.

TEXT BOOKS:

1. Matthew N.O. Sadiku- Elements of Electromagnetics, Oxford University Press, 3rd ed., 2001.
2. E.C. Jordan and K.G. Balmain- Electromagnetic Waves and Radiating Systems, PHI, 2nd Edition, 2000.
3. William H. Hayt Jr. and John A. Buck, Engineering Electromagnetics, McGraw Hill Education, 7th Edition, 2006.
4. UmeshSinha, Transmission Lines and Networks, SatyaPrakashan (Tech. India Publications), New Delhi, 2001.

REFERENCE BOOKS:

1. GSN Raju- Electromagnetic Fields and Wave Theory, Pearson Education 2006
2. Nathan Ida -Engineering Electromagnetics, Springer (India) Private Limited, New Delhi, 2nd Edition, 2005.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**

Year &Sem	II Year – II Semester					
Course Code	22UEC12	L	T	P	SS	C
Course Name	LINEAR CONTROL SYSTEMS	3	1	0	0	3

Course Learning Objectives: This course will enable the students to

- To teach fundamental concepts of Control systems and mathematical modelling of the system.
- To teach the concepts of time response and frequency response analysis of Control Systems.
- To teach the concepts of time response and frequency response analysis of Control Systems.
- To teach concepts of controllers and compensators
- To design various applications of control systems

Course Outcomes:

After completion of this course, the students will be able to

CO1: Students will be able to understand the basic concepts of control system and identifycontrol systems in real life applications.
CO2: Students will be able to derive the mathematical model of different types of controlsystems and represent them in various forms.
CO3: Students will be able to analyze systems using time domain analysis techniques**.**
CO4: Students will be able to apply concepts of frequency domain techniques in stability analysis of control systems
CO5: Students will be able to create state variable models of systems and analyze their controllability, observability and time response.

UNIT- I:

Concepts of control systems: Open loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back characteristics, Effects of feedback.

Mathematical models of physical systems -Differential equations, Transfer functions of translational and rotational mechanical systems,

UNIT -II:

Control systems and components: DC servomotor (Armature controlled and field controlled) with necessary derivation for transfer function, AC Servomotor and its transfer function, Block diagram algebra, Signal flow graphs with illustrative examples.

Time response analysis: Time response analysis standard test signals, Time response of first and second order systems, steady state errors and error constants, Effect of adding a zero to a system, Design specifications of second order systems, Performance indices.

UNIT –III:

Concepts of stability and algebraic criteria: The Concept of stability, Necessary conditions for stability, Routh-Hurwitz stability criterion, Relative stability analysis,

The root locus technique: Introduction, The root locus concepts, Construction of root loci

UNIT- IV:

Frequency response analysis: Introduction, Correlation between time and frequency response, Bode Plots, Polar Plots, Nyquist Stability criterion

UNIT –V

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency domain, PID Controllers**.**

State space analysis of continuous systems Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- solving the time invariant state equations- State transition matrix and it's properties – Concepts of Controllability and Observability.

TEXT BOOKS:

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.
2. Automatic Control Systems 8th edition– by B. C. Kuo2003– John wiley and son's.

REFERENCE BOOKS:

1. Modern Control Engineering–by Katsuhiko Ogata – Pearson Publications, 5th edition,2015.
2. Control Systems by A.Nagoorkani, RBA publications,3 edition,2017.
3. Control Systems by A.Anandkumar, PHI, 2 Edition,2014.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	3
CO2	3	3	2	-	-	-	-	-	-	-	-	3
CO3	3	3	2	-	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	3

Programme	Common to all B.Tech. ECE

ECE – UG – R22

Year &Sem	II Year – II Semester					
Course Code	22UEC13	L	T	P	SS	C
Course Name	ELECTRONIC CIRCUIT ANALYSIS LAB	0	0	3	0	1.5

Note: The students are required to design the circuit and perform the simulation using Multisim/Equivalent Industrial Standard Licensed simulation software tool. Further they are required to verify the result using necessary hardware equipment.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. Determination of Ft of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Boots trapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required: Software:

i. Multisim/Equivalent Industrial Standard Licensed simulation software tool.
ii. Computer Systems with required specifications

HardwareRequired:

1. Regulated Power supplies
2. Analog/Digital Storage Oscillo scopes
3. Analog/Digital Function Generators
4.Digital Multimeters
5.Decade Résistance Boxes/Rheostats
6.Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	-	3	-	-	-	-	-	-	-
CO4	3	-	-	-	3	-	-	-	-	-	-	-

List of Experiments: (Twelve experiments to be done- The students have to calculate the relevant parameters) – (A. Hardware, B. MATLAB Simulink or MATLAB Communication tool box)

List of Experiments

Year &Sem	II Year – II Semester					
Course Code	22UEC14	L	T	P	SS	C
Course Name	ANALOG COMMUNICATIONS LABORATORY	0	0	3	0	1.5

1) Amplitude Modulation - Modulation & Demodulation
2) AM – DSBSC - Modulation & Demodulation
3) Spectrum Analysis of Modulated signal using Spectrum Analyzer
4) Diode Detector
5) Pre-emphasis & De-emphasis
6) Frequency Modulation–Modulation & Demodulation
7) AGC Circuits
8) Verification of Sampling Theorem
9) Pulse Amplitude Modulation & Demodulation
10) PWM, PPM–Modulation & Demodulation
11) PLLIC-565 as FM demodulator
12) Radio receiver characteristics
13) Radio Receiver/TV Receiver Demokits or Trainees.

Software required:

i) Computer Systems with latest specifications
ii) Connected in LAN (Optional)
iii) Operating system (Windows/Linuxsoftware)
iv) Simulations software (Simulink & MATLAB)

Equipment:

1. RPS - 0 –30V
2. CRO - 0– 20M Hz.
3. Function Generators - 0 – 1 MHz
4. Components and Bread boards
5. Multimeters and other meters
6. Spectrum Analyzer

Course learning objectives:

1. To Verify the working of different modulation and demodulation techniques.
2. To analyze the operation of different modulation techniques for given input data.
3. To Design the different communication circuits and verify the working of the circuits.

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

1.Verify the working of different modulation and demodulation techniques

2. Analyze the operation of different modulation techniques for given input data.
3. Design the different communication circuits and verify the working of the circuits

Year &Sem	II Year – II Semester					
Course Code	22UCS06	L	T	P	SS	C
Course Name	DATA STRUCTURES LABORATORY	0	0	3	0	1.5

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	3	3	2	-
CO2	-	3	-	-	-	-	-	-	3	3	2	-
CO3	-	2	3	-	-	-	-	-	3	1	2	-

CourseObjectives:

Theobjectiveofthislab isto

- Demonstratethedifferentdatastructuresimplementation.

CourseOutcomes:

Bythe endofthislabthestudentisable to

CO1: Use various searching and sorting algorithms

CO2: Use basic data structures such as arrays and linked list.

CO3: Programs to demonstrate fundamental algorithmic problems including Stacks, Queues and Tree Traversals.

ListofExperiments:

Exercise-1(Searching)

a) WriteCprogramthatusebothrecursiveandnon-recursivefunctionstoperformLinearsearchforaKeyvaluein agivenlist.
b) WriteCprogramthatuse bothrecursiveandnon-recursivefunctionstoperformBinarysearchforaKeyvaluein agivenlist.

Exercise-2(Sorting-I)

a) WriteCprogramthatimplementBubblesort,tosortagivenlistofintegersinascendingorder
b) WriteCprogramthatimplementQuicksort,tosortagivenlistofintegersinascendingorder
c) WriteCprogramthatimplementInsertionsort,tosortagivenlistofintegersinascendingorder

Exercise-3(Sorting-II)

a) WriteCprogramthatimplementradixsort,tosortagivenlistofintegersinascendingorder
b) Write C program that implement merge sort, to sort a given list of integers in ascendingorder

Exercise-4(SinglyLinkedList)

a) WriteaCprogramthat uses functionsto createasinglylinkedlist
b) WriteaCprogramthatusesfunctionstoperforminsertionoperationonasinglylinkedlist
c) WriteaCprogramthatuses functionstoperformdeletionoperationonasinglylinkedlist.
d) WriteaCprogramtoreverseelementsofasinglelinkedlist.

Exercise-5(Stack)

a) WriteCprogramthatimplementstack(itsoperations)usingarrays
b) WriteCprogramthatimplementstack(itsoperations)usingLinkedlist
c) WriteaCprogramthatusesStackoperationstoevaluatepostfix expression

Exercise-6(Queue)

a) WriteCprogramthatimplementQueue(itsoperations) usingarrays.
b) WriteCprogramthatimplementQueue(itsoperations)usinglinkedlists

Exercise-7(BinaryTree)

a) WritearecursiveCprogramfortraversinga binary treeinpreorder,inorderandpostorder.

Exercise-8(BinarySearchTree)

a) WriteaC programtoCreatea BST
b) WriteaCprogramtoinsertanodeintoaBST.
c) WriteaCprogramto delete nodefromaBST.

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3							2
CO2	3	1	2	2	3							2
CO3	3	1	2	2	3							2

Year &Sem	II Year – II Semester					
Course Code	22UEN07	L	T	P	C	L
Course Name	SOFT SKILLS-II (SKILL ORIENTED COURSE)	0	0	4	2	0

Course Outcomes:

At the end of the Course, the Student will be able to:

CO1: Develop language competency.
CO2: Write resumes.
CO3: Exhibit interview skills.
CO4: Use language fluently, accurately and appropriately in Group Discussions
CO5: Use their skills of comprehension to communicate effectively in cross-cultural contexts.

1. Language competency: Para jumbled, Analogy, sentence equivalence, critical reasoning.
2. Resume writing –structure and presentation, planning, defining the career objective.
3. Interview Skills– concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.
4. Group Discussion–dynamics of group discussion, Lateral thinking, Brainstorming.
5. Cross-Cultural Communication / Non-Verbal Communication, Problems of Language, Lack of Language equivalency/ difficulties in using English.

REFERENCES:

1. M. Ashraf Rizvi, "Effective Technical Communication",Tata McGraw-Hill Publishing Company Ltd.2005.
2. Andrea J. Rutherford, "Basic Communication Skills for Technology", 2nd Edition, Pearson Education, 2007.
3. Meenakshi Raman &Sangeeta Sharma, "Technical Communication", Oxford UniversityPress, 2011.

4. DELTA's key to the Next Generation TOEFL Test: "Advanced Skill Practice," New Age

Mapping of Course Outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	1	-	-
CO5	-	-	-	-	-	-	-	-	-		-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-

Year &Sem	II Year – II Semester					
Course Code	22UEN04	L	T	P	C	L
Course Name	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0	2

Course Objectives:

1. Thecourseaimsatimpartingbasicprinciplesofthoughtprocess,reasoningandinferencing.Sustainabilityis atthecoreof IndianTraditionalKnowledgeSystemsconnectingsocietyandnature.
2. HolisticlifestyleofYogic-scienceandwisdomcapsulesinSanskritliteraturearealsoimportantinmodernsocietywithrapidtechnologi caladvancementsandsocietaldisruptions.
3. ThecoursefocusesonintroductiontoIndianKnowledgeSystem,Indianperspectiveofmodernscientificwo rld-viewandbasic principlesofYogaandholistic healthcaresystem

Course Outcomes:

Uponsuccessfulcompletionofthe course,the studentwill be able to:

1. UnderstandthesignificanceofIndianTraditionalKnowledge
2. ClassifytheIndianTraditionalKnowledge
3. CompareModernSciencewithIndianTraditionalKnowledgesystem.
4. AnalyzetheroleofGovernmentinprotectingtheTraditionalKnowledge
5. UnderstandtheimpactofPhilosophicaltraditiononIndian KnowledgeSystem.

UnitI

IntroductiontoTraditionalKnowledge:DefineTraditionalKnowledge-NatureandCharacteristics-ScopeandImportance-kindsofTraditionalKnowledge-ThehistoricalimpactofsocialchangeonTraditionalKnowledge Systems-Value ofTraditionalknowledgeinglobaleconomy.

UnitII

Basic structure of Indian Knowledge System: AstadashVidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved,GandharvaVed&SthapthyaAdi), 6 vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha& Chand),4upanga (Dharmashastra,Meemamsa,purana&TharkaShastra).

Unit III

ModernScienceandIndianKnowledgeSystem-IndigenousKnowledge,Characteristics-YogaandHolistic Healthcare-cases studies.

UnitIV

Protection of Traditional Knowledge: The need for protecting traditional knowledge -Significance ofTraditionalknowledge Protection-Role ofgovernmenttoharnessTraditionalKnowledge.

UnitV

Impact of Traditions: PhilosophicalTradition(Sarvadarshan)Nyaya, Vyshepec, Sankhya,Yog,Meemamsa,Vedantha,Chavanka,Jain&Boudh-IndianArtisticTradition-Chitrakala,Moorthikala,Vasthukala ,Sthapthya,Sangeetha,NruthyaYevamSahithya

ReferenceBooks:

1. TraditionalKnowledgeSysteminIndia,byAmitJha,2009.
2. TraditionalKnowledgeSystemandTechnologyinIndiabyBasantaKumarMohantaandVipinKumarSingh,PratibhaPrakashan2012.
3. Sivaramakrishnan(Ed.),CulturalHeritageofIndia-coursematerial,BharatiyaVidya
4. SwamiJitatmanand,HolisticScienceandVedant,BharatiyaVidyaBhavan
5. YogaSutraofPatanjali, RamaKrishna Mission,Kolkata.
6. PramodChandra,IndiaArts,HowardUniv.Press,1983.
7. KrishnaChaitanya,ArtsofIndia,AbhinavPublications, 1987.

WebResources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
3. https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_text.pdf

Mapping of Course Outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-											
CO2												
CO3												
CO4												
CO5								1				
CO6												

Year & Sem	III Year – I Semester					
Course Code	22UEC34	L	T	P	SS	C
Course Name	Antennas and Wave Propagation	3	1	0	0	3

Course Objectives:

- **Understand the applications of the electromagnetic waves in free space.**
- **Learn the working principles of various types of antennas**
- **Understand the concept of antenna arrays**
- **Understand the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.**
- **Understand the concepts of radio wave propagation in the atmosphere.**

Course Outcomes:

After completion of this course, the students will be able to

CO1: Identify basic antenna parameters.
CO2: Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas
CO3: Design and analyze antenna arrays
CO4: Analyze antenna measurements to assess antenna's performance
CO5: Identify the characteristics of radio wave propagation

UNIT-1

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters – Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, Problems.

UNIT-2

ANTENNA ARRAYS : 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations). Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations. Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics.

UNIT-3

NON-RESONANT RADIATORS : Introduction, Traveling wave radiators – basic concepts, Long wire antennas – field strength calculations and patterns, Microstrip Antennas-Introduction,

Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. ***Introduction to PIFA Antenna*** .Broadband Antennas: Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UNIT-4

VHF, UHF AND MICROWAVE ANTENNAS: Reflector Antennas : Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds. Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications, Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods)

UNIT-5

WAVE PROPAGATION : Concepts of Propagation – frequency ranges and types of propagations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance – Space Wave Propagation – Mechanism, LOS and Radio Horizon.– Radius of Curvature of path, M-curves and Duct Propagation.

TEXT BOOKS:

1. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Antenna Theory – C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	1	1	1	2	1	--	--	--	--	2
CO2	1	3	3	3	2	2	3	--	--	--	--	2
CO3	1	2	3	3	2	3	2	--	--	--	--	1
CO4	1	3	3	3	3	2	2	--	--	--	--	3
CO5	1	3	2	3	3	3	2	--	--	--	--	2

Average	1.33	2.5	2.16	2.5	2	2.33	2.16	--	--	--	--	1.833

Programme	ECE					
Year & Sem	III Year – I Semester					
Course Code	22UEC15	L	T	P	SS	C
Course Name	DIGITAL COMMUNICATIONS	3	1	0	0	3

Course Objectives:

The students will be introduced to

- Understand different pulse modulation techniques and their comparison
- Familiarize various digital modulation techniques
- Familiarize the calculation of probability of error various digital modulation techniques
- Understand the concept of entropy and Information & Understand the different source coding techniques.
- Familiarize with block codes, cyclic codes and convolutional codes

Course Outcomes:

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

CO1: Determine the performance of different waveform coding techniques for the generation and digital representation of the signals

CO2: Analyze the performance of various digital modulation schemes

CO3: Determine the probability of error for various digital modulation schemes

CO4: Compute and analyze different error control coding schemes for the reliable transmission of digital information over the channel

CO5: Analyze noise characteristics of various analog modulation methods. Design pulseanalog systems for various modulation techniques

.

UNIT-I PULSE DIGITAL MODULATION

Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM), Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, applications of PCM, DM.

UNIT-II DIGITALMODULATIONTECHNIQUES

Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, similarity of BFSK and BPSK.

UNIT-III DATA TRANSMISSION

Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, noncoherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT IV

INFORMATION THEORY

Discrete messages, concept of amount of information and its properties. Average information, Entropy, types of Entropy and its properties,Information rate, Mutual information and its properties.

SOURCECODING

Introduction,Advantages,Shannonstheorem,ShanonFanocoding,Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth–S/N trade off.

UNIT V

LINEAR BLOCKCODES

Introduction, Matrix description of Linear Block codes,Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation.

CONVOLUTIONCODES

Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellisdiagramdecoding using Viterbi algorithm.

Text Books:

1. Digital communications - Simon Haykin, John Wiley, 2005
2. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.

Reference Books:

1. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog& Digital – Singh &Sapre,TMH, 2004.
3. Modern Analog and Digital Communication – B.P.Lathi,ZhiDing,Hari Mohan Gupta,Oxford University Press,4th Edition,2017

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) and Programme Specific Outcomes (PSO's)
(Strong – 3, Moderate – 2, Weak – 1)
CO – PO and PSO MAPPINGS

Mapping Course Outcomes with Programme Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	1	NC	NC	NC	NC	NC	NC	NC	2
CO2	3	3	2	1	NC	NC	NC	NC	NC	NC	NC	2
CO3	3	3	3	2	1	NC	NC	NC	NC	NC	NC	2
CO4	3	3	NC	1	1	NC	NC	NC	NC	NC	NC	2
CO5	2	3	3	2	1	NC	NC	NC	NC	NC	NC	2

Year &Sem	III Year – I Semester					
Course Code	22UEC16	L	T	P	SS	C
Course Name	ANALOG AND DIGITAL INTEGRATED CIRCUITS	3	1	0	0	3

COURSE OBJECTIVES:

- VHDL fundamentals were discussed to modeling the digital system design blocks.
- Design and implementation of combinational and sequential digital logic circuits.
- Understand the basic concepts of operational amplifier and its various applications.
- Explain the working and applications of multivibrators using IC 555.
- Know about various A/D and D/A convertors.

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
CO2: Analyze and design basic digital circuits with combinational logic circuits using VHDL.
CO3: Analyze and design basic digital circuits with sequential logic circuits using VHDL.
CO4: Understand the IC 741 operational amplifier and its applications
CO5: Demonstrate different applications of 555 Timer and D-A, A-D Converters

UNIT-I: VHDL

Introduction to VHDL, Entity Declaration, Architecture, Data-Flow, Behavioral and Structural Style of Modelings, Data Types, Data Objects, Configuration Declaration, Package Declaration, Generic, Operators and Identifiers, PROCESS, IF, CASE and LOOP Statements, VHDL Libraries.

UNIT-II: COMBINATIONAL LOGIC DESIGN

Parallel Binary Adder, Carry Look Ahead Adder, BCD Adder, Multiplexers and Demultiplexers and their use in Combinational Logic Design, ALU, Digital Comparators, Parity Generators, Code Converters, Priority Encoders. (Qualitative approach of designing and modeling the mentioned combinational logic circuits with relevant digital ICs using HDL)

UNIT-III: SEQUENTIAL LOGIC DESIGN

Registers, Applications of Shift Registers, Ripple or Asynchronous Counters, Synchronous Counters, Synchronous and Asynchronous Sequential Circuits, Hazards in Sequential Circuits. (Qualitative approach of designing and modeling the mentioned sequential logic circuits with relevant digital ICs using HDL)

UNIT-IV

Introduction to Op-Amp: Block Diagram, Symbolic Representation, Characteristics, Ideal and Practical Specifications. **Op-Amp Applications:**Inverting and Non-inverting Amplifier, Differentiator and Integrator, Summing Amplifier, Instrumentation Amplifier, V-I and I-V Converter. **Active Filters:** Low Pass, High Pass, Band Pass and Band Stop Filters and their design guidelines.

UNIT-V

555 Timer: Functional Diagram, Monostable and Astable Operations and Applications.

D-A and A-D Converters: Weighted Resistor, R-2R Ladder and Inverted R-2R DAC's,Parallel Comparator Type, Counter Type, Successive Approximation and Dual Slope ADC's.

TEXT BOOKS

1. J.Bhasker, "VHDLPrimer", 3rd Edition, Pearson Education/PHI.
2. R.P.Jain, "Modern Digital Electronics", 4th Edition, Tata McGraw Hill Education Pvt. Ltd., 2010.
3. D. Roy Choudhury, "Linear Integrated Circuits", 2nd Edition, New Age International (P) Ltd 2003.

REFERENCES

1. John F. Wakerly, "Digital Design: Principles and Practices", 3rdEdition, PHI/Pearson Education.
2. David A Bell, "Operational Amplifiers and Linear ICs", 3rd Edition, Oxford University Press.

Contribution of Course Outcomes (CO's) towards the achievement of Programme Outcomes (PO's)
(Strong – 3, Moderate – 2, Weak – 1)

CO –PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	2	-	-	-	-	-	-	2
CO2	2	2	3	2	2	-	-	-	-	-	-	2
CO3	2	2	3	2	2	-	-	-	-	-	-	2
CO4	3	2	3	2	-	-	-	-	-	-	-	1
CO5	3	2	3	2	-	-	-	-	-	-	-	1

Year &Sem	III Year – I Semester					
Course Code	22UEC17	L	T	P	SS	C
Course Name	DIGITAL SIGNAL PROCESSING	3	1	0	0	3

Course Learning Objectives:

1. To study about discrete time systems
2. To learn about FFT algorithms.
3. To study the design techniques for IIR digital filters
4. To study the design techniques for FIR digital filters
5. To study the properties ofMultirate digital signal processing and about QMF filters.

Course Outcomes:

After completion of this course, the students will be able to

CO1:.Applythedifferenceequationsconceptintheanalysisof Discretetimesystems

CO2: Use the FFT algorithm for solving the DFT.

CO3: Design and Realize a Digital IIR filter from the given specifications

CO4: Design and Realize a Digital FIR filter from the given specifications

CO5: Use the Multirate Processing concepts in various applications (eg: Design of phase shifters, Interfacing of digital systems)

UNIT-I

INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals &sequences, Classification of Discrete time systems, stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems,

UNIT-II

DISCRETE FOURIER SERIES &FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Time Fourier transforms, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT-III

DESIGN OF IIR DIGITAL FILTERS & REALIZATIONS:

Analog filter approximations Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT-IV

DESIGNOFFIRDIGITALFILTERS&REALIZATIONS:

Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters, Basic structures of FIR systems

UNIT-V

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Spectrum of Down Sampling, Up Sampling, Interpolation, Spectrum of Up Sampling, Cascading Sample Rate Converters, Sampling Rate Conversion, Applications of Multirate DSP, Filter Banks.

TEXTBOOKS:

1. DigitalSignalProcessing,Principles,Algorithms,and Applications:JohnG.Proakis,DimitrisG.Manolakis,PearsonEducation/PHI,2007.
2. DiscreteTimeSignalProcessing–A.V.OppenheimandR.W. Schaffer,PHI

ReferenceBooks:

1. Digital Signal Processing: Andreas Antoniou,TATAMcGrawHill,2006
2. DSPPrimer-C.BrittonRorabaugh, TataMcGrawHill,2005.
3. Digital signal processing: P. Ramesh babu, SCITECH Publications

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	3	1	2	-	-	-	-	-	-	2
CO4	3	3	3	1	2	-	-	-	-	-	-	2
CO5	3	3	3	1	2	-	-	-	-	-	-	2

Year &Sem	III Year – I Semester					
Course Code	22UME25	L	T	P	SS	C
Course Name	SUSTAINABLE ENERGY TECHNOLOGIES	3	0	0	0	3

COURSE OBJECTIVES:

The objective of this course is to make student understand the

1. Learn the fundamental concepts about solar energy systems and devices.
2. Design wind turbine blades and know about applications of wind energy for water pumping and electricity generation.
3. To know about Biomass energy, mini-micro hydro systems
4. Understand the working of OTEC system and different possible ways of extracting energy from ocean.
5. To understand the concepts of geothermal energy.

UNIT-I SOLAR ENERGY: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder. Solar Thermal systems: Flat plate collector; Solar distillation; Solar Pond electric power plant.

SOLAR ELECTRIC POWER GENERATION- Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system.

UNIT – II WIND ENERGY: Introduction, History of Wind Energy, Wind Energy Scenario of World and India. Basic principles of Wind Energy Conversion Systems (WECS), Types and Classification of WECS, Parts of WECS, Power, torque and speed characteristics, Electrical Power Output and Capacity Factor of WECS, stand alone, grid connected and hybrid applications of WECS, Economics of wind energy utilization, Site selection criteria, Wind farm, Wind rose diagram.

UNIT – III BIOMASS ENERGY: Photosynthesis process, Biomass fuels, Biomass energy conversion technologies and applications, Urban waste to Energy Conversion, Biomass Gasification, Types and application of gasifier, Biomass to Ethanol Production, Biogas production from waste biomass, Types of biogas plants, Factors affecting biogas generation, Energy plantation, Environmental impacts and benefits, Future role of biomass, Biomass programs in India.

UNIT-IV TIDAL ENERGY: Introduction, Capacity and Potential, Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power Plants. Ocean Thermal Energy: Introduction, Ocean Thermal Energy Conversion (OTEC), Principle of OTEC system, Methods of OTEC power generation.

UNIT – V GEOTHERMAL ENERGY: Introduction, vapor and liquid dominated systems, binary cycle, hot dry rock resources, magma resources, advantages and disadvantages, applications, MHD Power generation: concept and working principle, Environmental impacts, Economic and social considerations, Financing mechanisms, Carbon credits, clean development mechanisms.

TEXT BOOKS:

1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006
2. Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition.
3. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH.

REFERENCES:

1. Alternative Building Materials and Technologies - K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New Age international.

2. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth & John F Kreider /Taylor & Francis.
3. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd.
4. Renewable Energy Technologies -Ramesh & Kumar /Narosa.
5. Non-conventional Energy Source- G.D Roy/Standard Publishers.
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd.
7. Fuel Cell Technology -Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

COURSE OUTCOMES:

Upon completion of this course, students will gain the ability to:			
CO NO.	**COURSE OUTCOMES**	**BLOOM'S TAXONOMY**	**LEVEL**
CO-1	Describe the use of solar energy and the various components used in the energy production with respect to applications like-heating, cooling, desalination, power generation.	Understanding And evaluate	**L2, L5**
CO-2	Understand the conversion principles of wind energy.	Understanding	**L2**
CO-3	Understand the concept of biomass energy resources.	Understanding	**L2**
CO-4	Acquire the basic knowledge of ocean thermal energy conversion and hydrogen energy	Understanding	**L2**
CO-5	Utilize the concepts of geothermal energy	Evaluate	**L5**

MAPPING OF CO'S VS PO'S & PSO'S:

	PO'S												**PSO'S**			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
1	**3**	**2**	**2**	**NC**	**NC**	**2**	**NC**	**NC**	**NC**	**NC**	**NC**	**2**	**2**	**3**	**NC**	**NC**
2	**3**	**2**	**3**	**NC**	**NC**	**3**	**NC**	**NC**	**NC**	**NC**	**NC**	**3**	**2**	**3**	**NC**	**NC**
3	**3**	**3**	**2**	**NC**	**NC**	**3**	**NC**	**NC**	**NC**	**NC**	**NC**	**2**	**2**	**3**	**NC**	**NC**
4	**3**	**2**	**2**	**NC**	**NC**	**2**	**NC**	**NC**	**NC**	**NC**	**NC**	**2**	**2**	**3**	**NC**	**NC**
5	**3**	**2**	**2**	**NC**	**NC**	**3**	**NC**	**NC**	**NC**	**NC**	**NC**	**2**	**2**	**3**	**NC**	**NC**

(1-Low, 2-Medium, 3-High)

Year & Sem	III Year – I Semester					
Course Code	22UEC37	L	T	P	SS	C
Course Name	DIGITAL COMMUNICATIONS LABORATORY	0	0	3	0	1.5

List of Experiments: (Twelve experiments to be done- The students have to calculate the relevant parameters) – (A. Hardware, B. MATLAB Multisim or MATLAB or Open Source)

List of Experiments

14) Time division multiplexing.
15) Pulse code modulation
16) Differential pulse code modulation.
17) Delta modulation.
18) Frequency shift keying.
19) Phase shift keying.
20) Differential phase shift keying.
21) Companding
22) Source Encoder and Decoder
23) Linear Block Code-Encoder and Decoder
24) Binary Cyclic Code-Encoder and Decoder
25) Convolution Code –Encoder and Decoder
26) BCH Codes

Software required:

v) Computer Systems with latest specifications
vi) Connected in LAN (Optional)
vii) Operating system (Windows/Linux software)
viii) Simulations software (Simulink & MATLAB)

Equipment required for Laboratories:

1. RPS-0–30V
2. CRO-0 –20 MHz.
3. FunctionGenerators-0–1MHz
4. RFGenerators-0–1000M Hz./0–100MHz.
5. Rated Voltmeters and Ammeters
6. Lab Experimental kits for Digital Communication
7. Components
8. Bread boards and Multi-meters
9. Spectrum Analyze

Course learning objectives:

1. To evaluate the performance of PCM, DPCM and Delta modulation schemes.
2. To implement different digital modulation schemes like FSK, PSK, and DPSK.
3. To analyze source/channel encoding & decoding methods.
4. To Simulate Pulse Digital Modulation & demodulation using MATLAB
5. To Simulate digital communication techniques like ASK, FSK &PSK

Course Outcomes (COs):

At the end of the course, the student will be able to
1.Evaluate the performance of PCM, DPCM and Delta modulation schemes.
2.Implement different digital modulation schemes like FSK, PSK, and DPSK.
3.Analyze source/channel encoding & decoding methods.
4.Simulate Pulse Digital Modulation & demodulation using MATLAB.
5.Simulate digital communication techniques like ASK, FSK & PSK.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	2	3	-	-	1	1	1	-	-
CO2	3	-	3	2	-	-	-	1	1	1	-	-
CO3	2	-	3	3	-	-	-	1	1	1	-	-
CO4	2	-	2	2	3	-	-	1	1	1	-	-
CO5	2	-	2	2	3	-	-	1	1	1	-	-

Year & Sem	III Year – I Semester					
Course Code	22UEC38	L	T	P	SS	C
Course Name	ANALOG AND DIGITAL ICS APPLICATIONS LAB	0	0	3	0	1.5

List of Experiments: (Minimum 10experiments to be conducted)

PART-A: DIGITAL ICS APPLICATIONS

1. Realization of Logic Gates
2. Design of Full Adder using 3 modeling systems
3. 8 to 3 Encoder and 3 to 8 Decoder
4. 8x1Multiplexer– 74151 and 2x4 De-multiplexer– 74155
5. 4-bit Comparator– 7485
6. D Flip-Flop– 7474
7. Decade Counter – 7490
8. Shift Register– 7495

Note: Students are required to design and draw the internal logical structure of the above Digital ICs and to develop VHDL/Verilog HDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

PART-B: ANALOG ICS APPLICATIONS

1. Op-Amp Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order).
4. Function Generator using Op-Amps.
5. IC 555 Timer – Monostable Operation Circuit.
6. IC 555 Timer – Astable Operation Circuit.
7. 4-bit DAC using Op-Amp.

References:

1. J.Bhasker, "VHDLPrimer", 3rd Edition, Pearson Education/PHI.
2. John F.Wakerly, "Digital Design: Principles and Practices", 3rdEdition, PHI/Pearson Education.
3. D. Roy Choudhury, "Linear Integrated Circuits", 2nd Edition, New Age International (P) Ltd 2003.

Course Objectives:

- Design and implementation of various digital logic families and interfacing concepts
- VHDL fundamentals were discussed to modeling the digital system design block
- Learn various applications of analog integrated circuits
- Acquire skills required for designing and testing of integrated circuits

Course Outcomes (COs):

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

1. Design various combinational and sequential circuits using various digital ICs.
2. Design circuits using different analog integrated for various applications
3. Know the differences between linear and digital integrated circuits.
4. Demonstrate their knowledge by designing analog circuits and digital circuits.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO–PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	3	-	-	-	-	-	-	2
CO2	1	2	3	2	1	-	-	-	-	-	-	2
CO3	3	2	3	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	3	-	-	-	-	-	-	2

Year &Sem	III Year – I Semester					
Course Code	22UCS30	L	T	P	SS	C
Course Name	OOPS through Java Lab	0	0	3	0	1.5

Course Outcomes: At the end of the course, students will be able to — Knowledge Level (K)#

CO1	Identify classes, objects, members of a class and the relationship among them needed for a specific problem	K3
CO2	Implement programs to distinguish different forms of inheritance	K4
CO3	Create packages and to reuse them	K3
CO4	Develop programs using Exception Handling mechanism	K3
CO5	Develop multithreaded application using synchronization concept.	K6
CO6	Design GUI based applications using Swings and AWT.	K6

List of programs to be executed:

1. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1Every subsequent value is the sum of the 2 values preceding it. Write a Java Program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence.

2. Write a Java Program that prompts the user for an integer and then prints out all the prime numbers upto that integer.

3. Write a java program to implement call by value and call by reference mechanisms.

4.Write a Java Program that checks whether a given string is a palindrome or not.

5.Write a Java Program to check the compatibility for multiplication, if compatible multiply two matrices and find its transpose.

6.Write a Java program to implement constructor overloading and method overloading.

7.Write a Java Program that illustrates how run time polymorphism is achieved.

8.Write a Java Program that illustrates the use of super keyword. 9.Write a Java Program to create and demonstrate packages.

10.Write a Java Program, using String Tokenizer class, which reads a line of integers and then display search integer and the sum of all integers.

11.Write a Java Program that reads on file name form the user then displays information about whether the file exists, whether the file is readable/ writable, the type of file and the length of the file in bytes and display the content of the using File Input Stream class.

12.Write a Java Program that displays the number of characters, lines and words in a text/text file.

13.Write a Java Program to implement a Queue, using user defined Exception Handling (also make use ofthrow, throws).

14. Write a Java Program that creates 3 threads by extending Thread class. First thread displays "Good Morning" every 1 sec, the second thread displays "Hello" every 2 seconds and the third displays"Welcome"every 3 seconds. (Repeat the same by implementing Runnable).

15.Write a Java Program demonstrating the life cycle of a thread.

16. Write an Applet that displays the content of a file.

17.Write a Java Program that works as a simple calculator. Use a gridlay out to arrange buttons for the digits and for the +-*?% operations. Add a text field to display the result.

18.Writea Java Program for handling mouse events, keyboard events.

19. Write a Java Program that allows user to draw lines, rectangles and ovals.

20.Write a Java Program that lets users create Piecharts. Design your own user interface (with Swings & AWT).

Year &Sem	III Year – II Semester					
Course Code	22UEC39	L	T	P	SS	C
Course Name	VLSI Design	3	0	0	0	3

COURSE OBJECTIVES:

- Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
- Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
- Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.
- Understand the concept of synthesis and different testing techniques.
- Understand the FPGA Design process.

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be interconnected in silicon.

CO2: Know three sets of design rules with which nMOS and CMOS designs may be fabricated.

CO3: Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon.

CO4: Able to identify different types of faults and suitable Testing technique.

CO5: Design various applications using FPGA.

UNIT-I:

Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. NMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.

UNIT-II

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2µm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µm Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic DiagramsTranslation to Mask Form.

UNIT-III

Basic Circuit Concept: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

UNIT-IV

Introduction to Synthesis: Logic synthesis, RTL synthesis, High level Synthesis.

Design for Testability: Fault types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based Techniques and Built-In Self-Test techniques.

UNIT-V

FPGA Design: Complex Programmable Logic Devices (CPLDs), Basic FPGA Architecture, FPGA Configuration, Configuration Modes, FPGA Design Process- FPGA Design Flow, FPGA Families, FPGA Design Examples - Stack, Queue and Shift Register Implementation using VHDL, Step-by-step approach of FPGA design process on Xilinx environment.

INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET.

TEXT BOOKS

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGrawHill Education, 2003.

REFERENCES

1. Advanced Digital Design with the Verilog HDL, Michael D.Ciletti, Xilinx Design Series, Pearson Education.
2. Integrated Nano electronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.

Contribution of Course Outcomes (CO's) towards the achievement of Programme Outcomes (PO's)

(Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	3	-	-	-	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-
CO3	1	3	3	2	2	-	-	-	-	-	-	2
CO4	2	3	3	2	3	-	-	-	-	-	-	2
CO5	1	2	3	-	3	-	-	-	-	-	-	2

Year &Sem	III Year – II Semester					
Course Code	22UEC40	L	T	P	SS	C
Course Name	IOT AND APPLICATIONS	3	1	0	0	3

COURSE OBJECTIVES:

- To learn and understand elements of IoT system.
- Acquire knowledge about various protocols of IoT.
- To learn and understand design principles and capabilities of IoT.

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: Describe internet of Things and challenges posed by IoT networks leading to new models.
CO2: Understand internet of Things and its hardware and software components.
CO3: Remotely monitor data and control devices.
CO4: Learn IoT related protocols and specifications.
CO5: Design real time IoT based applications

UNIT-I: INTRODUCTION TO IOT

Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals-Devices and Gateways, Data Management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT-II: HARDWARE COMPONENTS & SOFTWARE TOOLS OF IOT

Arduino: Architecture and Programming, Raspberry Pi: Architecture and Programming, NodeMCU, Developing IoTs Introduction to Python, Introduction to different IoT tools, developing applications through IoT tools.

UNIT-III: SOLUTION FRAMEWORK FOR IOT

Implementation of Device integration, Data acquisition and integration, Device data storage-Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT-IV

IOT APPLICATION PROTOCOLS

Communication: Sensing, Actuation, I/O interfaces and Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth.

BLUETOOTH SMART CONNECTIVITY

Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, BluetoothLow Energy Architecture, PSoC4 BLE Architecture and Component Overview.

UNIT-V: IOT APPLICATIONS

Domain specific applications of IoT Home automation, Industry applications, Surveillanceapplications, Transportation,Agriculture, Healthcare.

TEXT BOOKS

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw HillEducation,2017.
2. The Definitive Guide to the ARM Cortex-M0 by JosephYiu,2011
3. Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", University Press,2015.
4. Ovidiu Vermesan & Peter Friess, "Internet of Things: Converging Technologies for SmartEnvironments and Integrated Ecosystems", River Publishers Series in Communications, 2017.

REFERENCES

1. Internet of Things with ARDUINO and BOLT, Ashwin Pajankar, BP
2. Internet of Things, Vasudevan, Nagrajan and Sundaram, Wiley India
3. Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.
4. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies,Platforms, and Use Cases", CRC Press,2017.

Contribution of Course Outcomes (CO's) towards the achievement of Programme Outcomes(PO's)

(Strong – 3, Moderate – 2,

Weak 1)CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	2
CO2	3	3	3	3	3	-	-	-	-	-	-	3
CO3	2	2	2	2	-	-	-	-	-	-	-	2
CO4	2	2	3	3	3	-	-	-	-	3	-	3
CO5	3	3	3	2	-	-	-	-	3	-	3	3

Year &Sem	III Year – II Semester					
Course Code	22UEC41	L	T	P	SS	C
Course Name	MICROPROCESSORS AND MICROCONTROLLERS	3	1	0	0	3

COURSE OBJECTIVES:

- To acquire knowledge on microprocessors and microcontrollers.
- To select processors based on requirements.
- To acquire the knowledge on interfacing various peripherals, configure and develop programs to interface peripherals/sensors.
- To develop programs efficiently on ARM Cortex processors and debug.

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: Understand the architecture of microprocessor and their operation

CO2: Demonstrate programming skills in assembly language programming

CO3: Do interfacing design of peripherals like I/O, A/D, D/A, timer, etc

CO4: Develop systems using different microcontrollers

CO5: Design ARM microcontroller based systems

UNIT-I

Introduction to Microprocessors: Basic Microprocessor Architecture, Overview of 8085, Architecture, Pin Diagram, Memory Organization, Interrupts.

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

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

UNIT-III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacingseven segment displays, Intel 8251 USART Architecture and Interfacing, Intel 8257 DMA Controller, Stepper Motor, A/D and D/A Converters, Need for 8259 ProgrammableInterrupt Controllers.

UNIT-IV

Intel 8051 Microcontroller: Difference between Microprocessor and Microcontroller, Architecture, I/O Ports,external memory, counters/timers, serial data input/output, interrupts.

Assembly language programming: Instructions, addressing modes, simple programs.

Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light controls.

UNIT-V

ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-A Class Processor, ARM Cortex-M0 Processor, ARM Cortex-M3 Processor.

TEXT BOOKS

1. Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Prentice Hall
2. A.K Ray, K.M.Bhurchandhi, "Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000.
3. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay, "The 8051 Microcontrollers and Embedded Systems using Assembly and C", 2nd Edition, Pearson, 2011.
4. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph You.

REFERENCES

1. Dr. Alexander G. Dean, "Embedded Systems Fundamentals with ARM Cortex-M based Microcontrollers: A Practical Approach", ARM Education Media, 2017.
2. Douglas V Hall, SSSP Rao, "Microprocessors and Interfacing: Programming and Hardware", by 3rdEdition, Tata McGraw Hill Education Pvt. Ltd., 1994.
3. Cortex-M3 Technical Reference Manual.

Contribution of Course Outcomes (CO's) towards the achievement of ProgrammeOutcomes (PO's) and Programme Specific Outcomes (PSO's)
(Strong – 3, Moderate – 2, Weak – 1)

CO –PO and PSO MAPPINGS

	PO 1	PO 2	PO	PO 4	PO 5	PO	PO7	PO	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
CO 1	3	2	1	2	1	1	1	-	-	-	-	-	3	-	1	-
CO 2	2	2	2	3	2	2	2	-	-	-	-	-	3	2	2	-
CO 3	3	1	3	2	2	2	2	-	-	-	-	-	3	2	3	-
CO 4	2	2	2	1	2	2	2	-	-	-	-	-	3	2	3	-
CO 5	2	2	3	3	2	2	2	-	-	-	-	-	3	2	3	-

Programme	B.Tech. - ECE					
Year & Sem	III Year – II Semester					
Course Code	22UEC42	L	T	P	SS	C
Course Name	MICROWAVE ENGINEERING	3	1	0	0	3

Course Objectives:

- Understand fundamental electrical characteristics of waveguides and transmission lines through electromagnetic field analysis.
- Understand the generation of microwave signals.
- Understand the basic properties of slow wave structure.
- Understand the basic properties of Polarization and Ferrite materials composition.
- Understand Microwave solid state devices**.**

OUTCOMES:

CO1**:**Design different modes in waveguide structures.

CO2**:**Understand the generation of microwave signals using O-type tubes.

CO3**:**Understand the concept of slow wave structures and the generation of microwave signals using M-type tubes.

CO4**:**Calculate S- matrix for various waveguide components and splitting the microwave energy in a desired direction.

CO5**:**Generation of microwave signals using solid state devices.

UNIT-1

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, pressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes,Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Impossibilityof TEM mode, Related Problems.

UNIT-2

MICROWAVE TUBES: Introduction, Re-entrant Cavities, Microwave tubes – O type and M type classifications, O-type tubes :2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory, Applications,

Reflex Klystrons –Structure, Applegate Diagram and Principle of working, Oscillating Modes and output Characteristics, Electronic Admittance, Applications.

UNIT-3

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations.

M-type Tubes: Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off Condition, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT-4

WAVEGUIDE COMPONENTS AND APPLICATIONS - I: Coupling Mechanisms– Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types, Scattering Matrix– Significance, Formulation and Properties, S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT-5

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes, IMPATT andTRAPATT diodes-Principle of operation and characteristics

.

TEXT BOOKS:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley,2ndEdition,2002.
2. Microwave and Radar Engineering-M. Kulkarni, Umesh Publications, 3rd Edition.
3. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994

REFERENCE BOOKS:

1. Microwave Engineering – G S N Raju , I K International
2. Microwave Engineering- Annapurna Das and Sisir K.Das, Mc Graw Hill Education, 3rd Edition.

Contribution of Course Outcomes (CO's) towards the achievement of Programme Outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)
CO – PO MAPPINGS-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	1	-	1	-	-	-	-	2
CO2	2	3	2	2	1	-	0	-	-	-	-	1
CO3	2	2	2	2	1	-	1	-	-	-	-	1
CO4	1	3	1	1	1	-	0	-	-	-	-	1
CO5	1	3	1	1	1	-	1	-	-	-	-	1

Year & Sem	III Year – II Semester					
Course Code	22UEC45	L	T	P	SS	C
Course Name	Microprocessor & Microprocessors Laboratory	0	0	3	0	1.5

PART- A: (Minimum of 5 Experiments has to be performed) 8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
   a. Addition and Subtraction operations
   b. Multiplication and Division operations.
2. Program for sorting an array.
3. Program for Factorial of given n-numbers.
4. DOS/BIOS Programmimg:Display String With & Without Echo
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.

PART-B: (Minimum of 5 Experiments has to be performed) 8051 Assembly Language Programming and Interfacing

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Average of n-numbers.
3. Program and verify Timer/ Counter in8051.
4. Interfacing Traffic Light Controller to8051.
5. UART operation in8051
6. Interfacing LCD to8051.

PART-C (Minimum of 2 Experiments has to be performed) Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module, DAC module
6. Stepper motor module
7. Key board module

8. Digital Multi-meters
9. ROM/RAM Interface module
10. Bread Board etc.
11. ARM CORTEX M3
12. KEIL MDKARM, Digital Multi-meters

References:

1. A.K Ray, K.M.Bhurchandhi, "Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000.
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay, "The 8051 Microcontrollers and Embedded Systems using Assembly and C", 2nd Edition, Pearson, 2011.

Course Learning Objectives:

To develop & execute variety of assembly language programs of Intel 8086 including arithmetic, Sorting, factorial programming

3. To learn about interfacing Intel 8086 with peripherals
4. To develop & execute simple programs on 8051 Microcontroller
5. To develop programming on ARM based CortexM3 Processsor

Course outcomes:

After the completion of the Course student is able to

1. Carry out basic arithmetic & Logical calculations on 8086 processor
2. Apply the concepts in the design of Micrprocessor based system
3. Design and implement 8051 Microcontroller based system
4. Develop and implement the program written in ARM CortexM3 language

CO-PO-PSO MAPPING

CO.No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	-	-	2	-	-	2
CO2	2	1	1	-	-	-	-	-	-	-	-	2	-	-	2
CO3	2	2	2	-	-	-	-	-	-	-	-	2	-	-	2
CO4	2	1	1	-	-	-	-	-	-	-	-	2	-	-	2

Year & Sem	IIIYear – II Semester					
Course Code	22UEC46	L	T	P	SS	C
Course Name	MICROWAVE AND OPTICAL COMMUNICATION LAB	0	0	3	0	1.5

Minimum Twelve Experiments to be conducted:

Part – A (Any 7 Experiments (8 & 9 compulsory)) :
1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. Impedance and Frequency Measurement.
6. Scattering parameters of Circulator.
7. Scattering parameters of Magic Tee.
8. Radiation Pattern of Horn and Parabolic Antennas.
9. Synthesis of Microstip antennas (Rectangular Structure) Using HFSS.

Part – B (Any 5 Experiments) :
10. Characterization of LED.
11. Characterization of Laser Diode.
12. Intensity modulation of Laser output through an optical fiber.
13. Measurement of Data rate for Digital Optical link.
14. Measurement of NA.
15. Measurement of losses for Analog Optical link.

Equipment required for Laboratories:
1. Regulated Klystron Power Supply, Klystron mount
2. VSWR Meter
3. Micro Ammeter
4. Multi meter
5. CRO
6. GUNN Power Supply, Pin Modulator
7. Crystal Diode detector
8. Micro wave components (Attenuation)
9. Frequency Meter
10. Slotted line carriage
11. Probe detector
12. Wave guide shorts
13. SS Tuner
14. Directional Coupler
15. E, H, Magic Tees
16. Circulators, Isolator
17. Matched Loads
18. Pyramidal Horn and Parabolic Antennas
19. Turntable for Antenna Measurements
20. HFSS Software

21. Fiber Optic Analog Trainer based LED
22. Fiber Optic Analog Trainer based laser
23. Fiber Optic Digital Trainer
24. Fiber cables - (Plastic, Glass)

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	3
CO2	3	-	3	3	-	2	-	-	3	3	1	3
CO3	3	3	-	3	3	2	-	-	3	3	1	3
CO4	3	3	3	3	3	2	-	-	3	3	1	3

Year & Sem	III Year – II Semester					
Course Code	22UEC47	L	T	P	SS	C
Course Name	DIGITAL SIGNAL PROCESSIG LABORATORY	0	0	3	0	1.5

1)Minimum of 12 experiments must be conducted.

2) The programs shall be implemented in software (Using MATLAB / Lab view / C programming/ Equivalent) and hardware (Using TI / Analog devices / Motorola / Equivalent DSP processors).

List of Experiments

1. To find DFT / IDFT of given DT signal
2. Implementation of Linear Convolution between two finite length sequences
3. Implementation of Circular Convolution between two finite length sequences.
4. To find frequency response of a given system (in Transfer Function form).
5. Implementation of FFT/IFFT of given sequence
6. Determination of power spectrum of a given signal(s).
7. Implementation of LP FIR filter for given sequence
8. Implementation of HP FIR filter for given sequence
9. Implementation of LP IIR filter for given sequence
10. Implementation of HP IIR filter for given sequence
11. Generation of sinusoidal signal through filtering
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D sampling rate converters.
15. Audio application such as to plot a time and frequency display of microphone plus a cosine using DSP. Read a .wav file and match with their respective spectrograms.
16. Impulse response of first order and second order systems

References:

Digital Signal Processing Using MATLAB, 3rd ed.: John G.Proakis, TMH Publications.

Course Learning Objectives:

1.To study about discrete time systems
2. To learn about FFT algorithms.
3. To study the design techniques for IIR digital filters
4. To study the design techniques for FIR digital filters
5. To study the properties of Multirate digital signal processing and about QMF filters.

Course Outcomes:

After completion of this course, the students will be able to

CO1:. Applythedifferenceequationsconceptintheanalysisof Discretetimesystems

CO2: Use the FFT algorithm for solving the DFT.

CO3: Design and Realize a Digital IIR filter from the given specifications

CO4: Design and Realize a Digital FIR filter from the given specifications

CO5: Use the Multirate Processing concepts in various applications (eg: Design of phase shifters, Interfacing of digital systems)

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	3	1	2	-	-	-	-	-	-	2
CO4	3	3	3	1	2	-	-	-	-	-	-	2
CO5	3	3	3	1	2	-	-	-	-	-	-	2

Year & Sem	III Year – II Semester					
Course Code	22UEC48	L	T	P	SS	C
Course Name	IOT AND APPLICATIONS LAB	0	0	3	0	2

List of Experiments:

1. Introduction to Raspberry Pi Board/ Arduino/NodeMCU
2. To interface rain drop and soil moisture sensors with Arduino.
3. To interface Gas Sensor (MQ-2) with Arduino for Smoke Detection
4. To interface ultrasonic sound sensor with Arduino and print the output on serial monitor
5. To interface temperature and humidity sensor with Arduino and print the output on LCD
6. Automatic street light control to control the street light (Turn on and off based on the light)using Arduino/Node MCU/RaspberryPi.
7. Detecting obstacle with IR Sensor and Arduino/Node MCU/RaspberryPi
8. To interface capacitor sensor (touch sensor) with smart phone and write a program to turnRGB LED ON/OFF when '1'/'0' is received from smart phone using Bluetooth.
9. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ONmotor when push button is pressed.
10. Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humiditydata to/from thingspeak cloud

Equipment required for Laboratories:

Boards:

1. Arduino Uno Board
2. Node MCU Board
3. Raspberry Pi Board

Sensor Modules:

1. Rain Drop Sensor
2. Soil Moisture Sensor
3. MQ-2 Gas Sensor
4. Ultrasonic sound sensor
5. DHT-11 Sensor

6. LDR Sensor
7. IR Sensor
8. Bluetooth Module (HC-05)
9. DC Motor
10. Relay Module

References:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti,Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD),2014, ISBN: 978935023975

Course Outcomes (COs):

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

1. Understand the concept of Internet of Things
2. Implement interfacing of various sensors with Arduino/Raspberry Pi.
3. Demonstrate the ability to transmit data wirelessly between different devices.
4. Show an ability to upload/download sensor data on cloud.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes(PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO–PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	3
CO2	3	3	3	3	3	2	-	-	3	3	1	3
CO3	3	3	3	3	3	2	-	-	3	3	1	3
CO4	3	3	3	3	3	2	-	-	3	3	1	3

List of the **OPEN ELECTIVES** offered by **ECE** Department to **other Branches**:

1. Basics of Signals and Systems
2. Electronic Measurements and Instrumentation
3. Principles of Signal Processing
4. Industrial Electronics
5. Consumer Electronics
6. Fundamentals of Microprocessors and Microcontrollers
7. Transducers and Sensors
8. IOT and Applications
9. Soft Computing Techniques
10. IC Applications
11. Principles of Communications
12. Basic Electronics
13. Data Communications
14. Digital Logic design
15. Remote Sensing and GIS
16. Bio Medical Instrumentation

Year &Sem					
Course Code	22UEC18	L	T	P	C
Course Name	BASICS OF SIGNALS AND SYSTEMS	3	0	0	3

Unit I:
Introduction: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems.

Unit II:
Time-domain representations for LTI systems: Convolution, impulse response representation, Convolution Sum and Convolution Integral. Properties of impulse response representation, Differential and difference equation Representations, Block diagram representations.

UNIT III:
Frequency-domain representation for signals: Introduction, Discrete-time and continuous-time Fourier series (derivation of series excluded) and their properties. Discrete-time and continuous-time Fourier transforms (derivations of transforms are excluded) and their properties.

Unit IV:
Applications of Fourier representations: Introduction, Frequency response of LTI systems, Fourier transform representation of periodic signals, Fourier transform representation of discrete time signals.

Unit V:
LAPLACE & Z-TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal.
Z-Transforms: Introduction, Z-transform, properties of ROC, properties of Z – transforms, inversion Z-transforms. Z-Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations

TEXT BOOKS:
1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", Pearson, 2nd Edn.
2. B. P. Lathi, "Linear Systems and Signals", Second Edition, Oxford University Press,
3. Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition.

Reference Books:
1. Michel J. Robert, "Fundamentals of Signals and Systems", MGH International Edition, 2008.
2. Ramakrishna Rao,"Signals and Systems", 2008, TMH

Course Outcomes:
1. Understand linear time invariant systems.
2. Apply the concepts of Fourier series representations to analyze continuous and discrete time periodic signals.
3. Understand and apply the continuous time Fourier transform, discrete time Fourier transform,
4. Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems

Year &Sem					
Course Code	**22UEC19**	**L**	**T**	**P**	**C**
Course Name	**ELECTRONIC MEASUREMENTS AND INSTRUMENTATION**	**3**	**0**	**0**	**3**

UNIT I

Performance characteristics of instruments, Static characteristics; Accuracy, Resolution, Precision, Expected value, Error, Sensitivity, Dynamic Characteristics, speed of response, Fidelity, Lag and Dynamic error. Types of errors in measurements and their analysis, Design of multi-range AC , DC meters (voltmeter &ammeter) and ohmmeter(series &shunt type) using D'arsonval movement. True rms meter.

UNIT II

Specifications and designing aspects of Signal Generators – AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT III

Oscilloscopes- general purpose CROs; block diagram , functions and implementation of various blocks, specifications, various controls and their functions , types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns, Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope

UNIT IV

Bridge circuits- Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge, Measurement of capacitance-Schearing Bridge. Wien Bridge, Errors and precautions in using bridges, Q-meter; principle of operation, measurement methods and sources of errors, Counters: principle of operation -modes of operation- totalizing mode, frequency mode and time period mode- sources of errors.

UNIT V

Transducers- active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers. Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement

TEXT BOOKS:

1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGrawHill, 2004.

2. Modern Electronic Instrumentation and Measurement Techniques – A.D. HelfrickandW.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 3rd Edition,2013.

2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. Dhanpat Rai & Co, 12thEdition,2002.

Course Outcomes:

The student will be able to

1. Select the instrument to be used based on the requirements.
2. Understand and analyze different signal generators and analyzers.
3. Understand the design of oscilloscopes for different applications.
4. Design different transducers for measurement of different parameters.

Year &Sem					
Course Code	22UEC20	L	T	P	C
Course Name	PRINCIPLES OF SIGNAL PROCESSING	3	0	0	3

Unit I:
Discrete Signals and Systems- A Review – Introduction to DFT – Properties of DFT – Circular Convolution – Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering.

Unit II:
Structures of IIR filters – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation.

Unit III:
Structures of FIR filters – Linear phase FIR filter – Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques

Unit IV:
Multirate signal processing: Basic building blocks of multirate DSP, Decimation, Interpolation, Sampling rate conversion by a rational factor, Multistage Sampling Rate Converters.

Unit V:
Adaptive Filters: Introduction, LMS and RLS Adaptation Algorithms, Applications of adaptive filtering to equalization, noise cancellation.

TEXT BOOKS:
1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI

Reference Books:
1. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
2. Understanding Digital Signal Processing 2nd Edition by Richard G.Lyons

Course Outcomes:
1. Use the FFT algorithm for solving the DFT of a given signal
2. Design a Digital filter (FIR&IIR) from the given specifications
3. Realize the FIR and IIR structures from the designed digital filter.
4. Use the Multirate Processing concepts in various applications
5. Apply the Adaptive signal processing concepts to various signal processing applications

Year &Sem					
Course Code	22UEC21	L	T	P	C
Course Name	INDUSTRIAL ELECTRONICS	3	0	0	3

UNIT - I

DC Amplifiers: Need for DC amplifiers, DC amplifiers - Drift, Causes, Darlington Emitter Follower, Cascode amplifier, Stabilization, Differential amplifiers - Chopper stabilization, Operational Amplifiers, Ideal specifications of Operational Amplifiers, Instrumentation Amplifiers.

UNIT - II

Regulated Power Supplies: Block diagram, Principle of voltage regulation, Series and Shunt type Linear Voltage Regulators, Protection Techniques - Short Circuit, Over voltage and Thermal Protection. Switched Mode & IC Regulators: Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators - Current boosting .

UNIT - III SCR and Thyristor: Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors - Classes A, B, C, D, E and F, Ratings of SCR.

UNIT - IV Applications of SCR in Power Control: Static circuit breaker, Protection of SCR, Inverters - Classification, Single Phase inverters, Converters –single phase Half wave and Full wave. DIAC, TRIAC and Thyristor Applications: Chopper circuits – Principle, methods and Configurations, DIAC AND TRIAC, TRIACS – Triggering modes, Firing Circuits, Commutation.

UNIT – V Industrial Applications –

I: Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital timers, Time base Generators. Electric Welding Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control. Industrial Applications –

II: High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonics – Generation and Applications.

TEXTBOOKS:

1. Industrial and Power Electronics – G. K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.
2. Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972

REFERENCE BOOKS:

1. Electronic Devices and circuits – Theodore. H. Bogart, Pearson Education, 6th Edn., 2003.
2. Thyristors and applications – M. Rammurthy, East-West Press, 1977.
3. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs, ISE

Course Outcomes:

1. Understand the concept of DC amplifiers.
2. Analyze and design different voltage regulators for real time applications
3. Describe the basis of SCR and Thyristor
4. Determine the performance of DIAC and TRIAC
5. Develop real time application using electronics

Year &Sem					
Course Code	22UEC22	L	T	P	C
Course Name	CONSUMER ELECTRONICS	3	0	0	3

Unit I:

Audio Systems: Microphones and Loudspeakers: Carbon, moving coil, cordless microphone, Direct radiating and horn loudspeaker, Multi-speaker system, Hi-Fi stereo and dolby system. Concept to fidelity, Noise and different types of distortion in audio system

Unit II:

Digital Audio Fundamentals:

Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

Unit III:

Television: Basics of Television: Elements of TV communication system, Scanning and its need, Need of synchronizing and blanking pulses, VSB, Composite Video Signal, Colour Television: Primary, secondary colours, Concept of Mixing, Colour Triangle, Camera tube, PAL TV Receiver, NTSC, PAL, SECAM

Unit IV:

Digital Transmission and Reception: Digital satellite television, Direct-To-Home(DTH) satellite television, Introduction to :Video on demand, CCTV, High Definition(HD)-TV. Introduction to Liquid Crystal and LED Screen Televisions Basic block diagram of LCD and LED Television and their comparison

Unit V:

Introduction to different type of domestic/commercial appliances: Operation of Micro-wave oven, Food Processors, Digital Electronic Lock, Vacuum cleaner, Xerox Machine, Scanner

Test Books:

1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company
4. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi

Course Outcomes:

1. Understand the various type of microphones and loud speakers.
2. To identify the various digital and analog signal.
3. Describe the basis of television and composite video signal.
4. Describe the various kind of colour TV standards and system.
5. Compare the various types of digital TV system.
6. Understand the various type of consumer goods.

Year &Sem					
Course Code	22UEC23	L	T	P	C
Course Name	FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3

UNIT I
8085 PROCESSOR
Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts,Interrupts.
8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration
UNIT II
8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.
UNIT-III
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
8051 MICRO CONTROLLER
Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts– Timing Diagram — Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085.
UNIT V
MICRO CONTROLLER PROGRAMMING & APPLICATIONS
Simple programming exercises- key board and display interface –Control of servo motor stepper motor control- Application to automation systems.
TEXTBOOKS:
1. R.S. Gaonkar, Microprocessor Architecture Programming and Application, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
2. A.K Ray, K.M.Bhurchandhi," Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000.
3. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; Pearson 2-Edition, 2011.
REFERENCEBOOKS:
1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata Mc Graw Hill Education Private Limited,3rdEdition,1994
Course Outcomes:
At the end of this course the student will be able to:
1. Understand the architecture of microprocessor/microcontroller and their operation.
2. Demonstrate programming skills in assembly language for processors and controllers.
3. Analyze various interfacing techniques and apply them for the design of processor/Controller based systems.

Year &Sem					
Course Code	22UEC24	L	T	P	C
Course Name	TRANSDUCERS AND SENSORS	3	0	0	3

UNIT – I

Measurements and Instrumentation of Transducers: Measurements – Basic method of measurement – Generalized scheme for measurement systems – Units and standards – Errors – Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers.

UNIT – II

Characteristics of Transducers: Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs

UNIT – III

Resistive Transducers: Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer

UNIT – IV

Inductive and Capacitive Transducer: Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

UNIT- V Miscellaneous Transducers: Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers

TEXT BOOKS:

1. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, Dhanpat Rai & Company Private Limited, 2007.

2. Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.

REFERENCE BOOKS:

1. Renganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.

2. Doebelin. E.A, "Measurement Systems – Applications and Design", Tata McGraw Hill, New York, 2000

3. John. P, Bentley, "Principles of Measurement Systems", III Edition, Pearson Education, 2000.

4. Murthy. D. V. S, "Transducers and Instrumentation", Prentice Hall of India, 2001.

4. Sensor Technology Hand Book – Jon Wilson, Newne 2004.

5. Instrument Transducers – An Introduction to their Performance and design – by Herman K. P. Neubrat, Oxford University Press

Course Outcomes:

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

1. Use concepts in common methods for converting a physical parameter into an electrical quantity
2. Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light
3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc
4. Predict correctly the expected performance of various sensors

5. Locate different type of sensors used in real life applications and paraphrase their importance

6. Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers

7. develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system.

Year &Sem					
Course Code	22UEC25	L	T	P	C
Course Name	IOT AND APPLICATIONS	3	0	0	3

UNIT I:

Introduction to IoT: Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT II:

Elements of IoT: Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT III:

IoT Application Development: Communication, IoT Applications, Sensing, Actuation, I/O interfaces.

Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth.

Bluetooth Smart Connectivity Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT IV:

Solution framework for IoT applications: Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT V:

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation. Cloud Analytics for IoT Application :Introduction to cloud computing, Difference between Cloud Computing and Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT, Connecting IoT to cloud, Cloud Storage for IoT Challenge in integration of IoT with Cloud.

Text Books:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education,2017.

2. The Definitive Guide to the ARM Cortex-M0 by JosephYiu,2011

3. Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", UniversityPress,2015

References:

1. CypressSemiconductor/PSoC4BLE(BluetoothLowEnergy)ProductTrainingModules.

2.PethuruRajandAnupamaC.Raman,"TheInternetofThings:EnablingTechnologies,Platforms,andUse Cases",CRCPress,2017.

Course Outcomes:

The student will be able to:

1. Understand internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication modules.
3. Remotely monitor data and control devices.
4. Design real time IoT based applications

Year &Sem					
Course Code	22UEC26	L	T	P	C
Course Name	SOFT COMPUTING TECHNIQUES	3	0	0	3

UNIT –I:

Introduction to soft computing: Introduction, Artificial Intelligence, Artificial Neural Networks, Fuzzy systems, Genetic Algorithm and Evolutionary programming, Swarm Intelligent systems, Expert systems, Comparison among Intelligent systems.

UNIT –II:

Artificial Neural Networks: Introduction to Artificial Neural Networks, Classification of ANNS, First generation neural networks, Perceptron network, Adaline, Madaline, Second generation neural networks, Back propagation neural networks, Hopfield Neural Network, Kohonen neural network, Hamming neural network, Radial basis function neural networks, spike neuron models.

UNIT –III:

Fuzzy Logic System: Introduction to fuzzy logic, classical sets and fuzzy sets, fuzzy set operations, fuzzy relations, fuzzy composition, natural language and fuzzy interpretations, fuzzy inference system, fuzzy controllers

UNIT –IV:

Genetic Algorithm: Introduction to Genetic algorithms, Genetic algorithms, procedures of Gas, working of Gas, Travelling sales man problem, Evolutionary programming, working principle of GA Machine learning classifier system

UNIT –V:

Swarm Intelligent system: Introduction to swarm intelligence, back ground, Ant colony system, working of ant colony optimization, Particle swarm intelligent systems, Artificial bee colony system, cuckoo search algorithm..

TEXT BOOKS:

1. Soft computing with MATLAB programming—N.P.Padhy, S.P.Simon, Oxford university press, 2015
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.
3. Introduction to Artificial Neural Systems-Jacek.M.Zurada, Jaico Publishing House,1999

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. &Folger T.A., Prentice-Hall of IndiaPvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.
3. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
4. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
5. Elements of Artificial Neural Networks - KishanMehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
6. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
7. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi.

Course Outcomes:

1. Develop intelligent systems leveraging the paradigm of soft computing techniques.
2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.

3. Recognize the feasibility of applying a soft computing methodology for a particular problem
4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
5. Design hybrid system to revise the principles of soft computing in various application

Year &Sem					
Course Code	22UEC27	L	T	P	C
Course Name	IC APPLICATIONS	3	0	0	3

Unit I:
Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics, General Linear Applications of Op-Amp: Adder, Subtractor, Differentiators and Integrators, Active Filters and Oscillators, Non linear Applications of OPAMP: Comparators, Schmitt Trigger, Multivibrators

Unit II:
Introduction to 555 Timer, Functional Diagram, Monostable and Astable Operations and Applications, Schmitt Trigger, PLL- Introduction, Block Schematic, Principles and Description of individual Blocks of 565, VCO.

Unit III:
Introduction, Basic DAC Techniques - Weighted Resistor Type. R-2R Ladder Type, inverted R-2R Type. Different types of ADCs - Parallel Comparator Type. Counter Type. Successive Approximation Register Type and Dual Slope Type DAC and ADC Specifications.

Unit IV:
Use of TTL-74XX Series & CMOS 40XX Series ICs, TTL ICs - Code Converters, Decoders, Demultiplexers, Encoders, Priority Encoders, multiplexers & their applications. Priority Generators, Arithmetic Circuit ICs-Parallel Binary Adder/Subtractor Using 2's Complement System, Magnitude Comparator Circuits.

Unit V:
Commonly Available 74XX & CMOS 40XX Series ICs - RS, JK.JK Master-Slave. D and T Type Flip-Flops & their Conversions, Synchronous and asynchronous counters. Decade counters. Shift Registers & applications.

TEXT BOOKS:
1. Linear Integrated Circuits -D. Roy Chowdhury, New Age International (p)Ltd, 3" Ed., 2008.
2. Digital Fundamentals - Floyd and Jain, Pearson Education,8th Edition, 2005.

REFERENCE BOOKS:
1. Modern Digital Electronics - RP Jain - 4/e - TMH, 2010.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

Course Outcomes:
1. Analyse the Differential Amplifier with Discrete components

2. Describe the Op-Amp and internal Circuitry: 555 Timer, PLL

3. Discuss the Applications of Operational amplifier: 555 Timer, PLL

4. Design the digital application using digital ICs

5. Use the Op-Amp in A to D & D to A Converters

Year &Sem					
Course Code	22UEC28	L	T	P	C
Course Name	PRINCIPLES OF COMMUNICATIONS	3	0	0	3

UNIT-1

Amplitude modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

Single side–band and vestigial sideband methods of modulation: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television

UNIT-II

Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing,

UNITIII Signal Sampling and Analog Pulse Communication: Ideal Sampling, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation. Digital Communication Techniques: Quantization, Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Pulse Code Modulation, Delta Modulation.

UNIT-IV

Noise in analog modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasise in FM.

UNIT-V Transmission of Binary Data in Communication Systems: Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction

Text Books:

1. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.

2. Communication Systems – B.P. Lathi, BS Publication,2006.

References:

1. Principles of Communication Systems - Simon Haykin, John Wiley,2ndEdition.

2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.

3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.

Course Outcomes:

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

1. Analyze the performance of analog modulation schemes in time and frequency domains.
2. Analyze the performance of angle modulated signals.
3. Characterize analog signals in time domain as random processes and noise
4. Characterize the influence of channel on analog modulated signals
5. Determine the performance of analog communication systems in terms of SNR
6. Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

Year &Sem					
Course Code	22UEC29	L	T	P	C
Course Name	BASIC ELECTRONICS	3	0	0	3

Unit I: Semiconductor Basics: Atomic Structure, Semiconductors, Conductors, and Insulators, Covalent Bonds, Conduction in Semiconductors, N-Type and P-Type Semiconductors, Diode, Biasing a Diode, Voltage-Current Characteristic of a Diode, Diode Models.
Diode Applications: Half- Wave Rectifiers, Full-Wave Rectifiers, Power Supply Filters and Regulators.

Unit II: Special-Purpose Diodes: Zener Diodes, Zener Diode Applications, Varactor Diodes, Optical Diodes

Unit III: Bipolar junction Transistors: Transistor Structure, Basic Transistor Operation, Transistor Characteristics and Parameters, Transistor as an Amplifier and Switch

Unit IV: Field-Effect Transistors (FETs): JFET, Characteristics and Parameters, JFET Biasing, MOSFET Characteristics and Parameters

Unit V: Thyristors and Other Devices: Basic 4-Layer Device, The Silicon-Controlled Rectifier, SCR Applications, Unijunction Transistor , IGBT, Phototransistor, Light-Activated SCR, Optical Couplers

Text Books:
1. Electronic Devices conventional current version By Floyd, Seventh Edition, Pearson publications

References:
1. Electronics devices & circuit theory- Robert L.Boylestad and Loui Nashelsky, Pearson/Prentice hall, tenth edition, 2009
2. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition,2007

Course Outcomes:
At the end of this course the student will be able to
1. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
2. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
3. Understand the construction, principle of operation of transistors,

Year &Sem					
Course Code	22UEC30	L	T	P	C
Course Name	DATA COMMUNICATIONS	3	0	0	3

UNIT I:

Introduction to Data Communications: Components, Data Representation, Data Flow, Networks-Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture,

UNIT II:

Data Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame.

UNIT III:

The Network Layer: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router**-**Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet-Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

UNIT IV:

Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control

UNIT V:

Application Layer: Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

TEXT BOOKS:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6thEdition , Pearson,2017.

2. Data Communications and Networking Behrouz A.Forouzan4th Edition McGraw Hill Education,2017.

REFERENCES:

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education, 2003.
3. Understanding Communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning, 2003.

Course Outcomes:

Upon completing this course, the student will be able to

1. Know the Categories and functions of various Data communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms

Year &Sem					
Course Code	22UEC31	L	T	P	C
Course Name	DIGITAL LOGIC DESIGN	3	0	0	3

UNIT – I
REVIEW OF NUMBER SYSTEMS & CODES:
Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.
BOOLEAN THEOREMS AND LOGIC OPERATIONS:
Boolean theorems, principle of complementation & duality, De-morgan theorems, Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT – II
MINIMIZATION TECHNIQUES:
Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method(Quine-mccluskey method) with only four variables and single function.
COMBINATIONAL LOGIC CIRCUITS DESIGN:
Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III
COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :
Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers, Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.
INTRODUCTION OF PLD's :
PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV
SEQUENTIAL CIRCUITS I:
Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop, Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register, Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V
SEQUENTIAL CIRCUITS II :
Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa, Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping)

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI, Niraj.K. Jha 3rdEdition,Cambridge UniversityPress,2009

2. Digital Design by M.Morris Mano, Michael D Ciletti,4th edition PHIpublication,2008

3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCES:

1. FundamentalsofLogicDesignbyCharlesH.RothJr,JaicoPublishers,2006

2. DigitalelectronicsbyRSSedha.S.Chand&companylimited,2010

3. SwitchingTheoryandLogicDesignbyA.AnandKumar,PHILearningpvtltd,2016.

4. DigitallogicapplicationsanddesignbyJohnMYarbough,Cengagelearning,2006.

5. TTL74-Seriesdatabook.

Course Outcomes:

1. Classify different number systems and apply togenerate various codes.

2. Use the concept of Boolean algebra in minimization of switching functions

3. Design different types of combination allogic circuits.

4. Apply knowledge offlip-flops in designing of Registers and counters

5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines

6. Produce innovative designs by modifying the traditional design techniques

Year &Sem					
Course Code	22UEC32	L	T	P	C
Course Name	REMOTE SENSING AND GIS	3	0	0	3

UNIT – I

Introduction to Photogrammetry: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

UNIT – V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data. Data Input: Metadata,
Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications

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

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems
6. Create GIS and cartographic outputs for presentation

Year &Sem					
Course Code	22UEC33	L	T	P	C
Course Name	BIO MEDICAL INSTRUMENTATION	3	0	0	3

UNIT-I

Sources of Bioelectric potentials and Electrodes: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, introduction to bio-medical signals

UNIT-II

The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT- III

Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT-IV

Bio telemetry and Instrumentation for the clinical laboratory Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT-V

X-ray and radioisotope instrumentation and electrical safety of medical equipment:
Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic resonance Imaging System, Ultrasonic Imaging System, Medical Thermography

TEXT BOOK:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A.Pfeiffer – Pearson education.
2. Biomedical signal analysis – Rangaraj, M. Rangayya – Wiley Inter science – John willey & Sons Inc.

Reference:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, (TMH)
2. Introduction to Bio-Medical Engineering – Domach, (Pearson)
3. Introduction to Bio-Medical Equipment Technology – Cart, (Pearson)

Course outcomes:

1. Apply principles and concepts of electronics to analyze input and output signals in medical electronics
2. Apply principles and concepts of electronics to design filters for de-noising of medical measurements
3. Recognize different types of transducers, ongoing progress in improving their design, and their application in medical measurements
4. Apply principles and concepts of engineering to quantify and model measurements of biopotentials
5. Apply principles and concepts of sensing and engineering to (i) design diagnostic devices for detection of markers in biofluids, and (ii) be able to evaluate quality of diagnostic devices
6. Apply engineering tools to evaluate parameters needed for point-of-care health screening and mobile-health, and design of appropriate point-of-care diagnostic devices