VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS):: BHIMAVARAM

Approved by AICTE, Accredited by NAAC-A^{++}, NBA & Affiliated to JNTUK

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG-R20

B.TECH-ELECTRONICS AND COMMUNICATION ENGINEERING

(*Applicable for batches admitted from 2020-2021*)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE

I Year –I SEMESTER

S.No.	Category	Name of the Subject	L	T	P	Credits
1	BSC	Mathematics-I (Linear Algebra & Calculus)	3	0	0	3
2	BSC	Applied Physics	3	0	0	3
3	HSMC	Communicative English	3	0	0	3
4	ESC	Engineering Graphics	2	0	2	3
5	ESC	Computational Thinking &Programming	3	0	0	3
6	HSMC lab	English Communication Skills Lab	0	0	3	1.5
7	BSC lab	Applied Physics Lab	0	0	3	1.5
8	ESC lab	Computational Thinking & Programming Lab	0	0	3	1.5
		TOTAL CREDITS				19.5

I Year – II SEMESTER

S.No.	Category	Name of the Subject	L	T	P	Credits
1	BSC	Mathematics – II (Vector Calculus & Transform Calculus)	3	0	0	3
2	BSC	Applied Chemistry	3	0	0	3
3	ESC	Network Analysis & Electrical Technology	3	0	0	3
4	ESC	Semiconductor Devices and Circuits	3	0	0	3
5	ESC	C & Data Structures	1	0	4	3
6	ESC lab	Semiconductor Devices and Circuits Lab	0	0	3	1.5
7	BSC lab	Applied Chemistry Lab	0	0	3	1.5
8	ESC lab	Engineering Workshop & IT Workshop	0	0	3	1.5
9	MC	Environmental Science	2	0	0	0
		TOTAL CREDITS				19.5

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS):: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year –I Semester

S.No.	Category	Name of the Subject	L	T	P	Credits
1	BSC	Mathematics –III (Complex variables & PDE)	3	0	0	3
2	PCC	Electronic Circuit and Analysis	3	0	0	3
3	PCC	Signals and Systems	3	0	0	3
4	PCC	Switching Theory and Logic Design	3	0	0	3
5	PCC /BSC	Random Variables and Stochastic Process	3	0	0	3
6	PCC	Electronic Circuit and Analysis Lab	0	0	3	1.5
7	PCC	Switching Theory and Logic Design Lab	0	0	3	1.5
8	ESC/PCC	Network Analysis and Electrical Technology Lab	0	0	3	1.5
9	SOC*	Employability Skills Lab (Aptitude/ATL/PCB Design)	1	0	2	2
10	MC	Constitution of India	2	0	0	0
					TOTAL CREDITS	21.5

II Year –II Semester

S.No.	Category	Name of the Subject	L	T	P	Credits
1	BSC	Control Systems	3	0	0	3
2	PCC	Analog Communication	3	0	0	3
3	PCC	Pulse and Digital Circuits	3	0	0	3
4	PCC	Electromagnetic Waves and Transmission lines	3	0	0	3
5	PCC /BSC	Universal Human Values II	2	1	0	3
6	PCC	Signals and Systems Lab	0	0	3	1.5
7	PCC	Analog Communication Lab	0	0	3	1.5
8	ESC/PCC	Pulse and Digital Circuits Lab	0	0	3	1.5
9	SOC	Employability Skills Lab (Aptitude/ATL/PCB Design)	1	0	2	2
10	MC	Critical Reading and Creative Writing	2	0	0	0
					TOTAL CREDITS	21.5
Internship 2 Months (Mandatory) during summer vacation						
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)						4

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS):: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year –I Semester

S.No.	Category	Name of the Subject	L	T	P	Credits
1	PCC	Integrated Circuits and Applications	3	0	0	3
2	PCC	Antenna and Wave Propagation	3	0	0	3
3	PCC	Digital Communication	3	0	0	3
4	OEC/JOE	Open Elective Course/Job oriented elective-I	1	0	4	3
5	PEC	Professional Elective course -I	3	0	0	3
6	PCC	IC Applications Lab	0	0	3	1.5
7	PCC	Digital Communication Lab	0	0	3	1.5
8	SAC/SSC*	Employability Skills Lab (Aptitude/ATL/PCB Design)	1	0	2	2
9	MC	Intellectual Property Rights and Patents	2	0	0	0
10	Summer Internship 2 Months (Mandatory) after II year (to be evaluated during V semester)		0	0	0	1.5
TOTAL CREDITS						21.5
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)						4

PEC:	**OEC/JOE:**
1.Electronic measurement and Instrumentation 2. Internet of Things 3. Electronic Switching Systems	1. Non-Conventional Energy Sources 2. Object Oriented Programming through Java 3. Principles of Mechanics

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS):: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year –II Semester

S.No.	Category	Name of the Subject	L	T	P	Credits
1	PCC	Microprocessors and Microcontrollers	3	0	0	3
2	PCC	Digital Signal Processing	3	0	0	3
3	PCC	Microwave Engineering & Optical Communication	3	0	0	3
4	PEC	Professional Elective course -II	1	0	4	3
5	OEC/JOE	Open Elective Course/Job oriented elective-II	3	0	0	3
6	PCC	Microprocessors and Microcontrollers Lab	0	0	3	1.5
7	PCC	Digital Signal Processing Lab	0	0	3	1.5
8	PCC	Microwave and optical Communication Lab	0	0	3	1.5
9	SAC/SSC	Advanced English Communication Skills Lab	1	0	2	2
10	MC	Essence of Indian Traditional Knowledge	2	0	0	0
11	Industrial/Research Internship (Mandatory) 2 Months during summer vacation					
					TOTAL CREDITS	21.5
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)						4

PEC:	**OEC/JOE:**
1. Computer Networks 2. EMI/ EMC 3. Digital System Design using HDL	1. Data Base Management Systems 2. Computer Aided Design and Analysis 3. NO SQL Databases

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year –I Semester

S.No.	Category	Name of the Subject	L	T	P	Credits
1	PEC	Professional Elective course -III	3	0	0	3
2	PEC	Professional Elective course -IV	3	0	0	3
3	PEC	Professional Elective course -V	3	0	0	3
4	OEC/JOE	Open Elective Course/Job oriented elective-III	3	0	0	3
5	OEC/JOE	Open Elective Course/Job oriented elective-IV	3	0	0	3
6	HSE	Humanities and Social Science Elective	3	0	0	3
7	SAC/SSC	VLSI Design Lab	1	0	2	2
8	Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester		0	0	0	3
TOTAL CREDITS						23
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)						4

PEC- III: 1. Cellular Mobile &Wireless Communications 2. 5G Technology 3 Digital IC Design	**PEC- IV:** 1. Radar & Satellite Systems 2. Cognitive Radio 3. Advance Digital Signal Processing
PEC- V: 1. Digital Image Processing 2. Computer Architecture & Organization 3. TV Engineering	**HSE:** 1. Fundamentals of Entrepreneurship 2. Business Environment 3.Managerial Economics & Management Science
OEC/JOE- III : 1. VLSI Design 2. Operating Systems 3. Industrial Robotics	**OEC/JOE- IV :** 1. Embedded System 2. Design and Analysis of Algorithms 3. Machine Learning

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS):: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year –II Semester

S.No.	Category	Course Title	L	T	P	Credits
1	Major Project	Project work, seminar and internship in industry	--	--	--	8
INTERNSHIP (6 MONTHS)						
					TOTAL CREDITS	**8**

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SUBJECTS FOR HONORS

S.No.	Course Title	L-T-P	Credits	Year & Sem
Track – I: VLSI				
1	CMOS VLSI Design	3-1-0	4	II year -II Sem
2	Low power VLSI Design	3-1-0	4	III year -I Sem
3	VLSI Physical Design	3-1-0	4	III year -II Sem
4	VLSI Verification and Testing	3-1-0	4	IV year -I Sem
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering				
Track – II : IC Manufacturing				
1	Microelectronics Materials	3-1-0	4	II year -II Sem
2	Si Processing Technology	3-1-0	4	III year -I Sem
3	Modeling of Si Transistors	3-1-0	4	III year -II Sem
4	Microelectronics Thin Films	3-1-0	4	IV year -I Sem
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering				
Track – III : Signal Processing				
1	Advanced Digital Signal Processing	3-1-0	4	II year -II Sem
2	Adaptive Signal Processing	3-1-0	4	III year -I Sem
3	Speech Signal Processing	3-1-0	4	III year -II Sem
4	Biomedical Image Processing	3-1-0	4	IV year -I Sem
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering				
Track – IV : Signal Processing				
1	Analytical and Computational Techniques in Electromagnetics	3-1-0	4	II year -II Sem
2	Millimeter Wave Technology	3-1-0	4	III year -I Sem
3	Advanced Optical Systems	3-1-0	4	III year -II Sem
4	Microwave Networks	3-1-0	4	IV year -I Sem
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering				

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS):: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MINOR SUBJETS FOR OTHER BRANCHES

S.No.	Course Title	L-T-P	Credits	Year & Sem
1	Electronic Circuits	3-1-0	4	II year -II Sem
2	IC Design	3-1-0	4	III year -I Sem
3	VLSI Technology	3-1-0	4	III year -II Sem
4	Embedded Systems	3-1-0	4	IV year -I Sem
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering				

List of the **OPEN ELECTIVE / JOB ORIENTED ELECTIVES** offered by ECE Department to other Branches:

S.No.	Course Title	L-T-P	Credits	Year & Sem
Open Elective Course/Job oriented elective-I				
1	Basics of Electronic and Digital Circuits	3-1-0	3	III B.Tech - I Sem
2	Principles of Communication Systems	3-1-0	3	III B.Tech- I Sem
Open Elective Course/Job oriented elective-II				
1	Data Communications	3-1-0	3	III B.Tech - II Sem
2	Fundamentals of Microprocessors and Microcontrollers	3-1-0	3	III B.Tech- II Sem
Open Elective Course/Job oriented elective-III				
1	Principles of Signals and Systems	3-1-0	3	IV B.Tech - I Sem
2	IOT and Applications	3-1-0	3	IV B.Tech - I Sem
Open Elective Course/Job oriented elective-IV				
1	VLSI System Design	3-1-0	3	IV B.Tech - I Sem
2	Information Theory and Coding	3-1-0	3	IV B.Tech- I Sem

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	3

I Year - I Semester

MATHEMATICS-I (LINEAR ALGEBRA & CALCULUS)

Course Objectives:

To enable the students to

- Know the importance of matrices to solve linear equations using matrices.
- Identify and solve various differential equations using corresponding method.
- Apply methods of solving higher order linear differential equations.
- Comprehend the theory of maxima and minima of a function of two variables.
- Analyse the techniques of tracing the curves and evaluate the lengths, areas, volumes of objects using multiple integrals.

UNIT –I: Matrices - Linear system of equations

Introduction, Different types of matrices, Rank-Echelon form - Normal form , Solution of a System of Linear Equations – Non-homogeneous and homogeneous equations, Gauss- Jordan method, Gauss – Elimination Method, LU Decomposition, Applications of electric circuits.

Unit- II: Eigen values - Eigen vectors

Eigen values - Eigen vectors – Properties– Cayley-Hamilton Theorem - finding inverse and power of a matrix by using Cayley-Hamilton theorem, Diagonalization of matrices, Spectral Decomposition and Principal Component Analysis

UNIT –III: Differential Equations

Differential equations of first order and first degree–Exact and Non– exact differential equations, Linear and Bernoulli differential equations. Orthogonal trajectories, Newton‘s Law of cooling, Law of natural growth and decay.

Higher order homogenous and non - homogenous linear differential equations with constant coefficients - Particular integrals for the functions of type eax, sin(ax+b),cos(ax+b), Polynomial of x , eax V(x) ,L-C-R Circuits

UNIT –IV : Partial Differentiation

Functions of several variables- Partial derivatives, Total derivative, Chain rule, Change of variables, Jacobians, Functional dependence.Generalized Mean Value theorem –Taylor’s theorem and Maclaurin’s theorem (without proof) for a function of two variables,Maxima and Minima of functions of two variables, Lagrange’s method of undetermined multipliers

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit –V : Multiple Integrals and Applications

Review of Curve tracing-Cartesian-Polar and Parametric curves. Multiple integrals - double integrals - change of variables (Cartesian and Polar coordinates), Change of order of integration and Evaluation of triple integrals, computing area and volume.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012
2. Erwin .Kreyszig,Advanced Engineering Mathematics,9th Ed., Wiley, 2012.

References:

1. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014
2. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
3. D. S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, reprint, 2008.

Course Outcomes:

After completing this course, the students will be able to

- Solve linear system of equations in engineering problems.
- Find Eigen values and Eigenvectors of a matrix in engineering studies.
- Model engineering problems as differential equations and solve analytically. .
- Find out local /global optimum of functions of several variables.
- Compute areas and volumes by integrals

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester

L	T	P	C
3	0	0	3

APPLIED PHYSICS

Course Objectives:

To enable the students to

- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
- To 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
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
- Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application and to know the importance of free electron theory for metals.
- Enlightenment of the importance of band theory for crystalline solids and metals. To understand the physics of Semiconductors and their working mechanism

Unit –I: Wave Optics

Interference:

Introduction- Principle of Superposition-Coherence-Conditions for Sustained Interference -Interference in thin films(reflected Geometry)-Newton's Rings-Determination of Wavelength and Refractive Index- Applications of Interference

Diffraction :

Introduction- Fresnel and Fraunhofer diffraction-Fraunhofer Diffraction due to Single slit, Double slit –N – slits (Qualitative)-Diffraction Grating -Determination of Wavelength-Applications of Diffraction.

Polarisation:

Introduction-types of polarized light, Polarization by reflection, refraction and double refraction-Nicol's prism-Half wave and Quarter wave plates

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit –II : Lasers and Fiber OpticsLasers: Introduction-Characteristics of Laser–Spontaneous and Stimulated emissions of radiation-Einstein's coefficients & Relation between them and their significance – population inversion - Ruby laser – Helium Neon laser –Semiconductor diode laser(Qualitative)- Applications of Lasers**.**

Fiber Optics:

Introduction to Optical Fibers-Total Internal Reflection- Construction of optical fibers -Acceptance angle- Numerical Aperture-Classification of fibers based on Refractive index profile, modes -Block Diagram of Fiber optic Communication- Applications of optical fibers.

UNIT–III : Magnetic Materials & Dielectric Properties

Magnetic Materials : Introduction -Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment -Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Magnetic device applications.

Dielectrics:

Introduction to Dielectrics - Electric polarization - Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations - Electronic and Ionic polarizations with mathematical derivations – Orientational polarization (Qualitative)–Internal field in solids -Claussius -Mosotti equation.

UNIT–IV: Quantum Mechanics and Free Electron Theory of Metals

Quantum Mechanics : Introduction- Dual nature of matter-Matter waves, de-Broglie wavelength, Properties of wave function- time independent and time dependent Schrödinger's wave equation-Particleina one dimensional infinite potential well.

Free Electron Theory of Meals:

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.

UNIT–V:Band Theory of Solids and Semiconductors Band

Theory of Solids:

Bloch Theorem - Kronig-Penny Model (Qualitative)-E vs K and v vsK diagram- Origin of energy bands-Classification of solids based on energy bands – Effective Mass of an Electron-Concept of a Hole

Semiconductors:

Introduction – Intrinsic semiconductors - density of charge carriers-Fermi level – extrinsic semiconductors - P-type & N-type - Density of charge carriers- Dependence of Fermi energy on carrier concentration and temperature - Drift and Diffusion currents – Einstein's equation - Hall effect- Hall coefficient - Applications of Hall effect.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text books:

1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.ChandPublications,2017.
2. H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018.
3. P.K.Palanisamy, AppliedPhysics ,SciTech Publications.

Reference Books:

1. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill, 2008.
2. Charles Kittel "Introduction to Solid State Physics",Wiley Publications,2011.
3. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008.
4. Halliday,ResnickandWalker, "FundamentalsofPhysics",JohnWileySons
5. M.R.Srinivasan,EngineeringPhysics,NewAgeInternationalPublishers
6. Ajoy Ghatak"Optics"TataMcGrawHill

Course Outcomes:

After completing this course, the students will be able to

- Explain the need of coherent sources and the conditions for sustained interference. Identify the applications of interference in engineering. Analyze the differences between interference and diffraction with applications. Illustrate the concept of polarization of light and its applications.
- Explain various types of emission of radiation. Identify the role of laser in engineering applications. Describe the construction and working principles of various types of lasers. Explain the working principle of optical fibers. Classify optical fibers based on refractive index profile and mode of propagation. Identify the applications of optical.
- Explain the concept of dielectric constant and polarization in dielectric materials. Summarize various types of polarization of dielectrics. Classify the magnetic materials based on susceptibility and their temperature dependence. Explain the applications of dielectric and magnetic materials. Apply the concept of magnetism to magnetic devices.
- Describe the dual nature of matter. Explain the significance of wave function. Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well. Identify the role of classical free electron theory in the study of electrical conductivity.
- Explain the concept of quantum free electron theory in the study of electrical conductivity. Classify the energy bands of solids. Outline the properties of charge carriers in semiconductors. Identify the type of semiconductor using Hall effect. Identify applications of semiconductors in electronic devices.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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L	T	P	C
3	0	0	3

I Year - I Semester

COMMUNICATTIVE ENGLISH

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from learning about the language to using the language. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives:

To enable the students to

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Methodology:

1. The classes are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generateactivities/tasks as per the requirement

5. The teacher is permitted to use lecture method when a completely new concept is introduced in theclass.

(R-20 Regulations) Detailed Textbook:

Infotech English by Maruthi Publications

Non-Detailed Textbook:

Wings of Fire: APJ Abdul Kalam by University Press

UNIT-I (10 periods)

Detailed: A Drawer Full of Happiness

Non-detailed: APJ Abdul Kalam's Wings of Fire 1-5 Chapters

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Writing: Writing **S**entences with proper word order - Basic Sentence Structures

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) Antonyms and Synonyms, Word applications, Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural, pronouns, basic sentence structures; simple question form - wh-questions; word order in sentences.

UNIT- II (10 periods)

Detailed: Nehru's letter to his daughter Indira on her birthday

Non-detailed: APJ Abdul Kalam's Wings of Fire 6-10 Chapters

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters. .

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) Antonyms and Synonyms, Word applications

Grammar: Use of articles and zero article; prepositions

Unit-III

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(10 periods)

Detailed: Stephen Hawking-Positivity 'Benchmark'

Non-detailed: APJ Abdul Kalam's Wings of Fire 10-15 Chapters

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) Antonyms and Synonyms, Word applications, Association

Grammar: Verbs - tenses; Subject-verb agreement

UNIT- IV (10 periods)

Detailed: Liking a Tree, Unbowed: Wangari Maathai's Biography

Non-detailed: APJ Abdul Kalam's Wings of Fire 16-20 Chapters

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) Antonyms and Synonyms, Word applications

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison,

UNIT-V (10 periods)

Detailed: Stay Hungry-Stay foolish from "Infotech English", Maruthi Publications

Non-detailed: APJ Abdul Kalam's Wings of Fire 21-24 Chapters by University Press

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques

Reading for Writing: Letter writing, E mail writing, email etiquette

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) Antonyms and Synonyms, Word applications

Grammar: Direct and indirect speech, reporting verbs for academic purposes, Active Voice- Passive Voice; editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement and conjunctions)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes

After completing this course, the students will be able to

- Appreciate a piece of prose; employ suitable strategies for skimming and scanning to get the general idea of a text; recognize paragraph structure and formulate sentences using proper grammatical structures and correct word forms of nouns and pronouns and GRE Words
- Study a piece of prose; write well structured paragraphs and understand applying cohesive devices and use articles and prepositions accurately and learn good vocabulary
- Analyze a text in detail and summarize and employ verbs, tenses and subject verb agreement appropriately; apply vocabulary and word associations
- Understand a text, and learn and apply information transfer and apply the use of adjectives and adverbs and vocabulary
- Interpret ideas from reading comprehension and write formal letters and emails, use voice and reported speech properly and edit short texts by correcting common errors and learn vocabulary

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cabridge Academic English (B2)*. CUP, 2012.

Sample Web Resources

Grammar/Listening/Writing

1-language.com

http://www.5minuteenglish.com/

https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online

http://www.bbc.co.uk/learningenglish/

http://www.better-english.com/

http://www.nonstopenglish.com/

https://www.vocabulary.com/

BBC Vocabulary Games

Free Rice Vocabulary Game

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Reading

https://www.usingenglish.com/comprehension/

https://www.englishclub.com/reading/short-stories.htm

https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613

http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/

BBC Learning English – Pronunciation tips

Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/

http://www.world-english.org/

http://learnenglish.britishcouncil.org/

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
2	0	2	3

I Year - I Semester

ENGINEERING GRAPHICS

Course Objectives:

To enable the students to

- To introduce the students to use drawing instruments and to draw polygons, engineering curves anduse scales
- To introduce the students orthographic projections, projections of points & lines
- The objective is to make the students draw the projections of the plane inclined to both the planes.
- The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
- The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

UNIT I :Introduction to Graphics

Curves: Ellipse, Parabola and Hyperbola by general methods, Tangent & Normal

Scales: Plain scale, Diagonal scale and Vernier scale.

UNIT II

Orthographic Projections Introduction to Projections, Horizontal plane, Vertical plane, Profile plane, importance of reference lines.

Projections of points in various quadrants.

Projections of straight lines inclined to one plane, inclined to both the planes, traces.

UNIT III

Projections of planes: Inclined to one reference plane; inclined to both the reference planes.

UNIT IV

Projections of Solids – Projections of Prisms, Pyramids, Cones and Cylinders simple positions, the axis inclined to one of the reference planes.

UNIT V

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

Text Books:

1. Engineering Drawing by N.D. Bhatt, Charotar Publishing House Pvt. Ltd
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Reference books

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publications
2. Engineering Graphics for Degree by K.C. John, PHI Learning
3. Engineering Graphics by PI Varghese, McGraw Hill Publishers.
4. Engineering Drawing + AutoCAD by K. Venugopal, V. Prabhu Raja, New Age

Course Outcomes:

After completing this course, the students will be able to

- Construct Engineering Curves and scales
- Understand orthographic projections, projections of points & lines.
- Draw the projections of a plane inclined to both the planes.
- Draw the projections of various types of solids in different positions inclined to one of the planes.
- Visualize and convert the isometric view to orthographic view and vice versa.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	3

I Year - I Semester

COMPUTATIONAL THINKING & PROGRAMMING

Course Objectives:

To enable the students to

- To teach problem solving through Algorithms and Flowcharts
- To elucidate problem solving through Python programming language.
- To train in the development of solutions using modular concepts
- To explain the role of data structures in programming
- To introduce object oriented programming paradigm through Python

UNIT– I: Knowing the Computer

Definition and Block Diagram of a Computer. Basic parts of a computer (Memory, CPU, Input, and Output), Memory hierarchy, Circuits and Logic, Hardware vs Software, Representation of Data in memory (integer (including negative), floating points etc. to text, images, audio and video), Principle of Abstraction, Operating System, Language Hierarchy - Machine Language to High Level Language, Compiler, Interpreter, The Command Line Interface (basic Linux commands)

UNIT – II: Computational Thinking and Introduction to Python

Simple logic building through flowcharting. Flowchart symbols, conditional and repetition blocks. Computational Thinking, Algorithm, Pseudocode, Time/Space complexity. Only Big O notation.

Basic structure of a Python program, Elements of Python programming Language: token, literals, identifiers, keywords, expression, type conversions, Numbers, Variables, Input/Output statements, basic data types. Operators and their types and precedence, expressions. Control structures in Python - conditionals and loops

UNIT – III: Python Data Structures and Modularization

List and List Operations, Using Lists to represent Matrices, Strings, String operations, Tuples, Dictionaries, Sets, Iterators and generators, comprehensions.

Basic math functions, User defined Functions, parameters to functions, positional, keyword and default arguments, Lambda Functions, recursion. Packages, modules and namespaces.

UNIT-IV: File Handling

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

UNIT – V: Object Oriented Programming

Object Oriented Design, Classes and Objects, Polymorphism, Abstraction, Inheritance, Encapsulation, Constructors, Function and operator overloading, Exception Handling

Text Book:

1. Think Python: How to Think Like a Computer Scientist , Allen B. Downey, 2nd Edition (https://www.greenteapress.com/thinkpython/thinkCSpy.pdf)

Reference Books:

1. Core python programming, W Chun PHI (http://emixam.sevla.free.fr/books/2.PythoProg_softarchive.net.pdf)
2. Python programming a modern approach, Vamsi Kurama, pearson

Web Resources:

1. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. https://snakify.org

Course Outcomes:

After completing this course, the students will be able to

- Understand the working principles of various components of a computer
- Develop computational thinking and be able to use Python constructs to solve basic problems
- Understand modularization and data structures concepts in Python
- Apply file handling concepts in problem solving
- Solve Real world problems by applying Object Oriented Concepts

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester

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ENGLISH COMMUNICATION SKILLS LAB

Course Objectives

To enable the students to

- To sensitize the student's nuances of English speech sounds.
- To bring about a consistent accent and intelligibility in students 'pronunciation of English by providing an opportunity for practice in speaking.
- To improve the fluency in spoken English in different contexts.
- To demonstrate the synchronization of verbal and non verbal communication.
- To speak with clarity and confidence.
- To enrich the persuasive skills

MODULE – I

Listening: Listening to short audio texts and identifying the topic, context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introduction and introducing others.

Non Verbal Communication

Pronunciation: Introduction to Phonetics-Sounds of English-Phoneme

MODULE – II

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

Functional English: Greetings and leave taking, Complaining and Apologizing.

Pronunciation: Vowels and Consonants, Past tense markers, Plural markers

MODULE – III

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Functional English: Permissions, Requesting, Inviting.

Pronunciation: Syllable, Word Stress: Weak and Strong forms, Stress in compound words, Contrastive Stress

MODULE– IV

Speaking: Just a Minute (JAM)

Functional English Asking for and giving Information/Directions; Suggesting/Opinion giving.

Pronunciation: Rhythm & Intonation

MODULE– V

Functional English: Dialogues/Role Plays

Speaking: Formal oral presentations on topics from Science and Technology - with the use of PPT slides.

Pronunciation: Accent Neutralization

INFRASTRUCTURE:

1. 60 computer systems for a class of 60 students.
2. LAN facility and English Language Software for self-study by learners.
3. Audio System
4. Projector

SYSTEM REQUIREMENT: Hardware Component

5. P – IV Processor
6. Speed – 2.8 GHZ
7. RAM – 512 MB minimum
8. Hard Disk – 80 GB
9. Headphones of high quality

SUGGESTED SOFTWARE:

1. Cambridge Advanced Learners "English Dictionary with CD.
2. Grammar Made Easy by Darling Kindersley.
3. Punctuation Made Easy by Darling Kindersle.
4. Clarity Pronunciation Power – Part I.
5. Clarity Pronunciation Power – part II.
6. Oxford Advanced Learner's Compass, 7th Edition.

7. DELTA„s key to the Next Generation TOEFL Test: Advanced Skill Practice.
8. MELL - K Van Solutions Software.
9. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
10. English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
11. English Pronunciation in Use, Cambridge University Press.
12. Technical Communication, OUP.
13. Communication Skills, OUP.

SUGGESTED READING

1. Infotech English, Maruthi Publications (with Compact Disc).
2. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge University Press.
4. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5. English Pronunciation in use- Mark Hewings, Cambridge University Press.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications

Course Outcomes:

After completing this course, the students will be able to

- Understand Non Verbal Communication and Identify the topic, the context, specific questions and overall idea by listening to short audio texts and answering a series of questions and will also be able to introducing themselves and others
- Articulate Vowels and Consonants properly and answer a series of questions about main idea and supporting ideas after listening to audio texts and will be able to use expressions for Greetings and Leave takings, Complaining and Apologizing.
- Understand stress and listen for global comprehension and summarize what is listened to and will be able to use expressions for Permissions, Requesting and Inviting.
- Apply the rules of stress and intonation while reading a text; will be able to speak on short topics and will also be able to use expressions for Asking for and giving Information/Directions; Suggesting/Opinion giving.
- Write and enact Dialogues/Role Plays and practice topics from Science and Technology - using PPT slides and neutralize accent

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester

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APPLIED PHYSICS LAB

Course Objectives:

To enable the students to

- Analyze laws of stretched strings and calculate frequency using a sonometer and Meldes experiment.
- Determine gravitational acceleration through compound pendulum experiment.
- Measure rigidity modulus for various materials.
- Utilize microscope and Newton's rings to study light phenomenon like interference, diffraction etc.
- Demonstrate electronic circuit construction and understand device applications.
- Investigate charge carrier polarity and electric current-magnetic field interactions.

List of Experiments

Conduct 10 out of 15 experiments

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence
2. Newton’s rings –Radius of Curvature of Plano Convex Lens.
3. Determination of thickness of a thin object using parallel interference fringes.
4. Determination/ of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde’s experiment – Transverse and Longitudinal modes.
7. Verification of laws of stretched string – Sonometer.
8. Determination of velocity of sound – Volume Resonator
9. L C R Series Resonance Circuit
10. Study of I/V Characteristics of Semiconductor diode
11. I/V characteristics of Zener diode
12. Thermistor characteristics – Temperature Coefficient
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee’s apparatus.
14. Energy Band gap of a Semiconductor p.n junction.
15. Hall Effect for semiconductor.

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ReferenceBooks:

1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links).
2. Physics Practical Manual, Lorven Publication.

Course Outcomes:

After completing this course, the students will be able to

- Analyze and understand the concepts of oscillations and standing waves. (Sonometer, Meldes experiment).
- Know how to determine the acceleration due to gravity at a place using Compound pendulum.
- Perform experiments on Properties of matter such as the determination of moduli of elasticity viz., Young's modulus, Rigidity modulus of certain materials;
- Gain hands-on experience of using various optical instruments like spectrometer, and making finer measurements of wavelength of light using Newton Rings experiment, diffraction grating etc.
- Acquire knowledge of electrical components (like resistors, capacitors, and inductors etc.,), demonstrate simple electronic circuits consisting of
- Able to determine the sign of charge carriers of conventional electric current and examine the interaction between electric current and magnetic fields

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester

L	T	P	C
0	0	3	1.5

COMPUTATIONAL THINKING & PROGRAMMING LAB

Course Objectives:

- Get acquainted with fundamentals of writing Python scripts.
- Master core Python scripting elements by solving more number of problems
- Able to identify right data structure to solve the problem
- Design Python functions to facilitate code reuse.
- Gaining familiarity with Python file I/O
- Getting Familiarity with Object Oriented Concepts

Laboratory Experiments:

Week 1-3

- Design algorithms and flowcharts for given problems
- Python programs on decision and loop control statement
    - Whether the given number is even or odd
    - Maximum of three numbers
    - Sum of digits, Palindrome
    - Factorial of a number,
    - GCD of given numbers
    - Sum of first n natural numbers
    - Evaluate Cosine and Sine Series etc

Week 4-6

- Exercise programs on lists and functions
    - Finding the sum and average of given numbers using lists.
    - To display elements of list in reverse order.
    - Finding the minimum and maximum elements in the lists.
    - Using functions to calculate power, factorial etc
    - Passing lists as function arguments
    - Pass by object
    - Recursion

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Week 7-9

- Exercise programs on Strings.
  - Count the number of characters, number of vowels etc in the given line of text etc
  - Palindrome Check
  - Reverse words in a line of text
  - Finding the occurrences of substring in the main string
- Exercise programs on Tuples, Dictionaries

Week 10-12

- Exercise programs on file handling covering creating file, writing content into the file and updating the file content etc.
- Python programs on Object Oriented Programming concepts:
  - Creating a Class with variables and methods
  - Class inheritance
  - Constructors
  - Exception handling

Course Outcomes:

After completing this course, the students will be able to

- Master core python scripting elements by solving more number of problems.
- Identify right data structure to solve problem.
- Design Python functions to facilitate code reuse.
- Solving Input and Output related problems using Python.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	3

I Year - II Semester

MATHEMATICS-II (VECTOR CALCULUS & TRANSFORM CALCULUS)

Course Objectives:

To enable the students to

- Find the vector differentiation and Integration
- Apply the techniques of Laplace transforms in engineering studies
- Learn the Fourier series of periodic functions and expand a function in sine and cosine series
- Solve problems related to engineering applications using integral transform techniques
- Evaluate the problems to engineering applications using Z- transform techniques

UNIT-I: Vector Differentiation

Vector Differentiation - Scalar and Vector Fields, Level surfaces, Directional Derivative, Gradient of a Scalar Field, Divergence, Curl of a vector field and applications, Vector Identities

UNIT- II: Vector Integration

Vector Integration - Line integral, work done, areas, Surface integrals.

Vector integral theorems - Green's theorem, Stokes theorem and Gauss Divergence theorem (All theorems Without proof) and applications areas, surface areas and volumes.

UNIT-III: Laplace Transforms

Laplace transform-Definition-conditions for existence– Linear Property -Shifting Theorems, Laplace transforms of Standard Functions-Transforms of derivatives and integrals–Unit step function–Dirac delta function. Inverse Laplace transforms by Partial fractions–Convolution theorem (without proof) – inverse by convolution, Solving ordinary differential equations with constant coefficients.

UNIT-IV: Fourier Series

Introduction, Periodic function, Dirichlet's conditions, Fourier series of periodic function, Fourier series atthe point of discontinuity, Fourier series of even and odd functions, Half-range Fourier Sine and Cosine series. Fourier series in an arbitrary interval.

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UNIT-V: Fourier Transforms and Z-Transforms

Fourier integral theorem (only statement) – sine and cosine integrals, Fourier transforms – sine and cosine transforms –Inverse Formulae-Properties- Finite Fourier Transforms.

Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems – Inverse Z – transform - Convolution theorem – solving difference equations by using Z-transforms.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012.
2. Erwin .Kreyszig,Advanced Engineering Mathematics,9th Ed., Wiley, 2012.

References:

1. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014.
2. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009.
3. D. S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, reprint, 2008.

Course Outcomes:

After completing this course, the students will be able to

- Understand gradient, divergence, curl and their physical significance
- Compute line, surface and volume integrals and evaluate the work done, flux, potential functions
- Make use of Laplace transforms in solving the differential equations with the initial and boundary Conditions
- compute Fourier series of periodic functions
- solve problems related to engineering applications using transform techniques

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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I Year - II Semester

APPLIED CHEMISTRY

Course Objectives:

To enable the students to

- To gain the knowledge on Polymer based materials in household appliances, aerospace and automotive industries.
- To learn the basic principles and applications of Electrochemistry.
- Advanced Analytical instrumental techniques are introduced for material characterization. With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced
- Understanding of crystal structures and preparation of semiconductors and insulators.
- A wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.

UNIT-I : Polymer Chemistry

Introduction to polymers, functionality of monomers, copolymerization, Stereospecific polymerization with specific examples.

Plastics - Thermoplastics and Thermosetting, Preparation, Properties and Applications of–Bakelite, Urea-Formaldehyde, Nylon-6,6, Carbon fibres.

Elastomers–Buna-S, Buna-N–Preparation, Properties and Applications.

Conducting polymers - polyacetylene, polyaniline, polypyrroles – Mechanism of conduction and applications

UNIT-II : Electrochemistry and Applications

Electrodes –Reference electrodes (Hydrogen electrode and Calomel electrode), Electrochemical cell, Nernst equation.Concept of pH, pH meter and applications of pH metry, Potentiometry- Potentiometric titrations (Redox titrations), Concept of Conductivity, Conductivity cell, Conductometric titrations (acid-basetitrations).

Primary cells – Dry cell - Zinc-air battery, Secondary cells – Lead acid battery, Lithium-ion batteries-working of the batteries including cell reactions, and button cells.

Fuel cells - Hydrogen-Oxygen and Methanol-Oxygen fuel cells – working of the cells.

UNIT-III : Instrumental Methods And Non-Conventional Energy Sources

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Part-A:Instrumental Methods

Electromagnetic Spectrum. Absorption of radiation: Beer-Lambert's law - Principles of UV-Visible, Infrared (IR) and Nuclear Magnetic Resonance (NMR) spectroscopy.

Basic concepts of Thin Layer Chromatography (TLC), Gas Chromatography (GC) and HighPerformance Liquid Chromatography (HPLC), Separation and purification of mixture of compounds.

Part-B: Non-Conventional Energy Sources

Introduction – Renewable and Non –Renewable energy sources - Solar Energy- Introduction, application of solar energy – photovoltaic cell: design, working and its importance.Hydropower includes setup a hydropower plant (schematic diagram), Geo-Thermal energy: Introduction-schematic diagram of a geothermal power plant, Tidal power - Introduction- Design and working, Biomass energy.

UNIT -IV: Solid State Chemistry

Types of solids – Crystal defects- Frenkel and Schottky defects – Spinel and Inverse spinel. Hall Effect and Applications.

Semiconductors:Preparation of pure semiconductors by Zone refining, Distillation and Czochralskicrystal pulling technique- Doping- Epitaxy, Diffusion and Ion-implantation technique. Intrinsic and Extrinsic semiconductors - Applications.

Insulators: Electrical Insulators and theirApplications.

UNIT - V: Material Chemistry

Nano materials –Introduction- Top- down and Bottom -up approaches, Sol-gel method. Characterization by BET and TEM methods.Carbon nano tubes and fullerenes - Types, Preparation (Arc discharge Laser ablation and Chemical Vapour Deposition methods) Properties and Applications. Liquid crystals - Introduction – Types – Applications.

Superconductors - Type-I & Type-II, Properties &Applications. Green chemistry- Principles and Applications**.**

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
2. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

4. A text book of Engineering Chemistry bySashiChawla, Dhanpat Rai & Co. 2017

Course Outcomes:

After completing this course, the students will be able to

- Recall the information related to polymers and their application(Remebering)\
- Distinguish between different parts in electrochemical cell, batteries and fuel cells. (Analyzing)
- Understand about the different analytical techniques and its applications.(Understanding)
  Design the technologies related to renewable energy sources. (Creating)
- Understand the conductivity phenomenon and applications of solids.(Understanding)
- Choose the materials like nano materials, liquid crystals, superconductors, and green synthetic
  Methods to solve the Engineering problems. (Applying)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester

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NETWORK ANALYSIS & ELECTRICAL TECHNOLOGY

Course Objectives:

To enable the students to

- To understand the basic concepts and analysis of DC Circuits and Network Theorems.
- To understand the concepts and analysis of various types of AC Circuits
- To understand the concepts of DC transients and two port network concepts
- To understand the principles of operation and characteristics of DC machines.
- To understand the principle of operation of AC Machines and special electrical machines

UNIT – I:

DC Circuits: Basic introduction to Electrical Energy sources and network elements- Series and Parallel circuits, Star-Delta conversion, Kirchhoff's laws, Mesh analysis, Nodal analysis- Numeric problems solving with resistances only

Network Theorems (DC Excitation): Superposition, Thevenin's, Norton's, Reciprocity, Max Power Transfer theorems-problem solving using independent sources with independent sources.

UNIT-II:

AC Circuits: Definitions of alternating quantities- Response of network elements to sinusoidal excitation, phase angle,series R-L, R-C, R-L-C circuits-problems, Introduction to three phase, phase sequence, relation between line and phase voltages and currents.

Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Naturalcurrent, Dot rule of coupled circuits, conductively coupled equivalent circuits- problems

Resonant Circuits: Series and parallel resonance, frequency-response of series and Parallel circuits, Q–Factor,Bandwidth.

UNIT – III:

DC Transients: Transient response of R-L, R-C, R-L-C circuits for DC excitations, Solution using differential equations.

Two-port Networks: Concept of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Relationship between parameter sets, Cascading of two port networks, series connection and Parallel connection.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT – IV:

DC Machines: Constructional details of DC Machine –Classification of DC machines. Principle of operation of DC generator – EMF equation--- Magnetization Characteristics of DC shunt Generator-Principle operation of DC motor – applications – Torque equation-three point starter, speed control methods.

UNIT – V:

Transformers: Principle of operation of single phase transformers, EMF equation, losses, efficiency and regulation.

AC Machines: Principle and operation of 3-phase Induction Motor and 3-phase Synchronous Generator.

Special Electrical Machines: Principle of Operation of Stepper motors and Permanent magnet brushless DC motors.- Applications

Text Books:

1. Electric Circuit Analysis by Hayt and Kimmarle, TMH
2. Special electrical Machines, K.VenkataRatnam, University press, New Delhi.
3. Electrical Machines by D. P.Kothari, I .J .Nagarth,McGrawHill Publications, 4th edition.

References Books:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, Reviced 3rd Edition, 2019.
2. Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications
3. Circuits and Network: Analysis and Synthesis by A sudhakar and Shyammohan S Palli, McGrawHill Publications.
4. Circuit Theory Analysis and Synthesis by AbhijitChakrabarthi,DhanpaiRai& Co Publications
5. Theory and performance of Electrical machines, J.B.Gupta,3rd edition, Kataria. S.K & Sons.
6. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition.

Course Outcomes:

After completing this course, the students will be able to

- Able to solve the various types DC circuits by applying different network techniques and Network Theorems
- Able to analyze various types of AC Circuits.
- Able to analyze different types DC transient circuits and two port networks
- Able to analyze the performance of DC machines
- Able to analyze the performance of AC Machines and Special electrical machines.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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I Year - II Semester

SEMICONDUCTOR DEVICES AND CIRCUITS

Course Objectives:

To enable the students to

- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
- The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers in different configuration is explained.

UNIT – I: **Junction Diode Characteristics:** Open circuited p-n junction, law of junction, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Diodes: Zener Diode, Breakdown mechanisms, LED, Photo diode, Tunnel Diode, UJT.Construction, operation and characteristics of all the diodes are required to be considered.

UNIT – II: Rectifiers and Filters: Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier,derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters,Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT – III: Transistor Characteristics:

BJT: Introduction to transistor, Operating modes of transistor, transistor current components, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through, typical transistor junction voltage values.

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

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT – IV: Transistor Biasing and Thermal Stabilization

Need for biasing and operating point, load line analysis, Stability factors, (S, S , S), BJT biasing methods, fixed bias, collector to base bias, self bias, Stabilization against variations in VBE, Ic, and β, Thermal runaway avoid condition. FET Biasing- methods and stabilization.

UNIT – V: Small Signal Low Frequency Transistor Amplifier Models

BJT: Two port network, Transistor hybrid model, determination of h-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, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

References:

1. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition
2. Electronic Devices and Circuits – A.P.Godse, U.A.Bakshi, Technical publications.

Course Outcomes:

After completing this course, the students will be able to

- Ability to analyze PN junctions in semiconductor devices under various conditions and understand the characteristics of various special diodes and their applications.
- Ability to design and analyze simple rectifiers and understand the importance of various filters in rectifiers.
- Ability to analyze input and output DC characteristics of BJT and FET
- Know the need of transistor biasing and design amplifiers with various biasing techniques for BJT and FET
- Ability to analyze and design single stage amplifiers using BJT and FET

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
1	0	4	3

I Year - II Semester

C & DATA STRUCTRES

Course Objectives:

To enable the students to

- To design & develop C programs using selection and repetition control statements
- To design & develop C programs using arrays and strings
- To design & develop C programs using structures, unions, pointers
- To design & develop modular programs using functions
- To design & develop C programs using Stacks, Queues and Linked Lists

UNIT – I

Introduction to the C Language: C Programming Basics: Identifiers, Types, Variable, Constants, Input/output, Operators, Expression Evaluation, Control Statements - Decision Control, Repetition Control, break, continue, Exercise programs covering these concepts

UNIT – II

Derived Datatypes: Arrays, Two Dimensional Arrays, Multidimensional Arrays, Programming Examples,Strings: String Concepts, C String, String Input / Output Functions, Predefined string handling functions,Exercise programs covering these concepts

UNIT – III

Structures: Definition, Variable declaration and initialization, Programming Examples, Nested Structures, Unions, Difference between Structure and Union, Pointers - Declaration & initialization, Operations on pointers, Exercise programs covering these concepts

UNIT – IV

Functions: Definition, Declaration, Function call, Predefined vs. User defined Functions, return statement, Types of functions, Parameter passing techniques – Call by value and Call by reference, Recursion, Exercise programs covering these concepts

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT – V

Data Structures: Definition, Linear vs. Non-linear data structure, Stack representation using arrays, applications of stacks, Queue representation using arrays, applications of queues, Linked Lists, Types of
Linked Lists, Operations on Singly Linked Lists, Exercise programs covering these concepts

Text Books:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson
3. Data Structures using C, E Balagurusamy, Mcgraw Hill

Reference Books:

Course Outcomes:

After completing this course, the students will be able to

- Understands the basic C programming constructs for proficient problem-solving and program development.
- Competence in utilizing arrays, strings, and related data types for effective data manipulation and algorithm implementation.
- Proficiency in handling complex data structures using structures, unions, and pointers for efficient memory management and data organization.
- Ability to design and implement modular and recursive algorithms using functions, enabling efficient code organization and problem-solving.
- Understanding and application of fundamental data structures like stacks, queues, and linked lists for efficient data management and algorithmic implementation.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester

L	T	P	C
0	0	3	1.5

SEMICONDUCTOR DEVICES AND CIRCUITS LAB

Course Objectives:

To enable the students to

- To be exposed to the characteristics of basic electronic devices
- To observe characteristics of electronic devices

Electronic Workshop Practice:

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JEETs, LEDs, LCDs, SCR, UST.
3. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function generator,

Regulated Power Supply and CRO.

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

1. P-N Junction Diode Characteristics Part A: Germanium Diode (Forward bias& Reverse bias) Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics Part A: V-I Characteristics Part B: Zener Diode as Voltage Regulator
3. Half-wave Rectifier(without and with c-filter)
4. Full-wave Rectifier(without and with c-filter)
5. BJT Characteristics(CB Configuration) Part A: Input Characteristics Part B: Output Characteristics
6. BJT Characteristics(CE Configuration) Part A: Input Characteristics Part B: Output Characteristics
7. FET Characteristics(CS Configuration) Part A: Drain Characteristics Part B: Transfer Characteristics
8. UJT Characteristics
9. Transistor Biasing
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier

Equipment Required:

Regulated Power supplies

Analog/Digital Storage Oscilloscopes

Analog/Digital Function Generators

Digital Multimeters

Decade Résistance Boxes/Rheostats Decade Capacitance Boxes

Ammeters (Analog or Digital) & Voltmeters (Analog or Digital)

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Active & Passive Electronic Components

Course Outcomes:

After completing this course, the students will be able to

- Learn the characteristics of P-N Junction Diode & Zener diode
- Verify the rectifier circuits using diodes with and without filter
- Learn the characteristics of BJT in CB & CE configuration
- Learn the characteristics of FET & UJT
- Obtain the frequency response of BJT-CE & BJT-CC amplifier

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
0	0	3	1.5

I Year - II Semester

APPLIED CHEMISTRY LAB

List of Experiments:

Conduct 10 out of 16 experiments

1. Trial experiment - Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of KMnO4 using standard Oxalic acid solution.
4. Estimation of MnO2 in Pyrolusite.
5. Determination of Copper using standard K2Cr2O7 solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Vitamin – C.
8. Determination of PH of the given sample solution using PH meter.
9. Conduct metric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.
11. Estimation of copper by Colorometry.
12. Photo Chemical Reduction of Ferric Salt (Blue-Printing).
13. Adsorption of acetic acid on charcoal.
14. Determination of rate of corrosion.
15. Preparation of a polymer.
16. Thin layer chromatography.

Reference Books:

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuris (2012) Laboratory Manual of engineering chemistry-II, VGS.
Techno Series.
3. Chemistry Practical Manual, Lorven Publications.
4. Practical Engineering Chemistry, K. Mukkanti (2009) B.S. Publication.

Course Outcomes:

After completing this course, the students will be able to

- 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.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
0	0	3	1.5

I Year - II Semester

ENGINEERING WORKSHOP & IT WORKSHOP

PART A: ENGINEERING WORKSHOP

Course Objectives:

To enable the students to

- To develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude.
- To acquire skills in basic engineering practice
- To identify the hand tools and instruments
- To gain measuring skills
- To develop general machining skills in the students

Note: At least two exercises to be done from each trade.

TRADES:

Carpentry

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tenon Joint

Fitting

1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Black Smithy

1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

House Wiring

1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

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Tin Smithy

1. Taper Tray

2. Square Box without lid

3. Open Scoop

4. Funnel

Text Books:

1. Workshop Technology Vol I & II/ S K Hajra Choudhury, A K Hajra Choudhury, N. Roy/ Media Promoters & Publishers Pvt. Ltd.
2. Workshop Practice/H S Bawa/ McGraw Hill Education; 2nd edition

Reference Books:

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
2. Engineering Practices Lab Manual/Jeyapoovan, Saravana Pandian, 4/e Vikas
3. Dictionary of Mechanical Engineering/GHF Nayler/Jaico Publishing House

Course Outcomes:

After completing this course, the students will be able to

- Know the importance of general safety precautions on different shop floors.
- Identify the basics of tools and equipments used in fitting, carpentry, sheet metal, machine, welding and smithy
- Fabrication of wooden joints and understands joining of metals.
- Make metal joints and sheet metal work.
- Understand the basics of removal of material from work piece surface to attain specific shape.
- Familiarize with the production of simple models in fitting, carpentry, sheet metal, machine, welding and smithy trades.

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PART B: IT WORKSHOP

Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of thecomputer along with the configuration of each component and its functionality. Describe about variousI/O Devicesand its usage and Practicing disassembling and assembling components of a PC.

Task 2: Demonstration and Practice of various features of Microsoft Word Assignment: 1. Create a project certificate.2. Creating a news letter Features to be covered:-Formatting Fonts, Paragraphs, Text effects, Spacing, Borders andColors,

Header and Footer, Date and Time option, tables, Images, Bullets and Numbering, Table of Content,Newspaper columns, Drawing toolbar and Word Art and Mail Merge in word etc.,

Task 3: Demonstration and Practice of various features Microsoft Excel Assignment: 1. Creating a scheduler 2.Calculating GPA 3. Calculating Total, average of marks in various subjects and ranks of students based on marksFeatures to be covered:- Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel,Charts, Renaming and Inserting worksheets, etc.,

Task 4: Demonstration and Practice of various features Microsoft Power Point Features to be covered:- Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks Tables and Charts, Master Layouts, Types of views, Inserting – Background, textures, Design Templates, etc.,

Task 5: Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoTdevices.

Task 6: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of asimple website/ homepage, Assignment: Develop your home page using HTML Consisting of your photo, name,address and education details as a table and your skill set as a list. Features to be covered:- Layouts, Inserting textobjects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
2	0	0	2

I Year - II Semester

ENVIRONMENTAL SCIENCE

Course Objectives:

To enable the students to

- To make the student to get awareness on environment, to understand the important of protecting natural resources, ecosystems for futures generations and pollution causes due to the day to day activates of human life to save Earth from the inventions by the engineers.

UNIT –I: Multidisciplinary nature of Environmental Science and Ecosystems

Definition, Scope and Importance – Sustainability: Need for public awareness-Human population and Environment. Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. -Types of Ecosystem- Forest, Grassland, Desert and Aquatic Ecosystems– Food chains, food webs and ecological pyramids.

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UNIT –II: Natural Resources

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people. Water resources: Conflicts over water, Dams – benefits and problems Mineral resources: Use and exploitation, Environmental effects of extracting and using mineral resources.

Energy resources: Growing energy needs, renewable and non-renewable energy sources

Food resources: World food problems.

Land resources: Wasteland reclamation.

Role of an individual in conservation of natural resources.

UNIT –III: Biodiversity and its conservation

Definition, Genetic, species and ecosystem diversity- classification - Value of biodiversity: Consumptive use, Productive use, Social use, Biodiversity at national and local levels. Hot-spots of biodiversity - Threats to biodiversity - Endangered and Endemic species of India – 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. Solid Waste Management: Sources, effects and control measures of urban and industrial solid wastes. Bio medical and e-waste management.

Global Environmental Challenges: Global warming and climate change-Acid rains, Ozone layer depletion.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V: Social Issues and Environmental Management

Urban problems related to energy -Water conservation, Rain water harvesting-Resettlement and rehabilitation of people. Environmental Protection Act –Air Act –Water Act - Wildlife Protection Act –Forest Conservation Act-Public awareness. International protocols: Stockholm and Rio Summit, Kyoto protocol and Montreal Protocol.

Impact Assessment and its significance various stages of EIA, Environmental audit, Ecotourism. The student should Visit an Industry / Ecosystem.

Text Books:

1. A Textbook of Environmental Studies, Shashi Chawla, TMH, NewDelhi.
2. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.
3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress

Reference Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers,Vijayawada.
2. Text Book of Environmental Studies, DeekshitaDave& P. Udaya Bhaskar, Cengage Learning.
3. Textbook of Environmental Science and Technology – Dr. Anji Reddy, BS Publications.
4. Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers,2014.
5. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education,Chennai.
6. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi.

Course Outcomes:

After undergoing the course students will be able to

- Articulate the basic structure, functions, and processes of key social systems affecting the Environment.
- Explain how Natural Recourses should be used.
- Identify the threats to biodiversity.
- Understand causes, effects and control measures of Environmental pollution.
- Gain knowledge about Watershed management and Environmental ethics.Gain a rigorous foundation

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester

L	T	P	C
3	0	0	3

MATHEMATICS-III(COMPLEX VARIABLES & PDE)

Course Objectives:

To enable the students to

- Make use the significance of differentiability and analyticity for complex variable functions and be familiar with the Cauchy-Riemann equations..
- Find integrals along a path in the complex plane using the Cauchy's theorem and Residue theorem.
- Solve the singularities of complex variable function by expanding them into Taylor's and Laurent's series and finding residues
- Make the students learn modelling various physical phenomena as first and higher order PDE and applications

UNIT-I: Functions of Complex Variables

Continuity and differentiability, Analyticity, properties, Cauchy Riemann equations in Cartesian and polar coordinates, harmonic and conjugate harmonic functions, Milne – Thompson method.

UNIT- II: Complex Integration

Integration of complex functions – Line Integrals, Cauchy's Integral theorem, Cauchy's Integral Formula -Generalized Cauchy's Integral formula (without proofs)

UNIT- III :Complex power series and Residues

Complex power series-Taylor's Series and Laurent's Series, Singularities, Poles and Residues-Cauchy Residues theorem (without proof),evaluation of integrals of type $\int_{-\infty}^{+\infty} f(x)dx$ and $\int_0^{2\pi} f(cos\theta, \sin\theta)d\theta$ using Residue theorem.

Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier,derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT- IV: First Order Partial Differential Equations

Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions– solutions of first order linear (Lagrange) equations and nonlinear equations-standard types

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UNIT- V: Higher Order Partial Differential Equations and Applications

Solutions of Linear Partial differential equations with constant coefficients. RHS terms of the type e^{ax+by}, Sin(ax+by), Cos (ax+by), $x^m\ y^n$. Classification of second order partial differential equations-parabolic, elliptical and hyperbolic. Method of Separation of Variables, Applications to wave equation, heat conduction equation in one dimensions and Laplace equation in two dimensions

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Ed., Wiley, 2012.

References:

1. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganatham and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014
2. D. S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
3. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
4. S.KaleshaValli, G.VenkataRao and A.V.Papa Rao, Engineering Mathematics-I, Cengage Publications, 2018.

Course Outcomes:

At the end of this course the student can able to:

- Understand the differentiability and analyticity for complex variable functions and learn sufficient conditions for analyticity
- Evaluate the integration of complex valued functions
- Expand the functions in power series, classify the singularities of complex function
- Model first order linear and non-linear partial differential equations and solve analytically
- Model higher order partial differential equations and solve analytically and physical problems of engineering like steady and unsteady heat conduction, vibration of string, etc.,

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester

L	T	P	C
3	0	0	3

ELECTRONIC CIRCUIT AND ANALYSIS

Course Objectives:

To enable the students to

- Small signal high frequency BJT transistor amplifier Hybrid-π equivalent circuit and the expressions for conductance's and capacitances are derived.
- Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived.
- The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived.
- Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.
- Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed.
- Different types of tuned amplifier circuits are analyzed.

UNIT- I: Small Signal High Frequency Transistor Amplifier Models :BJT at High Frequencies, Hybrid- Common Emitter Transistor Model, Hybrid- Conductance's, Hybrid capacitances, validity of hybrid pi model, determination of high frequency parameters in terms of low frequency parameters, Current Gain with Resistive Load, CE Short Circuit Current Gain, cutoff frequencies, frequency response and gain bandwidth product.

FET: Analysis of common source and common drain amplifier circuits at high frequencies.

UNIT –II: Multi Stage 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, Cascode amplifier, boot-strap emitter follower, analysis of multi stage amplifiers using FET,

Unit –III: Feedback Amplifiers

Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, characteristics of negative feedback amplifiers, generalized analysis of feedback amplifiers, performance comparison of feedback amplifiers.

Unit-IV: Oscillators

Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein Bridge

Oscillators with BJT and FET and their analysis, generalized analysis of LC oscillators, Hartley and colpitts oscillators

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UNIT –V: Power Amplifiers

classification of amplifiers, class A, class B and power amplifiers and their analysis , harmonicdistortions, push-pull amplifiers and their analysis , complementary symmetry push pull amplifier, class AB power amplifier, thermal stability and heat sinks. Introduction to tuned amplifiers, Q-factor, small signal tuned amplifier, capacitance coupled single tuned amplifier, double tuned amplifiers

Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw-Hill, 1972.
2. Electronic Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

Reference Books:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc GrawHill.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,TenthEdition.
3. Electronic Circuit Analysis-B.V.Rao,K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, PearsonPublications..
4. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, SixthEdition.

Course Outcomes:

At the end of this course the student will able to

- Analysis of small signal high frequency transistor amplifiers using BJT and FET.
- Design and analysis of multi stage amplifiers using BJT and FET and understand the concepts of cascading and cascading
- Interpret the concept of negative feedback in amplifiers and analysis of various negative feedback topologies
- Analysis and design of various oscillators
- Analysis of class-A, class-B, Class-AB power amplifiers and various types of tuned amplifiers

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester

L	T	P	C
3	0	0	3

SIGNALS & SYSTEMS

Course Objectives:

To enable the students to

- To introduce the terminology of signals and systems.
- To introduce Fourier series and Fourier Transform through signal analysis.
- To analyze the linear systems in time and frequency domains.
- To introduce Laplace transform as mathematical tool to analyze continuous-time signals and systems.
- To introduce Sampling theorem and to study z-transform to analyze discrete-time signals and systems.

UNIT- I: Introduction

Definition of Signals and Systems, Classification of Signals, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling, Complex exponential and sinusoidal signals, Singularity functions: unit impulse and unit doublet functions, properties, step function, signum function and ramp function. Classification of Systems, Causality and Stability Conditions, Problems on classification of Signals and Systems.

Signal analysis: 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, Gibb's Phenomenon.

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, complex Fourier spectrum. Fourier transform of arbitrary signal.

Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT-III: Analysis of Linear Systems

Linear time invariant (LTI) system, impulse response, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer functions of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF,BPF and BSF characteristics.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –IV: Laplace Transform

Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT: Sampling and Z–Transform

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

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015.
3. Signals and Systems – K Raja Rajeswari, B VisweswaraRao, PHI, 2009.
4. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
5. Signals and Systems – T K Rawat , Oxford University press, 2011.
6. Signals and Systems- I. Ravi Kumar, PHI,2009

Course Outcomes:

At the end of this course the student will able to

- Understand and differentiate among various classes of signals and Systems.
- Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
- Understand the relationships among the various representations of LTI systems.
- Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
- Apply z-transform to analyze discrete-time signals and systems.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	3

II Year - I Semester

SWITCHING THEORY AND LOGIC DESIGN

Course Objectives:

To enable the students to

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behavior of logic gates.
- To optimize logic gates for digital circuits using various techniques.
- Boolean function simplification using Karnaugh maps and Quine-Mc Cluskey methods.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

UNIT –I: Review of Number systems

Representation of numbers of different radix, conversion of numbers from one radix to another radix, r-1's complement and r's complement of unsigned numbers subtraction, problem solving.Signed binary numbers, different forms, problem solving for subtraction. 4-bit codes: BCD, EXCESS 3, 2421, etc.

UNIT –II: Boolean Theorems and Minimization Functions

Boolean theorems, principle of complementation & duality, De-Morgan theorems. Basic logic gates and Universal gates, NAND-NAND and NOR-NOR realizations, Standard SOP and POS, Minimization techniques: minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 5variables, tabular minimization.

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UNIT –III : Combinational logic Design

Design of Half adder, Full adder, Half subtractor, Full subtractor, applications of Full adders, 4-bit binary adder, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess3 adder circuit, look-a-head adder circuit. Design of Encoder, Multiplexer, Decoder, Demultiplexer, Realization of Boolean Functions Using Decoders and Multiplexers, Priority Encoder, 4 bit digital comparator.

UNIT IV: PLDs:

Introduction, Types of PLDs, Basics structures of PROM, PAL, PLA, Realization of Boolean function using PROM, PAL, P7LA, Comparison of PLDs

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UNIT –V: Sequential Logic Circuits

Classification of sequential circuits, Latches and Flip flops, Triggering, excitation tables, Asynchronous inputs, Conversion from one flip-flop to another flip flop. Registers-Types, modes of operations, bi-directional shift registers, universal shift register, Counters-synchronous & Asynchronous counters, design of mod counters, Counters using shift registers, Serial binary adder.

Text Books:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
2. Switching Theory and Logic Design by A. Anand Kumar.
3. Digital Design by Mano PHI.
4. Switching and finite automata theory Zvi. KOHAVI, Niraj. K.Jha 3rdEdition,Cambridge University Press, 2009

Reference Books:

1. Modern Digital Electronics by RP Jain, TMH.
2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers.
3. Microelectronics by Milliman MH edition.

Course Outcomes:

At the end of this course the student will able to

- Classify different number systems and apply to generate various codes.
- Use the concept of Boolean algebra in minimization of switching functions
- Design different types of combinational logic circuits.
- Apply knowledge of flip-flops in designing of Registers and counters.
- The operation and design methodology for synchronous sequential circuits.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - I Semester

RANDOM VARIABLES AND STOCHASTIC PROCESS

Course Objectives:

To enable the students to

- To give students an introduction to elementary probability theory, in preparation for courses on statistical analysis, random variables and stochastic processes.
- To mathematically model the random phenomena with the help of probability theory concepts.
- To introduce the important concepts of random variables and stochastic processes.
- To analyze the LTI systems with stationary random process as input.

UNIT-I : The Random Variable

Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT-II: Operation On One Random Variable – Expectations

Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance, Characteristic Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Nonmonotonic Transformations of Continuous Random Variable.

UNIT-III : Multiple Random Variables

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables.

Operations on Multiple Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV: Random Processes – Temporal Characteristics

The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence.First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, Nth-order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

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UNIT-V: Random Processes – Spectral Characteristics

The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

Linear Systems with Random Inputs

Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output.

Text Books:

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4th Edition, 2001.

2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrisha, PHI, 4th Edition, 2002.

Reference Books:

1.Probability Theory and Stochastic Processes – B. Prabhakara Rao, BS Publications

2. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3rd Edition.

3. An Introduction to Random Signals and Communication Theory, B.P. Lathi, Int. Textbook, 1968

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Course Outcomes:

After completion of the course, the student will be able to

- Mathematically model the random phenomena and solve simple probabilistic problems.
- Identify different types of random variables and compute statistical averages of these random variables.
- Characterize the random processes in the time and frequency domains.
- Analyze the LTI systems with random inputs.
- Apply these techniques to analyze the systems in the presence of different types.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - I Semester

ELECTRONIC CIRCUIT AND ANALYSIS LAB

Course Objectives:

To enable the students to

- To identify and test various electronic components .
- To use DSO for various measurements.
- To design and implement RC coupled and Cascade amplifier circuits.
- To design and implement feedback amplifier circuits.
- To measure the frequency of oscillators.
- To design and simulate class A power amplifier circuits, and single tuned voltage amplifier circuits

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 Oscillator
6. Colpitt's Oscillator
7. TwoStageRCCoupledAmplifier
8. DarlingtonPairAmplifier
9. BootstrappedEmitterFollower
10. ClassASeries-fedPowerAmplifier
11. Transformer-coupledClassAPowerAmplifier
12. ClassBPush-PullPowerAmplifier
13. ComplementarySymmetryClassBPush-PullPowerAmplifier
14. SingleTunedVoltageAmplifier

Equipment Required:

Software:

- Multisim/EquivalentIndustrialStandardsimulationsoftwaretool.
- ComputerSystemswithrequiredspecifications

Hardware:

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

Course Outcomes:

At the end of this course the student will able to

- The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.
- Designing and analyzing the transistor at high frequencies
- Determine the efficiencies of power amplifiers.
- Designing the Oscillators using transistors
- Determine Frequency response and design of tuned amplifiers
- analyze all the circuits using simulation software and Hardware

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - I Semester

SWITCHING THOERY AND LOGIC DESIGN LAB

Course Objectives:

To enable the students to

- Solve a typical number base conversion and analyze new error coding techniques.
- Understand theorems and functions of Boolean algebra and behavior of logic gates.
- Optimize Boolean functions for digital circuits using various techniques.
- Design and realize basic digital combinational and sequential circuits.
- Verify the functionality of advanced digital combinational and sequential circuits.

Experiments (minimum of ten)

1. Verify

(a) Basic Logic gates (AND, OR, NOT, NAND, NOR, EX-OR)

(b) De-Morgan's Theorem for 2 variables.

2. Verification of functional table of 3 to 8 line Decoder
3. Variable logic function verification using 8 to 1 multiplexer IC 74151
4. Design and implementation De-multiplexer using logic gates and study of IC74155
5. Design and implementation of Adders and Subtractor (Half and Full) using logic gates.
6. Verification of functional tables of

(a) RS Flip Flop using level triggering,

(b) JK Flip Flop using level triggering

7. Verify the operation of 4-bit Universal Shift Register for different Modes of operation
8. Design and implementation of decade counter
9. Design and Implementation of 4-bit Digital Comparator using IC 7485.
10. Verification of functional tables of dual D type level triggered flip-flops with preset and clear inputs.
11. Verification of functional table of Master Slave JK Flip Flop.
12. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
13. (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.

14. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verify output.

15. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output..
16. Design and implementation of Encoder and Decoder using logic gates and study of IC7445 and IC74147

Course Outcomes:

After completion of the course, the student will be able to

- Classify different number systems and apply to generate various codes.
- Use the concept of Boolean algebra in minimization of Boolean functions.
- Design different types of combinational logic circuits.
- Design different types of programmable logic devices.
- Apply knowledge of flip-flops in designing of registers and counters and to understand operation and design methodology for synchronous/ asynchronous sequential circuits

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - I Semester

NETWORKS ANALYSIS & ELECTRICAL TECHNOLOGY LAB

Course Objectives:

To enable the students to

- To understand the concept network theorems in network reduction of electrical networks.
- To determine resonance frequency, Q-factor of RLC networks.
- To estimate parameters of two port networks
- To determine efficiency of dc shunt machine with actual loading
- To analyze performance of transformer and three phase induction motor

Any five experiments are to be conducted from each part.

PART – A

1. Verification of KCL and KVL.
2. Verification of Thevenin's and Norton's theorems
3. Verification of Superposition theorem& Reciprocity theorem.
4. Verification of Maximum power transfer theorem(DC)
5. Series and Parallel Resonance Circuits 6. Z and Y parameters of two port Network

PART – B

1. Determination of critical field resistance of D.C. Shunt generator by using Magnetization characteristics
2. Speed control of D.C. Shunt motor by Armature & flux control methods
3. Determination of performance characteristics by conducting Brake test on DC shunt motor.
4. OC & SC tests on Single-phase transformer.
5. Brake test on 3-phase Induction motor (performance characteristics).
6. Load test on Single Phase Transformer

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes:

After completion of the course, the student will be able to

- Analyze RLC resonance circuits and understand resonant frequency and Qfactor
- Estimate the parameters of two port networks
- Apply network theorems to analyze the electrical network.
- Describe the performance of dc shunt machine
- Investigate the performance of Single-phase transformer.
- Perform tests on 3-phase induction motor

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II Year - I Semester

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EMPLOYABILITY SKILLS-APTITUDE LAB

Course Objectives:

To enable the students to

- To enhance the basic mathematical skills for any type of competitive examinations
- To develop the skills for better job opportunity
- To build fundamental , mathematical aspects and to instil confidence among students
- To enrich their knowledge and to develop their logical reasoning thinking ability.

. List of topics

1. Problems on Ages
2. Problems on Profit and Loss
3. Problems on Time and Distance
4. Problems on Time and Work
5. Problems on Calendar
6. Problems on Clock
7. Problems on Boats and Streams
8. Problems on Simple and Compound Interest
9. Problems on Number Systems
10. Problems on Permutations and Combinations

Text Books:

1. Dr. R.S.Aggarwal, Quantitative Aptitude for competitive Examinations, Sultan Chand Publications, 2017

Reference Books:

1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, Tata McGrawHill Publishing Company, 2016
2. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson India, 2016

Course Outcomes:

After completion of the course, the student will be able to

- Solve the problems related to Ages, Profit and Loss
- Solve the problems related to Time and work, Time and distance

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- Solve the problems related to to Calendar and Clock
- Solve the problems related to Simple and Compound Interest, Boats and Streams
- Solve the problems related to Number Systems, Permutations and Combinations

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1	0	2	2

II Year - I Semester

EMPLOYABILITY SKILLS-ASSISTIVE TECHNOLOGY LAB

Course Objectives:

To enable the students to

- To gain an understanding of the engineering, medical, and social aspects associated with the design, development, and use of assistive technology.
- To understand various tools used in assistive technology.
- To provide an opportunity for students to interact with users of assistive technology in the local community along with health care professionals, coaches, and project partners.
- To enhance the problem solving, critical thinking and communication skills.
- To engage students in a project experience that enhances the team work skills and enable them to apply engineering design process to address the needs of individuals with disabilities and older adults.

ABOUT ASSISTIVE TECHNOLOGY

Assistive technology – definition, principles of operation, perspectives of assistive technology,general awareness including the use of various embedded technologies in the development of assistive devices. Engineering, Medical, and Social issues to be considered in the design of assistive technology. Ethical issues in assistive technology.

IDE TOOLS

Writing Sketches, Tabs, Multiple Files, and Compilation, Uploading, Libraries, Serial Monitor,

Preferences of Arduino IDE.

List of Experiments

1. Light Emitting Diodes (LEDs), Push Button Switch, and Magnetic Switch.
2. 7-Segment Display with Keypad.
3. Input voltage measurement using ADC
4. LCD Interfacing
5. Object range measurement using Ultrasonic Sensor and LCD
6. Temperature and humidity measurement using DHT 11 and LCD
7. Servo motor interfacing
8. Stepper motor interfacing
9. Automatic street light control using LDR.
10. Gas detection using MQ 3 sensor.

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Text Books:

1. Assistive technologies principles and practice - Jan Miller Polgar and Pedro Encarnação, St. Louis Mosby, 2020.
2. Arduino Programming: The Ultimate Guide for making the best of your Arduino Programming Projects by Damon Parker

Reference Books:

1. The Handbook of Assistive Technology by Gregory Church and Sharon Glennen, 1992.
2. Essentials of Assistive Technologies by Albert Cook Janice Polgar, Mosby, 2011

Course Outcomes:

After completion of the course, the student will be able to

- Understand the Assistive Technology and its applications
- Understand to interface various I/O devices like LCD, keypad to Arduino board.
- Understand to write the software programs to various interfacing devices.
- Understand to control the stepper and servomotors through to Arduino board.
- Understand to interface temperature and humidity sensors to Arduino board.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - I Semester

EMPLOYABILITY SKILLS-PCB DESIGN LAB

Course Objectives:

To enable the students to

- To understand the PCB designing used for various electronic devices.
- To learn a variety of PCB designing issues like clearance between tracks and DRC errors etc.
- Students get good skills on PCB designing
- To provide an opportunity for students in various electronic industries

List of Experiments:

1.Design the schematic and PCB layout of Astable Multivibrator using 555 timer using Multisim EDA tool

2 Design the schematic and PCB layout of Burglar alarm and using Multisim EDA tool

3 Design the schematic and PCB layout of overhead tank level using Multisim EDA tool

4. Design the schematic and PCB layout of 12V battery charger circuit using transistors using Multisim EDA tool

5) Design the schematic and PCB layout of distance measurement circuit using PIC microcontroller with ultrasonic sensor using Multisim EDA tool

6) Design the schematic and PCB layout of clap operated fan with transistors using Multisim EDA tool

7 Design the schematic and PCB layout of a bike antitheft alarm using Multisim EDA tool
eda tool

8. Design the schematic and PCB layout of an automatic street light controller circuit using Multisim EDA tool

9. Design the schematic and PCB layout of a traffic controller circuit using PIC Microcontroller using Multisim EDA tool

10. Design the schematic and PCB layout of a quiz competition buzzer circuit using Multisim EDA tool

11. Design the schematic and PCB layout of a gas leakage detector circuit using
using Multisim EDA tool

12. Make a line soldering PCB for LCD display interfacing with PIC microcontroller.

Course Outcomes:

After completion of the course, the student will be able to

- Understand how to design a schematic & layout of a design.
- Understand how to place a component in a workspace from library.
- Understand how to route the components in the workspace.
- Understand how to check and fix the DRC errors.
- Understand how to generate silk screen top, copper bottom, soldering mask files of design

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II Year - I Semester

CONSTITUTION OF INDIA

Course Objectives:

To enable the students to

- To train students in understanding the basic structure of Indian Constitution.
- To prepare students to live better and happily with other fellow beings through the application of Fundamental Rights in their lives.

UNIT –I: Introduction to Indian Constitution

Meaning of the term Indian Constitution –Preamble- Constituent Assembly- Salient Features of Indian Constitution

UNIT-II: Fundamental Rights

Fundamental Rights -Fundamental Duties -The Directive Principles of State

UNIT-III: Union Government

Union Government -Union Legislature (Parliament) -Lok Sabha and Rajya Sabha (with Powers and Functions) -UnionExcecutive -President of India (with Powers and Functions) -Prime Minister of India (with Powers and Functions) -Union Judiciary (Supreme Court) -Jurisdiction of the Supreme Court

UNIT-IV State Goernment

State Government -State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan Parishad) -Powers and Functions of the State Legislature -State Executive-Governor of the State (with Powers and Functions) -TheChief Minister of the State (with Powers and Functions) -State Judiciary (High Courts)

UNIT-V: Local Self Governance

Powers and functions of Municipalities, Panchyats, ZP's and Co – Operative Societies

Text Books:

1. Introduction to constitution of India, Durga Das Basu, Lexis Nexis Publications
2. Constitution of India by PRFESSIONAL BOOK PUBLISHERS
3. The Constitution of India by Arun K Tiru vengadam, Blooms bury publishers.
4. The constitution of India by PM Bakshi, Universal law publishing co
5. The Constitution of India by S.R. Bhansali, Universal law publishing co

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Course Outcomes:

After completion of the course, the student will be able to

- Examine salient features of Indian Constitution and live accordingly in society
- Interpret the meaning of Fundamental Rights and Directive Principles of State Policy and, develop an attitude which paves the way for better living conditions
- Discover various aspects of Union Government legislation and live up to the expectations of the rules
- Critically examine State Government legislation and improve your living standards by following the rules strictly
- Examine powers and functions of local bodies such as Muncipalities and Panchayats and, take advantage of available resources for better living

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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3	0	0	3

II Year – II Semester

CONTROL SYSTEMS

Course Objectives:

Enable the students to

- To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
- To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
- To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices
- To analyze the system in terms of absolute stability and relative stability by different approaches
- To design different control systems for different applications as per given specifications
- To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability

UNIT-I:

Introduction

System Control System, Open Loop Control System, Closed loop Control System, different examples

Mathematical models of Physical Systems

Differential equations of physical systems, Transfer functions, Block diagram Algebra, Signal flow graphs with illustrative examples

Effects of Feedback

Feedback Characteristics and its advantages

UNIT -II:

Controller Components

DC Servomotor (Armature Controlled and Field Controlled) with necessary derivation for transfer function, AC Servomotor and its transfer function.

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

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UNIT -III:

Concepts of Stability and Algebraic Criteria

The concept of Stability, Necessary Conditions for Stability, Routh-Hurwitz Srability Criterion, Relative stability analysis

The Root Locus Technique

Introduction, The Root Locus concepts, Construction of Root Loci

UNIT –IV:

Frequency response analysis

Introduction to Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability criterion. Effects of various controllers.

UNIT –V:

State Space Analysis of LTI Systems

Concepts of state, state variables and state model, state space representation of transfer function, Diagonalization- Solving the time invariant state equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Text Books:

1. J.Nagarath and M.Gopal, "Control System Engineering," New Age International Publishers, Fifth Edition

References:

1. Katsuhiko Ogata, "Modern Control Engineering," Pearson, FifthEdition
2. S. Salivahanan, R. Rengaraj, and G. R. Venkata Krishnan, " Control Systems Engineering," Pearson, FirstImpression
3. Benjamin C. Kuo, FraridGolnaraghi, " Automatic Control Systems," Wiley Student Edition, Eigth Edition
4. PadmaRaju and Reddy , " Instrumentation and Control Systems ", McGrawHill Education,2016

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Course Outcomes:

After completing this course, the students will be able to

- Determine the mathematical modelling of physical systems
- Calculation of Time Domain Specification of first and second order systems and understand the effect of Controllers
- Investigate the stability of closed loop systems using Routh‟s stability criterion and root locus method.
- Find the stability of control systems using frequency response approaches.
- Analyze physical systems using state space approach.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - II Semester

ANALOG COMMUNICATION

Course Objectives:

The student will be able to

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

UNIT-I: AMPLITUDE MODULATION

Introduction to communication system, need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector, Review of noise and noise sources, Noise in Analog communication Systems, Noise in AM System.

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UNIT –II: DSB & SSB MODULATION:

Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Noise in DSB& SSB System, Comparison of AM Techniques, Applications of different AM Systems.

UNIT-III: ANGLE MODULATION:

Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave, Generation of FM Waves, Armstrong Method, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Phase locked loop, Noise in Angle Modulation Systems, Threshold effect in Angle

Modulation System, Comparison of FM & AM.

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UNIT-IV: TRANSMITTERS & RECEIVERS:

Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter –Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superheterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Pre-emphasis & de-emphasis,Comparison with AM Receiver, Amplitude limiting. oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and wein bridge oscillators with BJT and FET and their analysis, generalized analysis of LC oscillators, Hartley and colpitts oscillators with BJT and FET and their analysis, crystal oscillators.

UNIT-V: PULSE MODULATION

Time Division Multiplexing, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, TDM Vs FDM..

Text Books:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2ndEd.,.
2. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007,3rdEdition.

References:

1. Electronics & Communication System – George Kennedy and Bernard Davis, TMH2004.
2. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.
3. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA,2006..
4. Electronic Communication systems – Tomasi,Pearson.
5. Communication Systems – B.P. Lathi, BS Publication,2006.

Course Outcomes:

After going through this course the student will be able to

- Analyze Amplitude modulation and demodulation schemes and their spectra characteristics
- Analyze DSB-SC,SSB-SC,VSB modulation schemes and their spectra characteristics
- Understand Frequency and phase modulation schemes and their spectra characteristics
- Analyze various functional blocks of radio transmitters and receivers
- Understand various pulse analog modulation schemes.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - II Semester

PULSE AND DIGITAL CIRCUITS

Course Objectives:

The student will be able to

- To understand the concept of linear wave shaping circuits such as RC low pass and high pass with sinusoidal, step, pulse, square, ramp and exponential inputs.
- To understand the concept of non-linear wave shaping circuits such as clippers and clampers with their transfer characteristics.
- To study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families & Sampling Gates.

UNIT –I:

Linear Wave Shaping

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; Attenuators, its applications in CRO probe.

UNIT –II:

Non-Linear Wave Shaping

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper; Clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem

UNIT –III:

Bistable Multivibrator: Analysis And Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Collector Catching Diodes, Triggering of Binary Circuits, Emitter Coupled Bistable Multivibrator (Schmitt Trigger).

Monostable Multivibrator

Analysis and Design of Collector Coupled Monostable Multi vibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator.

Astable Multivibrator: Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –IV: Voltage Time Base Generators

General features of a time base signal, Methods of generating time base waveform Exponential Sweep Circuits, Negative Resistance Switches, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

UNIT –V:

Logic Families & Sampling Gates:

Logic Families: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic

Sampling Gates: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Reduction of Pedestal in Sampling Gates, Applications of Sampling Gates.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill.
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

References:

1. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002.
2. Pulse & Digital Circuits by Venkata Rao,K,Ramasudha K, Manmadha Rao,G., Pearson,2010.

Course Outcomes:

After going through this course the student will be able to

- Design linear wave shaping circuits such as RC, RL and RLC and apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Design non-linear wave shaping circuits such as clippers and clampers and apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Design different Multivibrators and apply the fundamental concepts to various digital circuits.
- Design different time base generators and can be used in different display devices
- Utilize the logic families, sampling gates and non-sinusoidal signals in many experimental research areas.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - II Semester

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Course Objectives:

The student will be able to

- Fundamentals of steady electric and magnetic fields using various laws.
- The concept of static and time varying Maxwell equations and power flow using pointing theorem.
- Wave characteristics in different media for normal and oblique incidence.
- To introduce the various types of transmission lines and to discuss the losses associated.

UNIT-I: Electrostatics

Coulomb's Law, Electric Field Intensity & Electric Flux Density, Gauss Law and Applications, Electric work & Potential, Divergence, Maxwell's Equations for Electrostatic Fields, Convection and Conduction Currents, Dielectric Constant, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT-II:

Magneto Statics

Biot-Savart Law, Magnetic Flux Density, Ampere's Circuital Law and Applications, Maxwell's two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, forces in Magnetic field Illustrative Problems. Conditions at a Boundary Surface :Dielectric-Dielectric and Dielectric-Conductor Interfaces

Time Varying Fields : Induced emf, Faraday's Law, Types of Induced emf, Displacement Current Density, Inconsistency of Ampere's Law and Maxwell's Equations in point and Integral Forms and Word Statements.

UNIT –III: EM Wave Characteristics - I

EM Wave Characteristics - I: Plane Waves – Definition, Wave Equations for Conducting , Perfect Dielectric Media, harmonically time varying fields, Relations Between E & H, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Surface Impedance. Poynting Vector and Poynting Theorem –Applications, Polarization & Types..

UNIT-IV: EM Wave Characteristics – II

EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal Incidences, for dielectric boundary and conducting boundary, Standing waves, SWR. Reflection and Refraction of Plane Waves –

Oblique Incidence, types-vertical polarisation and horizontal polarisation, Brewster Angle, Critical Angle and Total Internal Reflection.

UNIT –V:

Transmission Lines : Types, Parameters, Transmission Line Equations, Infinite Line ,Primary & Secondary Constants, Phase and Group Velocities, Attenuation constant and Phase constant ,Lossless lines, distortion less lines, Telephone line Loading - Types of Loading. Illustrative Problems. Input Impedance, Relations for SC and OC Lines, Reflection Coefficient, VSWR.Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements;Impedance Transformations λ/4, λ /2, λ/8 Lines –. Quarter wave transformer, Short notes on Smith Chart and Stub Matching-single & double.

Text Books:

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

References:

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.
2. Engineering Electromagnetics:Nathan Ida, Springer(India)Pvt.Ltd., New Delhi, 2nd ed., 2005.
3 Transmission Lines and Networks–Umesh Sinha,S Prakashan (Tech. India pub New Delhi, 2001.
4. Electromagnetic Waves and Transmission Lines-U.A.Bakshi &A.V.Bakshi, Technical pub.
5. Electromagnetic Waves and Transmission Lines-Y.Mallikharjuna Reddy,Universities press.

Course Outcomes:

After going through this course the student will be able to

- Analyze the basic concepts of electric fields
- Analyze the basic concepts of magnetic fields and derive Maxwell's Equations for time varying fields
- Formulate the wave equations in perfect dielectric and conduction media
- Derive the equations of reflection and refraction of Electromagnetic waves in different media
- Determine the parameters of transmission lines

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - II Semester

UNIVERSAL HUMAN VALUES II

Course Objectives:

The student will be able to

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal HumanValues-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the Current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physicalfacility

9. Understanding the Body as an instrument of 'I' (I being the doer, seer andenjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity indetail
12. Programs to ensure Sanyam and Health.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values ofrelationship
14. Understanding the meaning of Trust; Difference between intention andcompetence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values inrelationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive HumanGoals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to worldfamily.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self- regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasivespace
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi,2010

References:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi,2004.
3. The Story of Stuff(Book).
4. The Story of My Experiments with Truth - by Mohandas KaramchandGandhi
5. Small is Beautiful - E. FSchumacher.
6. Slow is Beautiful - CecileAndrews
7. Economy of Permanence - J CKumarappa
8. Bharat Mein Angreji Raj -PanditSunderlal
9. Rediscovering India - byDharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul KalamAzad

12. Vivekananda - Romain Rolland(English)

13. Gandhi - Romain Rolland(English**)**

Course Outcomes:

After going through this course the student will be able to

- By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - II Semester

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SIGNALS AND SYSTEMS LAB

Course Objectives:

The student will be able to

- To provide background and fundamentals of MATLAB tool for the analysis and processing of Signals and to generate various continuous and discrete time signals.
- To provide an overview of signal transmission through linear systems, convolution and Correlation of signals and sampling.
- To understand the concept and importance of Fourier and Z-Transforms

LIST OF EXPERIMENTS

1. Operations on Matrices
2. Generation of signals
3. Operation on signals
4. Convolution
5. Auto correlation and Cross correlation between signals
6. Finding Fourier Transform for a given signal
7. Gibbs Phenomenon
8. Generation of Gaussian function.
9. Verification of Weiner-Khinchine Relations
10. Pole- Zero Plots in S-Plane and Z-Plane

Course Outcomes:

After going through this course the student will be able to

- Analyze the generation Various Signals and Sequences in MATLAB, including the operations on Signals and Sequences
- Analyze the response of LTI system
- Analyze the Fourier Transform of a given signal and plotting its magnitude and phase spectrum and also plot Pole-Zero Maps in Z-Plane.
- Verify Wiener Khinchine relations

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - II Semester

ANALOG COMMUNICATIONS LAB

Course Objectives:

The student will be able to

- To learn the basic principles of Continuous wave Analog Modulation and demodulation
- To learn the basic principles of Pulse Modulation and demodulation

LIST OF EXPERIMENTS (Minimum of Ten Experiments has to be performed)

1. Amplitude Modulation - Modulation & Demodulation (Hardware & Software)
2. AM - DSB SC - Modulation & Demodulation (Hardware & Software)
3. Spectrum Analysis of Modulated signal using Spectrum Analyser.
4. Diode Detector.
5. Pre-emphasis & De-emphasis.
6. Frequency Modulation - Modulation & Demodulation (Hardware & Software)
7. AGC Circuits.
8. Sampling Theorem. (Hardware & Software)
9. Pulse Amplitude Modulation - Modulation & Demodulation (Hardware & Software)
10. PWM , PPM - Modulation & Demodulation
11. PLL

Equipment's& Software required:

Software:

- Computer Systems with latest specifications.
- Connected in Lan (Optional).
- Operating system (Windows XP).
- Simulations software (Simulink & MATLAB).

Equipment:

- RPS - 0 – 30 V
- CRO - 0 – 20 M Hz.
- Function Generators - 0 – 1 M Hz
- Components
- Multimeters

- Spectrum Analyser

Course Outcomes:

After going through this course the student will be able to

- Analyze different Amplitude modulators and demodulators.
- Analyze Frequency modulation and demodulation .
- Analyze pulse Amplitude and Pulse Time modulation systems
- Analyze Continuous wave Analog Modulation and demodulation, Pulse Time systems using Matlab Simulink.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - II Semester

PULSE AND DIGITAL CIRCUITS LAB

Course Objectives:

The student will be able to

- To impart knowledge on the RC linear wave shaping circuits
- To design non-linear wave shaping circuits.
- To understand the switching characteristics of devices
- To verify the response of pulse generator circuits such as multi vibrators, time base generators**.**

LIST OF EXPERIMENTS (Minimum of Ten Experiments has to be performed)

1.Linear wave shaping.

2. Non Linear wave shaping – Clippers.

3. Non Linear wave shaping – Clampers.

4. Transistor as a switch.

5. Astable Multivibrator.

6. Monostable Multivibrator.

7. Bistable Multivibrator.

8. UJT Relaxation Oscillator.

9. Schmitt Trigger.

10. Bootstrap sweep circuit.

11. Attenuators

12. Sampling Gates.

Equipment required:

1 RPS - 0 – 30 V

2 CRO - 0 – 20 M Hz.

3 Function Generators - 0 – 1 M Hz

4 Components

5 Multi Meters

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes:

After going through this course the student will be able to

- Analyze and Design of different types of linear and non-linear wave shaping circuits.
- Analyze and Design of Transistor to act as a switch
- Analyze and Design of different types of multivibrators.
- Analyze the operation of various time base generator circuits and sampling gates

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
1	0	2	2

II Year – II Semester

EMPLOYABILITY SKILLS-APTITUDE LAB

Course Objectives:

- To enhance the basic mathematical skills for any type of competitive examinations
- To develop the skills for better job opportunity
- To build fundamental , mathematical aspects and to instil confidence among students
- To enrich their knowledge and to develop their logical reasoning thinking ability.

. **List of topics**

1. Problems on Ages
2. Problems on Profit and Loss
3. Problems on Time and Distance
4. Problems on Time and Work
5. Problems on Calendar
6. Problems on Clock
7. Problems on Boats and Streams
8. Problems on Simple and Compound Interest
9. Problems on Number Systems
10. Problems on Permutations and Combinations

Text Books:

1. Dr. R.S.Aggarwal, Quantitative Aptitude for competitive Examinations, Sultan Chand Publications, 2017

Reference Books:

1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, Tata McGrawHill Publishing Company, 2016
2. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson India, 2016

Course Outcomes:

After completion of the course, the student will be able to

- Solve the problems related to Ages, Profit and Loss

- Solve the problems related to Time and work, Time and distance
- Solve the problems related to to Calendar and Clock
- Solve the problems related to Simple and Compound Interest, Boats and Streams

  Solve the problems related to Number Systems, Permutations and Combinations

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - II Semester

EMPLOYABILITY SKILLS-ASSISTIVE TECHNOLOGY LAB

Course Objectives:

- To gain an understanding of the engineering, medical, and social aspects associated with the design, development, and use of assistive technology.
- To understand various tools used in assistive technology.
- To provide an opportunity for students to interact with users of assistive technology in the local community along with health care professionals, coaches, and project partners.
- To enhance the problem solving, critical thinking and communication skills.
- To engage students in a project experience that enhances the team work skills and enable them to apply engineering design process to address the needs of individuals with disabilities and older adults.

ABOUT ASSISTIVE TECHNOLOGY

Assistive technology – definition, principles of operation, perspectives of assistive technology,general awareness including the use of various embedded technologies in the development of assistive devices. Engineering, Medical, and Social issues to be considered in the design of assistive technology. Ethical issues in assistive technology.

IDE TOOLS

Writing Sketches, Tabs, Multiple Files, and Compilation, Uploading, Libraries, Serial Monitor, Preferences of Arduino IDE.

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List of Experiments

1. Light Emitting Diodes (LEDs), Push Button Switch, and Magnetic Switch.
2. 7-Segment Display with Keypad.
3. Input voltage measurement using ADC
4. LCD Interfacing
5. Object range measurement using Ultrasonic Sensor and LCD
6. Temperature and humidity measurement using DHT 11 and LCD
7. Servo motor interfacing
8. Stepper motor interfacing
9. Automatic street light control using LDR.

10. Gas detection using MQ 3 sensor.

Text Books:

1. Assistive technologies principles and practice - Jan Miller Polgar and Pedro Encarnação, St. Louis Mosby, 2020.
2. Arduino Programming: The Ultimate Guide for making the best of your Arduino Programming Projects by Damon Parker

Reference Books:

1. The Handbook of Assistive Technology by Gregory Church and Sharon Glennen, 1992.
2. Essentials of Assistive Technologies by Albert Cook Janice Polgar, Mosby, 2011

Course Outcomes:

After completion of the course, the student will be able to

- Understand the Assistive Technology and its applications
- Understand to interface various I/O devices like LCD, keypad to Arduino board.
- Understand to write the software programs to various interfacing devices.
- Understand to control the stepper and servomotors through to Arduino board.
- Understand to interface temperature and humidity sensors to Arduino board.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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II Year - II Semester

EMPLOYABILITY SKILLS-PCB DESIGN LAB

Course Objectives:

To enable the students to

- To understand the PCB designing used for various electronic devices.
- To learn a variety of PCB designing issues like clearance between tracks and DRC errors etc.
- Students get good skills on PCB designing
- To provide an opportunity for students in various electronic industries

List of Experiments:

1.Design the schematic and PCB layout of Astable Multivibrator using 555 timer using Multisim EDA tool

2 Design the schematic and PCB layout of Burglar alarm and using Multisim EDA tool

3 Design the schematic and PCB layout of overhead tank level using Multisim EDA tool

4. Design the schematic and PCB layout of 12V battery charger circuit using transistors using Multisim EDA tool

5) Design the schematic and PCB layout of distance measurement circuit using PIC microcontroller with ultrasonic sensor using Multisim EDA tool

6) Design the schematic and PCB layout of clap operated fan with transistors using Multisim EDA tool

7 Design the schematic and PCB layout of a bike antitheft alarm using Multisim EDA tool
eda tool

8. Design the schematic and PCB layout of an automatic street light controller circuit using Multisim EDA tool

9. Design the schematic and PCB layout of a traffic controller circuit using PIC Microcontroller using Multisim EDA tool

10. Design the schematic and PCB layout of a quiz competition buzzer circuit using Multisim EDA tool

11. Design the schematic and PCB layout of a gas leakage detector circuit using
using Multisim EDA tool

12. Make a line soldering PCB for LCD display interfacing with PIC microcontroller.

Course Outcomes:

After completion of the course, the student will be able to

- Understand how to design a schematic & layout of a design.
- Understand how to place a component in a workspace from library.
- Understand how to route the components in the workspace.
- Understand how to check and fix the DRC errors.
- Understand how to generate silk screen top, copper bottom, soldering mask files of design

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
2	0	0	0

II Year - II Semester

CRITICAL READING AND CREATIVE WRITING

Course Objectives:

The student will be able to

- Understand how to identify, analyze, interpret and describe critical ideas, themes, and values in literary texts
- List the elements of a Short Story.
- Apply critical and theoretical approaches to the reading and analysis of literary texts in Multiple genres

UNIT-I:

Essentials of Good Writing

1. Focus, Development, Unity, Coherence and Correctness
2. Imagery
   A. Figurative Language- Simile, Metaphor, Personification, Hyperbole, Oxymoron, Paradox, Alliteration, Assonance
   B. Sensory details
3. Point of View

UNIT-II: Elements of a Short story

1. Plot, Setting, Character, Theme

2. Analysis of given short stories: 2 stories

A. Good Sees the Truth but Waits by Leo Tolstoy

B. The Cop and the Anthem by O. Henry

UNIT-III:

Prose Writing:

Reflective Writing – Personal Essay

Descriptive Writing: Person/Place/Thing

UNIT –IV:

Reading Comprehension

Reading for facts, contextual vocabulary, tone and inference

UNIT –V

Speech Analysis

A. Tryst with Destiny-

https://www.youtube.com/watch?v=lrEkYscgbqE

B. Stay Hungry, Stay Foolish –

https://www.youtube.com/watch?v=UF8uR6Z6KLc

Text Books:

1. Dr. R.S. Aggarwal,A Modern Approach to Verbal & Non-Verbal Reasoning Sultan Chand Publications, 2018.

References:

1. The Cambridge Companion to Creative Writing (South Asian Edition)
2. Creative Writing: A Beginner's Manual (Paper Back Edition)
3. Teaching and Developing Reading Skills: Cambridge Handbooks for Language Teachers

Web References:

https://www.skillsyouneed.com/learn/critical-reading.html

https://englishforeveryone.org

http://sixminutes.dlugan.com/speech-evaluation-1-how-to-study-critique-speech/

http://www.homeofbob.com/literature/genre/fiction/ficElmnts.html

Course Outcomes:

After completing this course, the students will be able to

- Understand and explain the characteristics of a literary text
- Critically analyze the quality of a Shorty Story
- Produce essays like personal essay or descriptive essay applying the principles of good writing
- Identify facts, themes and critical ideas in a passage
- Articulate an awareness of the basic elements of a speech

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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3	0	0	3

III Year - I Semester

INTEGRATED CIRCUITS AND APPLICATIONS

Course Objectives:

Enable the students to

- To understand the basic operation & performance parameters of differential amplifiers.
- To understand & learn the measuring techniques of performance parameters of OP-AMP.
- To learn the linear and non-linear applications of operational amplifiers.
- To learn the internal structure, operation of Analog IC 555.
- To understand the analysis & design of different types of active filters using Op-Amps.

UNIT -I: Integrated Circuits

Differential Amplifier-DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input– Balanced/Unbalanced Output), Methods to improve CMRR

UNIT-II: OP-Amps Parameters and Characteristics

Characteristics of OP-Amps, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics,741 op-amp & its features, Op-Amp parameters &Measurement, Offset voltages & currents, slew rate, CMRR, PSRR, drift, Frequency Compensation techniques**.**

UNIT–III:

Linear Applications of Op-Amps:

Open loop and closed loop configurations,Inverting and Non-inverting amplifiers, Ideal and practical Integrator, Ideal and practical differentiator, Difference amplifier, Instrumentation amplifier, V to I, I to V converters,

Non-linear Applications of Op-Amps : Comparators, Schmitt trigger, Precision Rectifiers, Multivibrators, Log and Antilog Amplifiers

UNIT–IV: Active Filters and IC 555

Active Filters: Design&Analysis of Butterworth active filters –1st order,2nd order Low pass, High pass, Band pass,Band reject and allpass filters.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IC 555 Timer**:** Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger.

UNIT –V: Digital to Analog and Analog to Digital Converters

Introduction, Basic DAC techniques,weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs –parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications.

Textbooks:

1. Linear Integrated Circuits–D.Roy Choudhury, NewAgeInternational(p) Ltd,2nd Edition,2003.
2. Op-Amps&LinearICs – RamakanthA.Gayakwad,PHI,1987.
3. Operationa lAmplifiers–C.G.Clayton,Butterworth&CompanyPubl. Ltd./Elsevier,1971.

References:

1. Operational Amplifiers &Linear Integrated Circuits Sanjay Sharma; SK Kataria & Sons; 2ndEdition, 2010
2. Design with Operational Amplifiers& Analog Integrated Circuits Sergio Franco, McGraw Hill,1988.
3. OPAMPS and linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.
4. Operational Amplifiers& Linear Integrated Circuits–R.F. Coughlin & Fredrick Driscoll, PHI, 6thEdition.
5. Operational Amplifiers & Linear ICs– David A Bell, Oxford Uni.Press,3rdEdition

Course Outcomes:

After completion of the course, the student will be able to

- Analyze the basic operation & performance parameters of differential amplifiers
- Analyze the various characteristics of Op-Amp
- Analyze and design linear and non-linear applications of operational amplifiers.
- Analyze and design of active filters and multivibrators using Op-amp
- Analyze the concept in different types of ADC and DAC

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year - I Semester

ANTENNA AND WAVE PROPAGATION

Course Objectives:

The student will be able to

- Understand the concept of the electromagnetic radiation by the antenna and its parameters.
- Introduce the working principles of various types of antennas.
- The principle of working of various types of antenna arrays.
- Analyse the features and characteristics of non-resonant and HF antennas.
- Understand the concepts of radio wave propagation in the atmosphere.

UNIT –I: Antenna Fundamentals

Introduction, Radiation Mechanism – single wire, 2-wire,dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Main Lobe and Side Lobes, Beam width, Beam Area, Radiation Intensity, Beam Efficiency,Directivity, Gain and Resolution, Antenna Apertures, Effective Height, illustrated problems.

UNIT –II: Thin Linear Wire Antennas

Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance

UNIT –III: Antenna Arrays

2 element arrays –different cases, principle of pattern multiplication, N element uniform linear arrays – Broadside, End-fire Arrays, Derivation of their characteristics and comparison; concept of scanning arrays, Binomial arrays, Arrays with Parasitic Elements,Yagi-Uda arrays, folded dipoles and their characteristics, Related Problems.

UNIT –IV:

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, Broadband Antennas: Helical Antennas – Significance, Geometry, basicproperties; helical antennas in axial mode and normal modes (Qualitative Treatment).

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.

UNIT –V:: Wave Propagation

Concepts of Propagation – frequency ranges and types of propagations, Ground Wave Propagation–Characteristics, Parameters, Wave Tilt, Sky Wave Propagation – Formation of Iono spheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance – Calculations for flat earth cases, Optimum Frequency, LUHF, Virtual Height, Fundamental Equation for Free-Space Propagation, Space Wave Propagation–Mechanism, LOS and Radio Horizon.

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.

References Books:

1. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition,2001.
2. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi,2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors,Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition,1955
5. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition,1988.

Course Outcomes:

After going through this course the student will be able to

- Identify basic antenna parameters.
- Quantify the fields radiated by various types of antennas.
- Design and analyse antenna arrays.
- Design and analyse wire antennas, reflector antennas, lens antennas, horn antennas and micro strip antennas.
- Identify the characteristics of radio wave propagation.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
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III Year - I Semester

DIGITAL COMMUNICATION

Course Objectives:

The main objectives of this course are to understand:

- Understand pulse digital modulation systems such as PCM, DPCM andDM.
- Understand various digital modulation techniques and able to analyze various systems for their performance in terms of probability of error.
- Study the concepts of information theory and need for source coding.
- Study Block codes, cyclic codes and convolution codes.

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,noise in PCM and DM systems.

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UNIT–II: Digital Modulation Techniques

Introduction, ASK, FSK, PSK, DPSK, QPSK, M-ary PSK, M-ary FSK, 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, 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 and its properties.Information rate, Mutual information and its properties.

Source Coding: Introductions, Advantages, Shannon‟s theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT –V:

Linear Block Codes : Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Convolution Codes: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

Text Books:

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

References:

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 Digital and Analog Communication Systems –B.P.Lathi,ZhiDing,Hari Mohan Gupta,Oxford University Press, 4th Edition,2017.

Course Outcomes:

At the end of this course the student can able to:

- Analyze various pulse digital modulation techniques and Apply different sampling and quantization techniques for A/D conversions.
- Analyze various digital modulation techniques.
- Evaluate the probability of error for digital modulation techniques.
- Compute and analyze Block codes, cyclic codes and convolution codes.
- Design a coded communication system.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
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III Year - I Semester

NON-CONVENTIONAL ENERGY SOURCES

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-I)

Course objectives:

The main objectives of this course are

- Solar radiation data, extra-terrestrial radiation, radiation on earth's surface.
- Maximum power point techniques in solar pv and wind.
- Wind energy conversion systems, Betz coefficient, tip speed ratio.
- Basic principle and working of hydro, tidal systems.
- Basic principle and working biomass, fuel cell and geothermal systems.

Unit –I: Fundamentals of Energy Systems

Energy conservation principle, Energy scenario (world and India), Solar radiation: Outside earth's atmosphere, Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surface, Numerical problems**.**

Unit –II: Solar Thermal Systems Liquid flat plate collections:

Performance analysis, Transmissivity, Absorptivity, Product collector efficiency factor, Collector heat removal factor, Numerical problems, Introduction to solar air heaters, Concentrating collectors and solar pond.

Unit –III:

Solar Photovoltaic Systems

Balance of systems, I-V & P-V characteristics, System design, Storage sizing, PV system sizing, Maximum power point techniques, Perturb and observe (P&O) technique.

Wind Energy

Wind patterns, Types of turbines, Kinetic energy of wind, Betz coefficient, Tip speed ratio, efficiency, Power output of wind turbine, Maximum power point tracking.

Unit –IV: Hydro and Tidal power systems

Basic working principle, Classification of hydro systems: large, small, micro, Measurement of head and flow, Energy equation, Types of turbines, Numerical problems.

Unit –V: Biomass, fuel cells and geothermal systems

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat– Different digesters and sizing. Fuel cell: classification – Efficiency – V-I characteristics–Geothermal: classification – Dry rock and acquifer –Energy analysis.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text Books:

1. S. P. Sukhatme and J. K. Nayak, Solar Energy: Principles of Thermal Collection and Storage, TMH, New Delhi, 3rd Edition, 2009.

2. John Twidell and Tony Weir, Renewable Energy Resources, Routledge, 3rd Edition, 2015.

3. John Andrews and Nick Jelly, Energy Science: Principles, Technologies and Impacts, Oxford, 2nd Edition, 2013.

Reference Books:

1.Ramesh & Kumar, Renewable Energy Technologies, Narosa, 1997.

2. Chetong Singh Solanki, Renewable energy technologies, A practical guide for beginners, PHI, 2008.

Course Outcomes:

At the end of this course the student can able to

- Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface.
- Develop maximum power point techniques in solar PV and wind.
- Explain wind energy conversion systems, Betz coefficient , tip speed ratio.
- Explain basic principle and working of hydro, tidal systems.
- Explain the basic principle of biomass ,fuel cell and geothermal systems.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester

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OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-I)

Course Objectives:

The main objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java

.

UNIT –I

Introduction to OOPS: Introduction, Need of OOP, Principles of Object Oriented Languages, Procedural languages vs OOP, Applications of OOP, History of Java, JVM, Java Features,Programming Style, Escape Sequence Comments

Data Types, Variables, Operators and Flow of Control: Variables, Primitive Data types, Constants, Identifiers-Naming Conventions, Keywords, Literals, Operators- Binary, Unary,Ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and casting, Flow of Control- Branching, Conditional Loops.

UNIT –II

Classes and Objects: Class declaration and Modifiers, Class Members, Declaration of Class Object, Object Creation, Access control for Class Members, Defining methods, Method Overloading, Recursive methods, Constructor, Constructor overloading, static keyword, this keyword. Class String, Methods for Extracting characters from strings, Command Line Arguments, String Methods

Inheritance: Types of Inheritance, Deriving classes using Extends keyword, Super keyword,Final keyword, Polymorphism- Abstract classes and methods, Overriding, final methods and classes

UNIT-III

Interface: Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Static methods in interface, functional interfaces.

Packages and Java Library: Defining package, Importing packages and classes into programs, Path and class path, Access control, Java.lang package and its classes, wrapper classes, auto –

boxing and auto-unboxing, Java.util package**.**

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UNIT –IV

Exception Handling: Introduction, Exception handling techniques- try, catch, throw, throws, finally block, nested try and catch blocks, User defined Exception, checked exception, unchecked exception

Input/Output and String Handling: Files and streams- Byte stream, I/O stream, Character Stream, File Reader and Writer, char Array Reader and Writer, String Buffer, String Builder.

UNIT –V:

Muti-threading: Introduction, Need for Multiple threads, Multithreaded Programming, Thread Class, Runnable interface, Creation of new thread, thread states, thread priority.

Java Database Connectivity: Introduction, JDBC Architecture, Environment Setup, JDBC Database Connections, Resultset Interface, Creating JDBC Applications

Text Books:

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. The complete Reference Java, 8th edition, Herbert Schildt, TMH
3. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals, 9th Edition, Prentice Hall, 2013.

References:

1. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2. Murach's Java Programming, Joel Murach

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://www.w3schools.com/java/java_data_types.asp

Course Outcomes:

On successful completion of the course, students will be able to:

- Able to understand the need for Java and use basic programming constructs like operators, branching and looping structures.
- Able to describe basic OOPS concepts like classes, objects, Inheritance and polymorphism.
- Able to understand the use of interface and able to create or use packages.
- Able to handle exceptions using exception handling and write programs for performing input/Output operations.
- Able to perform basic database operations using JDBC and develop programs using multi-threading.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
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III Year - I Semester

PRINCIPLES OF MECHANICS

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-I)

Course Objectives:

The main objectives of this course are

- Understand and apply principles of force systems to analyze equilibrium of rigid bodies.
- Apply concepts of moments and couples to determine resultant forces and positions in systems of coplanar forces.
- Analyze frictional forces and their effects on equilibrium of bodies on inclined planes.

UNIT-I: FORCE

Different force systems, principle of transmissibility of forces, law of superposition. Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, triangle law of forces, polygon law of forces, resolution of forces, resolving a force into two rectangular components, Free body diagram, Lami's theorem, Type of Load, supports, Beams, analysis for simply supported, cantilever beams.

UNIT-II: MOMENT

Moment of a force, Varignon's theorem, Principle of moment and its applications (Levers, simple and compound), Parallel forces (like and unlike parallel forces), calculating their resultant, Concept of couple, its properties and effects, General conditions of equilibrium of bodies under coplanar forces, Position of resultant force by moment.

UNIT-III: FRICTION

force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction, angle of repose and coefficient of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. Equilibrium of bodies on level plane, external force applied horizontal and inclined up and down. Equilibrium of bodies on inclined plane, external forces is applied parallel to the plane, horizontal and incline to inclined plane.

UNIT-IV: CENTER OF GRAVITY

Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies, Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion, Determination of center of gravity of solid bodies, cone, cylinder and sphere; composite bodies.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-V: Simple Machines

Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, Simple and compound machine, Definition of ideal machine, reversible and self, locking machine, Effort lost in friction, Load lost in friction, System of pulleys, simple screw jack, worm and worm wheel, single and double winch crab.

Textbooks:

1. S Ramamurtham, Engineering Mechanics, DhanpatRai Publishing Co. Ltd., Rev. Edition, 2016.
2. RK Rajput, Applied Mechanics, Laxmi Publications, 3rd Edition, 2016. REFERENCE BOOKS: 1. RS Khurmi, A Text Book of Engineering Mechanics, S Chand and Co. Ltd.,

References:

1. RS Khurmi, A Text Book of Engineering Mechanics, S Chand and Co. Ltd., Rev. Edition, 2010.
2. AK Upadhya, Applied Mechanics, SK Kataria& Sons, 5th Edition, 2013..

Course Outcomes:

At the end of this course the student can able to:

- Understand and analyze the various types of forces acting on a body, their unit's conversion from one to another and draw free body diagrams.
- Calculate resultant force and moment to maintain equilibrium.
- Calculate the co-efficient of friction for different types of surfaces.
- Determine the centroid /centre of gravity of plain and composite laminar and solid bodies.
- Determine velocity ratio, mechanical advantage and efficiency of simple machines

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester

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ELCTRONIC MEASUREMENT AND INSTRUMENTATION
(PROFESSIONAL ELECTIVE –I)

Course Objectives:

The main objectives of this course are to understand:

- Concepts of design and development of different instruments.
- Concepts different signal generators and analyzers.
- Familiarize with the design of oscilloscopes and bridges for different applications.
- Familiarize with different transducers for measurement of different parameters.

UNIT-I

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension ,shunt. Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multi-meter for Voltage, Current and resistance measurements..

UNIT-II

Signal Generators - fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep. Wave Analyzers - Basic concepts, Harmonic Distortion Analyzers, Spectrum Analyzers,Digital Fourier Analyzers.

UNIT-III

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement,standard specifications of CRO.

UNIT-IV

AC Bridges Measurement of inductance- Maxwell‟s bridge, Anderson Bridge. Measurement of capacitance - Schearing Bridge. Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-V

Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement. Data acquisition systems.

Text Books:

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

Reference Books:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.
3. Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

Course Outcomes:

At the end of this course the student can able to

- Analyze the operation of different instruments
- Analyze different signal generators and analyzers.
- Analyze the operation of oscilloscopes for different applications.
- Analyze and Design AC bridges
- Analyze and Design of transducers for measurement of different electrical and physical parameters

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	P	T	C
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III Year - I Semester

INTERNET OF THINGS

(PROFESSIONAL ELECTIVE –I)

Course Objectives:

The main objectives of this course are

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices..

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Physical Design of IoT, IoT Protocols, IoT communication models, IoT Communication APIs, Networking basics, Machine-to-Machine Communications.IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics,Communication protocols. Domain Specific IoTs – Home, City, Environment, Energy,Agriculture and Industry.

UNIT-II: IoT system management

Software defined networks (SDN), network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETOPEER, M2M to IoT, Definition and differing characteristics, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

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UNIT-III:. IoT Architectural and Wireless Technologies for IoT

Building architecture, design principles and needed capabilities, IoT architecture outline, standards considerations. Reference Architecture and Reference Model.Wireless Technologies for IoT: Protocol Standardization for IoT, M2M, RFID & NFC protocol

UNIT-IV: IoT Physical Devices

Introduction to different IoT tools, IoT Physical Devices and Endpoints, Introduction to Raspberry PI, Interfaces (serial, SPI, I2C)Programming – Python program to Interface Raspberry PI with external gadgets, reading inputsfrom pins, and controlling output.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-V: Cloud Analytics

Introduction to cloud computing, Role of Cloud Computing in IoT, Cloud-to-Device Connectivity. IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API

Text Books:

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: 9789350239759

References Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
3. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1-4493- 9357-1.

Course Outcomes:

At the end of this course the student can able to

- Ability to understand the broad scope and applications of IoT
- Ability to understand and differentiate between M2M and IoT, IoT network characteristics and device management
- Ability to understand IoT Architecture and reference models and also different protocols such as NFC, RFID, and M2M
- Ability to understand Raspberry Pi and Python Programming concepts
- Ability to understand the role of cloud concepts in IoT, its advantages and applications

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year - I Semester

ELECTRONIC SWITCHING SYSTEMS

(PROFESSIONAL ELECTIVE –I)

Course Objectives:

The main objectives of this course are

- The concepts of space switching, time switching and combination switching
- Techniques and means of measuring traffic
- Implication of the traffic level on system design
- ISDN system in subscriber loop.

UNIT-I: Introduction

Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System, Major Telecommunication Networks. Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

UNIT-II: Switching Techniques

Electronic Space Division Switching: Stored Program Control, Centralized SPC: Stand by mode, Synchronous duplex mode, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-Stage Networks.

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Generalized time division Space switch, Time Multiplexed Space Switching, Time Multiplexed Time division space Switch, Time Multiplexed Time Switching, Combination Switching: Time Space (TS) Switching, Space-time (ST) Switching

UNIT-III: Telephone Networks

Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, CCITT Signaling System no.6,CCITT Signaling System no.7, Packet Switching: Statistical Multiplexing, Local- Area andWide- Area Networks, Large-scale Networks, Broadband Networks.

UNIT-IV: Switching Networks

Single- Stage Networks, Grading, Link Systems, Grades of service of link systems, Application of Graph Theory to link Systems, Use of Expansion, Call Packing, Rearrange-able Networks, Strict- Sense non-blocking Networks, Sectionalized

Switching Networks Telecommunications Traffic: The Unit of Traffic, Congestion, Traffic Measurement, A Mathematical Model, Lost-call Systems, Queuing Systems, Problems

UNIT-V: Integrated Services Digital Network

Motivation for ISDN, New Services, Network and Protocol Architecture, ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D ChannelProtocol, Transmission Channels, User- Network Interfaces, Signaling, Numbering and Addressing, Service Characterization, Interworking, ISDN Standards, Expert Systems in ISDN, Broadband ISDN, Voice Data Integration.

Text Books:

1. Telecommunication Switching Systems and Networks- Thiagarajan Viswanathan, 2000, PHI.
2. Telecommunications Switching, Traffic and Networks- J. E. Flood, 2006, Pearson Education.

Reference Books:

1. Digital Telephony- J. Bellamy, 2nd Edition, 2001, John Wiley.
2. Data Communications and Networks- Achyut S. Godbole, 2004, TMH.
3. Principles of Communication Systems- H. Taub & D. Schilling, 2nd Edition, 2003, TMH.
4. Data Communication & Networking- B. A. Forouzan, 3rd Edition, 2004, TMH.
5. Telecommunication System Engineering – Roger L. Freeman, 4th Ed., Wiley-Inter Science, John Wiley & Sons,2004.
6. T.N.Saadawi, M.H.Ammar, A.E.Hakeem, “Fundamentals of TelecommunicationNetworks”, Wiley Interscience, 1994.

Course Outcomes:

At the end of this course the student can able to

- Evaluate the time and space parameters of a switched signal
- Establish the digital signal path in time and space, between two terminals
- Investigate the traffic capacity of the system.
- Evaluate methods of collecting traffic data.
- Evaluate the method of interconnecting two separate digital switches.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester

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IC APPLICATIONS LAB

Course Objectives:

The main objectives of this course are

- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of IC555
- To use Xilinx software for combinational circuit design.

LIST OF EXPERIMENTS (Minimum of Twelve Experiments has to be performed)

1. OPAMP Applications–Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC741.
3. Active Filter Applications –LPF, HPF (first order)
4. Active Filter Applications –BPF
5. IC741 Oscillator Circuits –Phase Shift Oscillators.
6. Function Generator using OPAMPs.
7. Schmitt Trigger Circuits– using IC741 and IC555.
8. Three Terminal Voltage Regulators–7805, 7809, 7912.
9. Realization of Logic Gates
10. Design of Full Adder using 3 modeling styles
11. 3to 8 Decoder -74138
12. 8x 1 Multiplexer-74151 and 2x4 De-multiplexer-74155
13. 4-Bit comparator-7485
14. D-Flip-Flop-7474
15. Decade counter-7490
16. Shift registers-7495

Equipment's & Software required:

Software:

- Xilinx Vivado software/Equivalent Industry Standard Software
- Xilinx Hardware/Equivalent hardware
- Personal computer system with necessary software to run the programs and implement.

Equipment:

- RPS

- CRO
- Function Generators
- Millimetres
- IC Trainer Kits (Optional)
- Breadboards
- Components:-IC741, IC555, 7805, 7809, 7912 and other essential components.
- Analog IC Tester

Course Outcomes:

At the end of this course the student can able to

- Analyze and Design the various linear applications of op-amp
- Analyze and design of active filters using Op-amp
- Analyze and Design the various non linear applications of op-amp
- Analyze and Design various combinational circuit building blocks using Xilinx software tool

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
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III Year - I Semester

DIGITAL COMMUNICATION LAB

Course Objectives:

The main objectives of this course are

- To understand the building blocks in Digital Communication system
- To understand and analyze the signal flow in Digital Communication system.
- To understand various Pulse and digital modulation techniques

LIST OF EXPERIMENTS (Minimum of Ten Experiments has to be performed)

Using Hardware Kits: (Any 5 Experiments)

1. Time Division Multiplexing.
2. Pulse Code Modulation and Demodulation.
3. Differential Pulse Code Modulation and De modulation.
4. Delta Modulation and Demodulation.
5. Frequency Shift Keying Methods.
6. Phase Shift Keying.
7. Differential Phase Shift Keying.

Simulation using MATLAB: (Any 5 Experiments)

1. Pulse Code Modulation and Demodulation.
2. Differential Pulse Code Modulation and De modulation.
3. Delta Modulation and Demodulation.
4. Amplitude Shift Keying.
5. Frequency Shift Keying Methods.
6. Phase Shift Keying.
7. Differential Phase Shift Keying.
8. Companding**.**

Equipment Required For Laboratories

1. RPS
2. CRO
3. Function Generator
4. RF Generators
5. Rated Voltmeters and Ammeters

6. Lab Experimental kits for Digital Communication
7. Components
8. Breadboards and Multimeters
9. PC loaded with Matlab Software.

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Course Outcomes:

At the end of this course the student can able to

- Design and implement different modulation and demodulation techniques.
- Analyze digital modulation techniques by using MATLAB tools.
- Identify and describe different techniques in modern digital communications, in particular in source coding using MAT Lab tools.
- Will perform channel coding.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year - I Semester

EMPLOYABILITY SKILLS-APTITUDE LAB

Course Objectives:

The main objectives of this course are

- To enhance the basic mathematical skills for any type of competitive examinations
- To develop the skills for better job opportunity
- To build fundamental , mathematical aspects and to instil confidence among students
- To enrich their knowledge and to develop their logical reasoning thinking ability.

. List of topics

1. Problems on Ages
2. Problems on Profit and Loss
3. Problems on Time and Distance
4. Problems on Time and Work
5. Problems on Calendar
6. Problems on Clock
7. Problems on Boats and Streams
8. Problems on Simple and Compound Interest
9. Problems on Number Systems
10. Problems on Permutations and Combinations

Text Books:

1. Dr. R.S.Aggarwal, Quantitative Aptitude for competitive Examinations, Sultan Chand Publications, 2017

Reference Books:

1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, Tata McGrawHill Publishing Company, 2016
2. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson India, 2016

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes:

After completion of the course, the student will be able to

- Solve the problems related to Ages, Profit and Loss
- Solve the problems related to Time and work, Time and distance
- Solve the problems related to to Calendar and Clock
- Solve the problems related to Simple and Compound Interest, Boats and Streams
- Solve the problems related to Number Systems, Permutations and Combinations

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
1	0	2	2

III Year - I Semester

EMPLOYABILITY SKILLS-ASSISTIVE TECHNOLOGY LAB

Course Objectives:

The main objectives of this course are

- To gain an understanding of the engineering, medical, and social aspects associated with the design, development, and use of assistive technology.
- To understand various tools used in assistive technology.
- To provide an opportunity for students to interact with users of assistive technology in the local community along with health care professionals, coaches, and project partners.
- To enhance the problem solving, critical thinking and communication skills.
- To engage students in a project experience that enhances the team work skills and enable them to apply engineering design process to address the needs of individuals with disabilities and older adults.

ABOUT ASSISTIVE TECHNOLOGY

Assistive technology – definition, principles of operation, perspectives of assistive technology,general awareness including the use of various embedded technologies in the development of assistive devices. Engineering, Medical, and Social issues to be considered in the design of assistive technology. Ethical issues in assistive technology.

IDE TOOLS

Writing Sketches, Tabs, Multiple Files, and Compilation, Uploading, Libraries, Serial Monitor,
Preferences of Arduino IDE.

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List of Experiments

1. Light Emitting Diodes (LEDs), Push Button Switch, and Magnetic Switch.
2. 7-Segment Display with Keypad.
3. Input voltage measurement using ADC
4. LCD Interfacing
5. Object range measurement using Ultrasonic Sensor and LCD
6. Temperature and humidity measurement using DHT 11 and LCD
7. Servo motor interfacing
8. Stepper motor interfacing

9. Automatic street light control using LDR.
10. Gas detection using MQ 3 sensor.

Text Books:

1. Assistive technologies principles and practice - Jan Miller Polgar and Pedro Encarnação, St. Louis Mosby, 2020.
2. Arduino Programming: The Ultimate Guide for making the best of your Arduino Programming Projects by Damon Parker

Reference Books:

1. The Handbook of Assistive Technology by Gregory Church and Sharon Glennen, 1992.
2. Essentials of Assistive Technologies by Albert Cook Janice Polgar, Mosby, 2011

Course Outcomes:

After completion of the course, the student will be able to

- Understand the Assistive Technology and its applications
- Understand to interface various I/O devices like LCD, keypad to Arduino board.
- Understand to write the software programs to various interfacing devices.
- Understand to control the stepper and servomotors through to Arduino board.
- Understand to interface temperature and humidity sensors to Arduino board.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year – I Semester

EMPLOYABILITY SKILLS-PCB DESIGN LAB

Course Objectives:

The main objectives of this course are

- To understand the PCB designing used for various electronic devices.
- To learn a variety of PCB designing issues like clearance between tracks and DRC errors etc.
- Students get good skills on PCB designing
- To provide an opportunity for students in various electronic industries

List of Experiments:

1.Design the schematic and PCB layout of Astable Multivibrator using 555 timer using Multisim EDA tool

2 Design the schematic and PCB layout of Burglar alarm and using Multisim EDA tool

3 Design the schematic and PCB layout of overhead tank level using Multisim EDA tool

4. Design the schematic and PCB layout of 12V battery charger circuit using transistors using Multisim EDA tool

5) Design the schematic and PCB layout of distance measurement circuit using PIC microcontroller with ultrasonic sensor using Multisim EDA tool

6) Design the schematic and PCB layout of clap operated fan with transistors using Multisim EDA tool

7 Design the schematic and PCB layout of a bike antitheft alarm using Multisim EDA tool
eda tool

8. Design the schematic and PCB layout of an automatic street light controller circuit using Multisim EDA tool

9. Design the schematic and PCB layout of a traffic controller circuit using PIC Microcontroller using Multisim EDA tool

10. Design the schematic and PCB layout of a quiz competition buzzer circuit using Multisim EDA tool

11. Design the schematic and PCB layout of a gas leakage detector circuit using
using Multisim EDA tool

12. Make a line soldering PCB for LCD display interfacing with PIC microcontroller.

Course Outcomes:

After completion of the course, the student will be able to

- Understand how to design a schematic & layout of a design.
- Understand how to place a component in a workspace from library.
- Understand how to route the components in the workspace.
- Understand how to check and fix the DRC errors.
- Understand how to generate silk screen top, copper bottom, soldering mask files of design

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year - I Semester

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Course Objectives:

The main objectives of this course are

- This course seeks to equip students with a broad understanding of the intellectual property rights system.
- To analyze intellectual property issues in the context of environmental, economic and social development.
- This includes an introduction to the conceptual foundations for intellectual property protection and the basic relevant treaties in the field.

UNIT –I

Introduction to Intellectual Property Law – Intellectual Property Law Basics - Types of Intellectual Property – Agencies Responsible for Intellectual Property Registration – Infringement – Over use or Misuse of Intellectual Property Rights.

UNIT – II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Right to prepare Derivative Works – Rights of Distribution – Rights of performers – Copyright Formalities and Registration–Infringement of Copyright .

UNIT –III

Introduction to Patent Law – Rights and Limitations – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation –International Patent Law – New developments in Patent Law.

UNIT –IV

Introduction to Trade Mark – Trade Mark Registration Process – Trade Mark maintenance – Transfer of rights – Infringement – Dilution of Ownership of Trade Mark – Trade Mark claims and Litigation –International Trade Mark Law.

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security– Employee Access Limitation – Employee Confidentiality Agreement –Trade Secret Law – Trade Secret Litigation – Breach of Contract.

UNIT –V

Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text Books:

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western‟s Special Topics Collections

Reference Books:

1. Prabhuddha Ganguli: „ Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi
2. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.

Course Outcomes:

After completing this course, the students will be able to

- Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
- Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development
- Identify activities and constitute IP infringements and the remedies available to the IP owner and describe the precautious steps to be taken to prevent infringement of proprietary rights in products and technology development
- Be able to anticipate and subject to critical analysis arguments relating to the development and reform of intellectual property right institutions and their likely impact on creativity and innovation.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester

L	P	T	C
3	0	0	3

MICROPROCESSOR AND MICROCONTROLLERS

Course Objectives:

The main objectives of this course are

- To develop an in-depth understanding of the operation of microprocessors.
- To master the assembly language programming using concepts like assembler directives, procedures, macros, software interrupts etc.
- To create an exposure to basic peripherals, its programming and interfacing techniques
- To understand the concept of Interrupts and interfacing details of 8086.
- To develop an in-depth understanding of the operation of microcontroller
- To understand the features of 8051 Microcontroller, its instruction set and also other controllers.

UNIT –I: 8086 architecture

8086 architecture- functional diagram, Register organization, memory segmentation, programming model, Memory addresses, physical memory organization, Signal descriptions of 8086-common function signals, timing diagrams.

UNIT –II: Programming with 8086 Microprocessor

Instruction formats. Addressing modes,instruction set, assembler directives. Simple programs involving logical, branch and call instructions. Sorting, evaluating arithmetic expressions, string manipulations, Interrupts of 8086, Vector interrupt table, Interrupt service routine

UNIT –III: Memory&I/O Interfacing :

Memory interfacing to 8086, 8255 PPI, various modes of operation and interfacing to 8255, interfacing of Stepper motor interfacing, D/A &A/D converter, Intel 8259 programmable interrupt controller, Intel 8257 DMA controller.

UNIT –IV: 8051 Micro controller:

Architecture of 8051, Pin description, Special Function Registers (SFRs), Memory Organization, I/O Pins Ports and Circuits, Instruction set, Addressing modes, Assembly language programming.

UNIT –V: Interfacing 8051 Microcontroller:

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

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Text Books:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5thEdition, McGrawHill,2011.
2. Advanced microprocessors and peripherals-A. K ray and K.M.Bhurchandani, TMH, 2nd edition 2006.
3. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, Dhananjay V.Gadre,CengageLearning, India Edition.
4. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.

Reference Books:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th EditionPHI/Pearson,2012.
3. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey, Pearson, Eighth Edition-2012
4. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, \ PHI Learning Private Limited, Second Edition, 2014.
5. Microprocessors and Microcontrollers by N.Senthil Kumar, M.Saravanan and S.Jeevananthan, Oxford University Press, Seventh Impression 2013

Course Outcomes:

After completion of the course, the student will be able to

- Understand the internal architecture of 8086 microprocessors
- Understand and execute programs based on 8086 microprocessors
- Design Memory and I/O Interfacing circuits
- Design and implement 8051 microcontroller-based systems.
- Design interfacing 8051 microcontroller-based systems

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year - II Semester

DIGITAL SIGNAL PROCESSING

Course Objectives:

The main objectives of this course are

- Analyse the Discrete Time Signals, Discrete Time Systems & Solutions of Discrete Time Systems using z-Transform.
- Know the importance of FFT algorithm for computation of Discrete Fourier Transform
- Understand the design procedures and realization structures of IIR and FIR systems
- Learn the need of Multirate Signal Processing and its applications
- Learn the concepts of DSP Processors

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UNIT –I: Discrete Time Signals and Systems

Basic elements of DSP System, advantages of DSP over ASP, applications of DSP, Classification of discrete time signals and systems, linear shift invariant systems, stability, and causality, frequency domain representation of discrete systems, solution of LCCDE using z-transform.

UNIT –II: Discrete Fourier Series and Discrete Fourier Transform

DTFT, Discrete Fourier Transform(DFT), Properties of DFT, linear convolution of sequences using DFT, Computation of DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT –III: Design of Digital Filters and Realization

Design of IIR Digital Filters and Realization: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters (Impulse Invariant and Bilinear Transformation Methods), Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

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

UNIT –IV:

Multirate Digital Signal Processing: Introduction, Decimation, Interpolation, Sampling rate conversion, Implementation of sampling rate converters.

Applications: Digital Filter Banks, Sub-band Coding of Speech and Audio Signals and Trans-multiplexers.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V: Introduction to DSP Processors

Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

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 Ed., 2010

3. Digital Signal Processors – Architecture, Programming and Applications, B.Venkataramani, M.Bhaskar, TATA, McGraw Hill, 2002

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill, 2006

2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA MCGraw Hill, 2007.

3. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007.

4. Digital Signal Processing, Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006

5. Digital Signal Processing, Tarun Kumar Rawat by OXFORD Publishers

6. Digital Signal Processing – P. Ramesh babu, Sci Tech publications

Course Outcomes:

After completion of the course, the student will be able to

- Apply z-Transform to solve the discrete time systems characterized by the difference equations
- Use the Radix-2 FFT algorithms for solving the DFT of a given sequence
- Design and Realization of a Digital filter (FIR & IIR) from the given specifications
- Design the multirate system for the given specifications
- Understand the key architectural features of DSP processors

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year - II Semester

MICROWAVE & OPTICAL COMMUNICATION ENGINEERING

Course Objectives:

The main objectives of this course are

- The fundamental characteristics of rectangular waveguides through electromagnetic field analysis.
- The principle of working and operation of various microwave tubes and solid state devices as microwave sources.
- The basic properties of waveguide components and microwave test bench setup for measurements.
- The properties of optical fiber that affect the performance of a communication link and types of fibers and connectors with their losses.
- The Structure and operation of LEDs, laser diodes, PIN and APD and apply in optical system design.

UNIT –I : MICROWAVE TRANSMISSION LINES - RECTANGULAR WAVEGUIDES:

Introduction, Microwave Spectrum and Bands, Advantages and Applications of Microwaves, Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations;Power Transmission in Rectangular Guide, Impossibility of TEM mode, Related Problems.

UNIT –II: MICROWAVE TUBES (Qualitative treatment only):

Klystron Tubes: Cavity Resonators, Re-entrant Cavities, Two Cavity Klystrons-Structure, Velocity Modulation and Bunching process, Reflex Klystrons- Structure, principle of working.

Helix TWT: Significance, Types and Characteristics of Slow Wave Structures; Structure and operation of TWT.

M-Type Tubes: Introduction, Cross-field effects, Magnetrons – 8-Cavity Cylindrical Travelling Wave Magnetron.

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

UNIT –III:

WAVEGUIDE COMPONENTS:

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Scattering Matrix–Significance, Formulation and Properties, S-Matrix Calculations for – 2 port Junction, E-plane, H-plane Tee, Magic Tee, Hybrid Ring; Directional Couplers. Ferrite Components–Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method, Measurement of Attenuation, Frequency, VSWR and Impedance.

UNIT –IV:

OVERVIEW OF OPTICAL FIBER COMMUNICATION: Introduction, optical fiber waveguides, Ray theory, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Step Index fibers, Graded Index fibers

TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS: Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion.

OPTICAL FIBER CONNECTORS: Connector types, Fiber Splicing- Splicing techniques,

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UNIT –V:

OPTICAL SOURCES AND DETECTORS (Qualitative treatment only): Introduction, LED's, LASER diodes, Quantum efficiency, Power, Modulation, Power bandwidth product, Photo detectors- principles of PIN and APD detectors, comparison of photo detectors.

OPTICAL SYSTEM DESIGN: Point to point links – Component Choice and considerations, Link power budget and Rise time budget, Line coding in Optical links, WDM-Necessity and Principles, Eye pattern.

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Text Books:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley,2nd Edition,2002.
3. Optical Fiber Communications – Gerd Keiser, McGraw-Hill International edition,3rd Edition,2000.
4. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

ReferencesBooks:

1. Microwave Engineering- Annapurna Das and SisirK.Das, McGraw Hill Education, 3rd Edition.
2. Microwave Engineering – G S N Raju , I K International Publishing House Pvt.Limited, 2008.
3. Microwave and Radar Engineering-M.Kulkarni, Umesh Publications, 3rd Edition.
4. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition,2004.
5. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.

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Course Outcomes:

After completion of the course, the student will be able to

- Design different modes in rectangular wave guide structures and calculate the power transmitted.
- Use microwave tubes as sources and distinguish between microwave tubes and solid state devices.
- Calculate S-matrix for various waveguide components and measure various microwave parameters using a Microwave test bench.
- Apply knowledge to understand mode theory of optical communication, losses in optical fibers and optical connectors.
- Design and develop optical sources, detectors and links. Select appropriate optical components to suit advanced optical communications.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year - II Semester

COMPUTER NETWORKS

(PROFESSIONAL ELECTIVE –II)

Course Objectives:

The main objectives of this course are

- To provide insight about networks, topologies, and the key concepts
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

UNIT –I:

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models

UNIT –II:

Physical Layer – Fourier Analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel - Guided Transmission Media, Digital Modulation and Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing

UNIT –III

The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol Using Go-Back-N- A Protocol Using Selective Repeat.

UNIT –IV:

The Medium Access Control Sub layer- The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha- Carrier Sense Multiple Multiple Access Protocols-Collision-Free Protocols-Limited Contention Protocols-Wireless LAN Protocols, Ethernet-Classic Ethernet Physical Layer-Classic Ethernet MAC Sub layer Protocol-Ethernet Performance-Fast Ethernet Gigabit Ethernet-10-Gigabit Ethernet-Retrospective on Ethernet, Wireless Lans-The 802.11 Architecture and Protocol Stack-The 802.11 Physical Layer-The802.11 MAC Sub layer Protocol.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V:

Design Issues-The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service-, Routing Algorithms-The Optimality principle-Shortest path Algorithm, Congestion Control Algorithms-Approaches to Congestion Control-Traffic Throttling-Load Shedding.

Transport Layer – The Internet Transport Protocols: Udp, the Internet Transport Protocols: Tcp

Application Layer –The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery

Text Books:

1 Computer Networks, Tanenbaum and David J Wetherall, 5th Edition, Pearson Edu, 2010

2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education

ReferencesBooks:

1. Computer Organization and Architecture – William Stallings Sixth Edition,Pearson/PHI

2. 1. Larry L. Peterson and Bruce S. Davie, ―Computer Networks - A Systems Approach‖ (5th ed), MorganKaufmann/ Elsevier, 2011

Course Outcomes:

After completion of the course, the student will be able to

- Demonstrate different network models for networking links OSI, TCP/IP and get knowledge about various communication techniques, methods and protocol standards
- Discuss different transmission media and different switching networks
- Analyze data link layer services, functions and protocols
- Compare and Classify medium access control protocols
- Determine Network Layer, Transport Layer and application layer services for client server protocols working with the client server paradigms.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year - II Semester

ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNEIC COMPATABILITY

(PROFESSIONAL ELECTIVE –II)

Course Objectives:

The main objectives of this course are :

- Understand the root causes for Electromagnetic Noise (EMI), its sources.
- Understand the effects of EMI and the required precautions to be taken/to be discussedWith his peer group.
- Understand the different measurement techniques of EMI (for conducted and normal) and their influences in detail.
- Understand different compatibility techniques (EMC)to reduce/suppress EMI.
- Understand different standards being followed across the world in the fields of EMI/EMC.

UNIT –I:

Natural and Nuclear sources of EMI / EMC

Introduction, Electromagnetic Environment, frequency spectrum conservations. An overview of EMI / EMC, Natural and Nuclear sources of EMI.

EMI from apparatus, circuits and open area test Sites: Electromagnetic emissions, noise from relays and switches, non-linearity's in circuits, passive inter modulation, cross talk in transmission lines, transients in power supply lines, electromagnetic interference (EMI). Open area test sites and measurements.

UNIT –II: Radiated and conducted interference measurements:

Anechoic chamber, TEM cell, GH TEM Cell, characterization of conduction currents / voltages, conducted EM noise on power lines, conducted EMI from equipment, Immunity to conducted EMI detectors and measurements.

UNIT –III: ESD, Grounding, shielding, bonding and EMI filters : Principles and types of grounding, shielding and bonding, characterization of filters, power lines filter design. ESD, Electrical fast transients / bursts, electrical surges.

UNIT –IV: Cables, connectors, components: Introduction, EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, opto-isolators, Transient and Surge Suppression Devices.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V: EMC standards- National / International.

Introduction, Standards for EMI and EMC, MIL-Standards, IEEE/ANSI standards, CISPR/IEC standards, FCC regulations, Euronorms, British Standards, EMI/EMC standards in JAPAN, Conclusions.

Text Books:

1. Engineering Electromagnetic Compatibility by Dr. V.P. Kodali, IEEE Publication, Printed in
2. Electromagnetic Interference and Compatibility IMPACT series, IIT –Delhi, Modules 1 – 9.

ReferencesBooks:

1. Introduction to Electromagnetic Compatibility, NY, John Wiley, 1992,by C.R. Pal.

Course Outcomes:

After completion of the course, the student will be able to

- Distinguish effects of EMI and counter measures by EMC- Techniques.
- Apply the knowledge gained in selecting proper gadget/device/appliance system.
- able to understand types of grounding, shielding techniques
- able to understand the suppression cables, connectors, gaskets and Isolation transformers
- Able to understand National / International EMC standards

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	3

III Year - II Semester

DIGITAL SYSTEM DESIGN USING HDL

(PROFESSIONAL ELECTIVE –II)

Course Objectives:

The main objectives of this course are

- Introduction of digital logic families and interfacing concepts for digital design is considered.
- VHDL fundamentals were discussed to modelling the digital system design blocks.
- VHDL compilers, simulators and synthesis tools are described, which are used to verify digital systems in a technology-independent fashion.
- Design and implementation of combinational and sequential digital logic circuits is explained.

UNIT –I:

Digital Logic Families and Interfacing: Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bipolar logic, transistor-transistor logic, TTL families, CMOS/TTL interfacing

.

UNIT –II:

Introduction to VHDL: Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers. Packages, Libraries and Bindings, Subprograms. VHDL Programming using structural and data flow modeling.

UNIT –III:

Behavioral Modeling: Process statement, variable assignment statement, signal assignment statement, wait statement , if statement, case statement ,null statement, loop statement, exit statement, next statement.

UNIT –IV:

Combinational Logic Design: Binary Adder-Subtractor, Ripple Adder, Look Ahead Carry Generator, ALU, Decoders, encoders, multiplexers and demultiplexers, parity circuits, comparators, Dual Priority Encoder, Design considerations of the above combinational logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

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UNIT –V:.

Sequential Logic Design: Ring Counter, Johnson Counter, Design of Modulus N Synchronous Counters, Shift Registers, Universal Shift Registers, Design considerations of the above sequential logic circuits with relevant Digital ICs, modeling of above ICs using VHDL. Mealy and Moore Circuits.

Text Books:

1. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

References:

1. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, Zvonko Vranesic, McGrawHill, 3rd Edition.

Course Outcomes:

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

- Analyse Digital Logic families and their applications.
- Analyse Programming concepts using VHDL hard ware description language
- Implement Behavioral Modeling using VHDL hard ware description language
- Analyse and Design of Combinational Logic using VHDL hard ware description language
- Analyse and Design of sequential Logic using VHDL hard ware description language

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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3	0	0	3

III Year - II Semester

DATABASE MANAGEMENT SYSTEMS

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-II)

Course Objectives:

The main objectives of this course is

- To learn the principles of systematically designing and using Database Management Systems for various applications.

UNIT –I:

Introduction to Database Management System : Data Independence- Relation Systems and Others, Database system architecture, Introduction- The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator, Various Data Models

The ER Model : The Relational Model, Relational Calculus, Introduction to Database Design, Database Design and ER Diagrams-Entities Attributes, and Entity Sets-Relationship and Relationship Sets - Conceptual Design with ER Model

UNIT –II:

The Relational Model – Basic Concepts, Integrity Constraints Over Relations- Key Constraints – Foreign Key Constraints - Relational Algebra Operations - Selection and Projection- Set Operations, Renaming – Joins- Division SQL – Various parts of SQL, Basic form of SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers

UNIT –III:

Schema Refinement (Normalization) : Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT –IV:

Transaction Management and Concurrency Control

Transaction, properties of transactions, Various concurrency control techniques – lock based, timestamp based, lock granularity, lock types, 2PL for ensuring serializability, deadlocks – dealing with deadlocks, Database Recovery management : Log based recovery

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UNIT –V:

Overview of Storages and Indexing, Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Tree-Based Indexing – B Trees, B+ Trees, Hash-Based Indexing – Basic idea, Comparison of File Organization

.

Text Books:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition

2. Database System Concepts, Abraham Silberschatz, Henry F. Korth

Reference Books:

1. Fundamentals of Database Systems, Elmasri Navate Pearson Education

2 Introduction to Database Systems, C.J.Date Pearson Education

3.Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel

Course outcomes:

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

- Understand database concepts and the use of data models in describing database
- Create, maintain and manipulate a relational database using SQL
- Understand the importance of schema refinement & be able to refine the schema
- Understand how the DBMS manages the execution of transactions
- Differentiate various file organizations and indexing methods for the representation and retrieval of data

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L	T	P	C
3	0	0	3

III Year - II Semester

COMPUTER AIDED DESIGN AND ANALYSIS

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-II)

Course Objectives:

The main objectives of this course are

- To understand the basic fundamentals of computer aided design
- To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.
- To understand the concepts behind formulation methods in FEM

UNIT –I: Introduction

Introduction to CAD, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD, Engineering Applications CAD systems, Computer Graphics Input devices cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch panels, Flat Panel display, printers and plotters.

UNIT –II: Computer Graphics

Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2D Geometric Transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3D transformations, multiple transformation.

UNIT –III: Curves

Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier Curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties**.**

UNIT –IV: 3D Graphics

Fundamentals of Solid modeling, Boundary representation, Constructive solid geometry, Sweep representation, Color models. Basic application commands for 2D drafting software AutoCAD & 3D solid modeling software Solidworks.

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UNIT –V: Basics of Finite Element Analysis

Basic concept of the finite element method, comparison of FEM with direct analytical solutions; Steps in finite element analysis of physical systems, Finite Element analysis of 1-D problems like spring and bar elements formulation and development of elemental stiffness equations and their assembly, solution and its post processing.

Text Books:

1. Hearn & Baker, Computer Graphics, Prentice Hall of India, 2nd Edition, 1994.
2. Groover and Zimmers, CAD/CAM: Computer-Aided Design and Manufacturing, Prentice Hall India Ltd. 1st Edition, 1984.

Reference Books:

1. Ibrahim Zeid, R Sivasubramanian, CAD/CAM: Theory and Practice, McGraw Hill, 2nd Edition, 2009.
2. Rogers and Adams, Mathematical Elements for Computer Graphics, McGraw Hill, 2nd Edition, 2017.

Course outcomes:

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

- Understand the fundamental concepts of CAD and applications of computer graphics.
- Interpret the geometric techniques and requirements including points and lines.
- Describe the parametric curves, surfaces and solid modelling techniques using transformation matrix.
- Understand the virtual environment of 3D modelling and able to modelling the 3D objects.
- Understand basics of FEM and Able to apply suitable boundary conditions to a global equation for 1D elements.

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3	0	0	3

III Year - II Semester

NO SQL DATABASES

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-II)

Course Objectives

The main objectives of this course are

- Understand the fundamentals of NoSQL Databases
- Understand various NoSQL databases and their uses.
- Perform various operations on NoSQL databases.

UNIT –I:

Introduction, Overview and History of NoSQL Databases, SQL vs NOSQL, Advantages over RDBMS, Limitations, Different Types of NoSQL Databases, Attack of the Clusters, The Emergence of NoSQL. Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation.

UNIT –II:

Distribution Models: Single Server, Shading, Master-Slave Replication, Peer-to-Peer Replication, Combining Shading and Replication, the CAP Theorem. Key-Value Databases: What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Suitable Use Cases, When Not to Use.

UNIT –III:

Column Oriented Databases: What Is a Column-Family Data Store, Cassandra Database: What is Cassandra, Cassandra Architecture, Cassandra Data types, Cassandra Query Language-CQL, Creating, Altering, Dropping a KeySpace, Cassandra CRUD Operations, Suitable Use Cases, and When Not to Use.

UNIT –IV: Document Oriented Databases: What Is a Document Database, Document Database using MongoDB, MongoDB Data Types, JSON, JSON Syntax, Creating JSON Object, MongoDB Data Modelling, MongoDB CRUD Operations, MongoDB Collections: Creating CSV Files, Exploring dataset structures, Using MongoDB , Suitable Use Cases, and When Not to Use

.

UNIT –V: Graph Databases: What Is a Graph Database, Graph Database using Neo4j, Advantages of Neo4j, CQL Data Types,Neo4j CQL Operators, Create Nodes, Create Relationships, Index, Constraint, Select data

with match, Import data from CSV, Drop an Index, Drop a Constraint, Deleting Nodes, Deleting Relationships. Suitable Use Cases, and When Not to Use**.**

Text Books:

1.Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019

Reference Books:

1. Dan Sullivan, "NoSQLFor Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13:978-9332557338)
2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2 nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

Course Outcomes:

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

- Discuss about Aggregate Data Models and NoSQL Databases
- Explain about Master-Slave Replication, Peer-to-Peer replication and Key- Value Databases
- Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.
- Explain performance tune of Key-Value Pair NoSQL databases.
- Apply NoSQL development tools on different types of NoSQL Databases.

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III Year - II Semester

MICROPROCESSOR AND MICROCONTROLLERS LAB

Course Objectives:

The main objectives of this course are

- To study programming based on 8086 microprocessor and 8051 microcontrollers.
- To study 8086 microprocessor-based ALP using arithmetic, logical and shift operations.
- To study to interface 8086 with I/O and other devices.
- To study parallel and serial communication using 8051 micro controllers.

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed)

8086 Assembly Language Programming using Assembler Directives

1. Sorting.
2. Multi byte addition/subtraction
3. Sum of squares/cubes of a given n-numbers
4. Addition of n-BCD numbers
5. Factorial of given n-numbers
6. Multiplication and Division operations
7. Stack operations
8. BCD to Seven segment display codes

PART-B: (Minimum of 2 Experiments has to be performed) 8086 Interfacing

1. Hardware/Software InterruptApplication
2. A/D Interface through Intel8255
3. D/A Interface through Intel8255
4. Keyboard and Display Interface through Intel8279
5. Generation of waveforms using Intel8253/8254

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PART-C: (Minimum of 2 Experiments has to be performed) 8051 Programming

Language Programs

1. Finding number of 1's and number of 0's in a given 8-bitnumber
2. Addition of even numbers from a given array
3. Ascending / Descending order
4. Average of n-numbers

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PAERT-D: (Minimum of 2 Experiments has to be performed) 8051 Interfacing

1. Switches and LEDs
2. 7-Segment display(multiplexed)
3. Stepper Motor Interface
4. Traffic Light Controller

Equipments Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module
8. Keyboard module
9. LED, 7-SegemtUnits
10. Digital Multimeters
11. ROM/RAM
12. Interface module
13. Bread Board etc.

Reference Books:

1. Advanced microprocessors and peripherals-A. K ray and K.M. Bhurchandani, TMH, 2nd edition 2006.
2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, Dhananjay V.Gadre, Cengage Learninbg , India Edition.
3. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.

Course outcomes:

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

- Understand and execute programs based on 8086 microprocessor
- Design and implement interfacing circuits using 8086 microprocessor.
- Understand and execute programs based on 8051 microcontroller
- Design and implement interfacing circuits using 8051 microcontroller

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L	T	P	C
0	0	3	1.5

III Year - II Semester

DIGITAL SIGNAL PROCESSING LAB

Course Objectives:

The main objectives of this course are:

- To generate Discrete Time Signals
- To generate frequency response of analog LP/HP filters
- To analyze the stability of system
- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- To compute FFT of 1-D signal and power density spectrum

List of the Experiments / Programs

1. Generation of discrete time signals
2. MATLAB program to generate sum of sinusoidal signals.
3. MATLAB program to find frequency response of analog LP/HP filters.
4. Transfer Function Stability Analysis: using Pole-zero plot and z-plane plot.
5. To verify linear convolution.
6. To verify circular convolution.
7. To design FIR filter (LP/HP) using windowing technique
    a) Rectangular window
    b) Triangular window
    c) Kaiser window
8. To Implement IIR filter (LP/HP) on DSP Processors
9. To find the FFT of given 1-D signal and plot.
10. To compute power density spectrum of a sequence.

Reference 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, 2010.
3. Digital Signal Processors, Architecture, Programming and Applications, B.Venkataramani, M. Bhaskar, TMH, 2002.

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Course Outcomes:

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

- Generate the discrete time signals
- Plot the frequency response of analog LP/HP filters
- Analyze the stability of the system
- Compute Linear and Circular Convolution
- Design FIR and IIR filters
- Find the FFT of 1-D signal and power density spectrum

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L	T	P	C
0	0	3	1.5

MICROWAVE AND OPTICAL COMMUNICATION LAB

Course Objectives:

The main objectives of this course are:

- To learn the Microwave beach setup
- To learn the different Microwave Components
- To setup the Fiber optic Analog Optical link
- To setup the Fiber optic Digital Optical link

Part – A (Microwave) (Minimum Ten Experiments to be conducted from Part – A and B)

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.

Part – B(Optical)

8. Characteristics of LED.
9. Characteristics of Laser Diode.
10. Measurement of Data rate for a Digital Optical link.
11. Measurement of NA.
12. Measurement of losses for an 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.Fiber Optic Analog Trainer based LED
20. Fiber Optic Analog Trainer based laser
21. Fiber Optic Digital Trainer
22. Fiber cables - (Plastic, Glass)

Reference Books

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rdEdition,1994.
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley,2nd Edition,2002.
3. Optical Fiber Communications – Gerd Keiser, McGraw-Hill International edition,3rd Edition,2000.

Course Outcomes

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

- Understand the Characteristics of Reflex Klystron and Gunn Diode
- Obtain the Scattering Matrix of Circulator, Directional coupler and Magic Tee
- Understand the Characteristics of LED/LASER
- Obtain the data rate for a digital optic link
- Measure the losses and Numerical Aperture of an Optical Fibre

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L	T	P	C
1	0	2	2

III Year - II Semester

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

The main objectives of this course are:

- To expose students to different contexts through right vocabulary
- To inculcate the habit of reading and understanding any text
- To enable students to acquire the ability of writing for business purposes
- To enable students to acquire interview skills and group discussion dynamics

UNIT –I:

Selected High GRE Words, Idioms & Phrases – Discourse Skills – using visuals – Synonyms and antonyms, word roots, one word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases, collocations. (2 sessions)

UNIT –II:

Reading Comprehension – General Vs Local Comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning. (2 sessions)

UNIT –III:

Writing Skills – Structure of Resume writing —Short Report Writing (Business/Technical)- (2sessions)

UNIT –IV:

Presentation Skills -- Group Discussion – Dynamics of Group Discussion, (4 sessions)

UNIT –V:

Interview Skills – Concept and process – pre-interview planning, opening strategies, answering strategies, interview through teleconference & video-conference and mock interviews. (3sessions)

Suggested Software:

1. K-Van solutions Software with CD
2. Oxford advanced learner's compass, 7th Edition

Suggested Reading:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

2. Business and Professional Communiction: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl.Sage South Asia Edition.Sage Publications. 2011.

3. English Vocabulary in Use Series, Cambridge University Press 2008.
4. Communication Skills by Leena Sen, PHI Learning Pvt. Ltd., New Delhi, 2009.
5. A Course Book of Advanced Communication Skills Lab published by University Press, Hyderabad.

Course Outcomes:

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

- Choose vocabulary contextually.
- Comprehend, analyse and interpret the text in a definite time frame.
- Write resumes cohesively and coherently.
- Construct and elaborate on a given topic and Comprehend and practice the dynamics of group discussion
- Comprehend the concept and process of interview; answering through mock interviews.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
2	0	0	0

III Year - II Semester

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Course Objectives:

The main objectives of this course is:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system.

UNIT –I: Introduction to traditional knowledge

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge

traditional knowledge

UNIT –II:Protection of traditional knowledge:

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT –III: Legal framework and TK:

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001(PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT –IV: Traditional knowledge and intellectual property:

Systems of traditional knowledge protection,Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge,Strategies to increase protection of traditional knowledge

UNIT –V: Traditional Knowledge in Different Sectors:

Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

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Text Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

ReferencesBooks:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

2."Knowledge Traditions and Practices of Indi", Kapil Kapoor1, Michel Danino2.

Web Links:

1.https://www.youtube.com/watch?v=LZP1StpYEPM

2.http://nptel.ac.in/courses/121106003/

Course Outcomes:

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

- Understand the concept of Traditional knowledge and its importance.
- Know the need and importance of protecting traditional knowledge.
- Know the various enactments related to the protection of traditional knowledge.
- Understand the concepts of Intellectual property to protect the traditional knowledge.
- Understand the traditional knowledge in different sectors.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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3	0	0	3

IV Year - I Semester

CELLULAR MOBILE & WIRELESS COMMUNICATIONS
(PROFESSIONAL ELECTIVE –III)

Course Objectives:

The main objectives of this course are:

- Basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems
- Effect of Co-channel and non-co channel interferences on cellular and mobile communications.
- Radio wave propagation, multipath and fading effects in wireless communications
- Frequency management, channel assignment, concept of handoff and types of handoffs in cellular environment.
- Architectures of GSM and 3G&4G cellular systems

UNIT –I: Introduction to Cellular and Mobile Systems

Cellular Mobile System, uniqueness of mobile radio, environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog, and Digital Cellular systems. Evolution of Cellular systems, frequency reuse and its ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Different cellular structures; Cell splitting, Cell sectoring.

UNIT –II: Interference

Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal casein an omni directional Antenna system, Design of Antenna System, Antenna Parameters and their Effects, diversity receiver, different types of non-co channel interference.

UNIT –III: Handoff concepts

Basic conceptualization of Handoff, types of handoffs, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, vehicle locating methods, dropped call rates and their evaluation.

UNIT –IV: Mobile Radio Propagation

Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model,Outdoor Propagation Models- LongleyRyce Model, Okumura Model, Hata Model, PCS Extension to Hata Model

Small Scale fading and multipath

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Small Scale Multipath Propagation-Factors influencing small scale fading,Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading

UNIT –V: Digital cellular networks

GSM architecture, GSM channels, multiple access schemes; TDMA,CDMA, OFDMA; architecture of 3G &4G cellular systems

.

Textbooks:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.

2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

References:

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.

2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.

3. Wireless Communication and Networking – Jon W. Mark and WeihuaZhqung, PHI, 2005.

5. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

Course Outcomes:

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

- Understand the basic concept and limitations/advancements of conventional mobile telephone systems, cellular mobile systems, and advanced generations of cellular wireless systems.
- Identify and understand the effect of interference in cellular mobile communication.
- Understand the concept of handoff and architectures of various cellular systems.
- Understand the mobile radio propagations
- Understand the architectures of 3G and 4G cellular systems.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

5G TECHNOLOGY

(PROFESSIONAL ELECTIVE –III)

Course Objectives:

The main objectives of this course are:

- Differentiate between 2G, 3G, 4G and 5G Communications.
- Design , Transmission and Propagation models in 5G
- Different types communication standards

UNIT –I: Overview of 5G Broadband Wireless Communications

Evaluation of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro) , An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

UNIT –II: The 5G wireless Propagation Channels:

Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems.

UNIT –III: Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

UNIT –IV: Device-to-device (D2D) and machine-to-machine (M2M) type communications

Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications

UNIT –V: Millimeter-wave Communications

spectrum regulations, deployment scenarios, beam forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM)

Text Books:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell

2. Afif Osseiran, Jose.F.Monserrat, Patrick Marsch, "Fundamentals of 5G Mobile Networks" , Cambridge University Press
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, "New Directions in Wireless Communication Systems from Mobile to 5G", CRC Press
4. Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock "Millimeter Wave Wireless Communications", Prentice Hall Communications.

References:

1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk "Essentials of LTE and LTE-A", Cambridge University Press

Course Outcomes:

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

- Analyze the evaluation of mobile technologies
- Learn different channel modeling in 5G
- Analyze transmission and design techniques for 5G
- Learn Device to device communication
- Learn millimeter wave communication

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

DIGITAL IC DESIGN
(PROFESSIONAL ELECTIVE –III)

Course Objectives:

The main objectives of this course are:

- The student will be able to understand the MOS Design.
- The concepts of Semiconductor Memories, RAM array organization

UNIT –I: MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates.

UNIT –II: Combinational MOS Logic Circuits

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OAI gates, CMOS full adder.

UNIT –III: Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT –IV: Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, Domino CMOS Logic circuits

.**UNIT –V:**

Interconnect: Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconnect Techniques.

Semiconductor Memories: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells.

Text Books:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

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References:

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.

2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson

Course Outcomes:

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

- Understand the concepts of MOS Design.
- Design and analysis of Combinational MOS Circuits.
- Design and analysis of Sequential MOS Circuits.
- Extend the Digital IC Design to Different Applications.
- Understand the Interconnect Techniques and Concepts of Semiconductor Memories, RAM array organization.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Sem

RADAR & SATTILITE SYSTEMS

(PROFESSIONAL ELECTIVE –IV)

Course Objectives:

The main objectives of this course are :

- The goal of the course is to introduce students to the fundamentals of radar and satellite communication.
- To explore the concepts of radar and its frequency bands
- To understand Doppler effect and get acquainted with the working principles of CW radar, FM- CW radar.
- To impart the knowledge of functioning of MTI and Tracking Radars

UNIT –I:

Basics of Radar : Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Illustrative Problems

Radar Equation: Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, PRF and Range Ambiguities, System Losses, Illustrative Problems.

UNIT –II:

CW and Frequency Modulated Radar : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

UNIT –III: MTI and Pulse Doppler Radar:

Introduction, Principle, MTI Radar with – Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation. Range Gated Doppler Filters. Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT –IV: Tracking Radar

Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates). Acquisition and Scanning Patterns

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UNIT –V: Introduction to Satellite Communications

Origin of Satellite Communications, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Brief overview of Attitude and orbit control system, Communication Subsystems, Future Trends of Satellite Communications

Text Books:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.
2. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt,WSE, Wiley Publications, 2ndEdition, 2003.
3. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2ndEdition, Pearson Publications, 2003.

References:

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013
4. Radar Engineering – GSN Raju, IK International
5. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
6. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.

Course Outcomes:

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

- Derive the radar range equation and to solve some analytical problems
- Understand the different types of radars and its applications
- Understand the concepts of MTI and Pulse Doppler Radar
- Understand the concept of tracking and different tracking techniques
- Understand the concepts, applications and subsystems of Satellite communications

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

COGNITIVE RADIO

(PROFESSIONAL ELECTIVE –IV)

Course Objectives:

The main objectives of this course are

- Understand the concepts of wireless networks and next generation networks
- Learn the wireless networks based on the cognitive radios

UNIT –I :Introduction to Cognitive Radios

Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.

UNIT –II: Sensing

Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).

UNIT –III: Optimization Techniques of Dynamic Spectrum Allocation

Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, Stochastic programming.

UNIT –IV: Dynamic Spectrum Access and Management

Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.

UNIT –V:

Spectrum Trading

Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), and classification of auctions (single auctions, double auctions, concurrent, sequential).

Research Challenges in Cognitive Radio: Network layer and transport layer issues, cross- layer design for cognitive radio networks

Text Books:

1. Ekram Hossain, DusitNiyato, Zhu Han, "Dynamic Spectrum Access and Management in Cognitive Radio Networks", Cambridge University Press,2009.
2. Kwang-Cheng Chen, Ramjee Prasad, "Cognitive radio networks", John Wiley & Sons Ltd.,2009.

References:

1. Bruce Fette, "Cognitive radio technology", Elsevier, 2nd edition, 2009.
2. HuseyinArslan, "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems", Springer,2007.
3. Francisco Rodrigo Porto Cavalcanti, Soren Andersson, "Optimizing Wireless Communication Systems" Springer,2009
4. Linda Doyle, "Essentials of Cognitive Radio", Cambridge University Press,2009

Course Outcomes:

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

- Understand the fundamental concepts of cognitive radio networks.
- Understand how to allow an efficient use of TVWS for radio communications based on two spectrum sharing business models/policies.
- Learn about Optimization techniques of dynamic spectrum allocation
- Understand fundamental issues regarding dynamic spectrum access and Management
- Understated the radio- resource management and trading,

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

ADVANCED DIGITAL SIGNAL PROCESSING
(PROFESSIONAL ELECTIVE –IV)

Course Objectives:

The main objectives of this course are

- To learn and understand the concepts of stationary and non-stationary random signals and analysis & characterization of discrete-time random processes
- To enunciate the significance of estimation of power spectral density of random processes
- To introduce the principles of optimum filters such as Wiener and Kalman filters
- To introduce the principles of adaptive filters and their applications to communication engineering
- To introduce the concepts of multi-resolution analysis

UNIT –I: DISCRETE-TIME RANDOM PROCESSES

Random variables - ensemble averages a review, random processes - ensemble averages, autocorrelation and autocovariance matrices, ergodic random process, white noise, filtering random processes, spectral factorization, special types of random processes - AR, MA, ARMA

UNIT –II: SPECTRUM ESTIMATION

Bias and consistency, Non-parametric methods - Periodogram, modified-Periodogram - performance analysis. Bartlett's method, Welch's method, Blackman-Tukey method. Performance comparison. Parametric methods - autoregressive (AR) spectrum estimation - autocorrelation method, Prony's method, solution using Levinson Durbin recursion.

UNIT –III: OPTIMUM FILTERS

Wiener filters - FIR Wiener filter - discrete Wiener Hopf equation, Applications - filtering, linear prediction. IIR Wiener filter - causal and non-causal filters. Recursive estimators - discrete Kalman filter.

UNIT –IV: ADAPTIVE FILTERS

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Principles and properties of adaptive filters - FIR adaptive filters. Adaptive algorithms - steepest descent algorithm, the LMS algorithm - convergence. Applications of adaptive filtering - noise cancellation, channel equalization.

UNIT –V: MULTIRESOLUTION ANALYSIS

Short-time Fourier transform - Heisenberg uncertainty principle. Principles of multi-resolution analysis - sub-band coding, the continuous and discrete wavelet transform - properties. Applications of wavelet transform - noise reduction, image compression

Textbooks:

1. Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York,Indian reprint2008. (UNITI-IV)
2. P. P. Vaidyanathan, "Multirate systems and filter banks", Prentice Hall Inc. 1993 (UNIT V)

.

References:

1. John G. Proakis & Dimitris G.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications‖, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2. Sophoncles J. Orfanidis, "Optimum signal processing", McGraw Hill, 2000

Course Outcomes:

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

- Analyze the characteristics of discrete random process
- Understand power spectrum estimation techniques in non-parametric and parametric approach
- Analyze wiener filter and their applications
- Understand adaptive algorithms and their applications
- Analyze the signal using multiresolution analysis with STFT and DWT

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

DIGITAL IMAGE PROCESSING

(PROFESSIONAL ELECTIVE –V)

.**Course Objectives:**

The main objectives of this course are

- Understand the basic concepts of digital image processing and different image transforms
- Learn image processing techniques image enhancement and restoration
- Understand the concepts of image compression and wavelets
- Understand the concepts of image segmentation and morphological image processing
- Understand the fundamentals of color image processing and learn various color models

UNIT –I:

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels.

Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms

UNIT –II:

Intensity Transformations and Spatial Filtering: Background, some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Combining spatial enhancement methods.

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filterimg.

UNIT –III: Image Restoration and Reconstruction: A model of the image degradation /Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean

square error (Wiener) filtering, constrained least squares filtering, geometric mean filter, image reconstruction from projections.

UNIT –IV:

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding.

Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT –V:

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation.

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Text Books

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall,2008
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", TataMcGraw-Hill Education, 2011.

Reference Books

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint,2002
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

Course Outcomes:

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

- Learn digital image fundamentals and image transform techniques
- Perform image intensity transformations using spatial and frequency domain filters
- Learn estimation and reconstruction of the image with various noise models
- Learn image compression methods and apply wavelet transforms
- Perform segmentation, morphological image processing, pseudo & color image processing

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester

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COMPUTER ARCHITECTURE & ORGANISATION

(PROFESSIONAL ELECTIVE –V)

Course Objectives:

The main objectives of this course are

- To understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- To understand the memory management system of computer
- To Understand the various instructions, addressing modes
- To Understand the concept of I/O organization

UNIT –I: Basic Structure of Computers

Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.Machine Instruction and Programs:Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types

UNIT –II:

Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions.

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT –III: Input/ Output Organization

Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,

Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT –IV: The Memory Systems

Basic memory circuits, Memory System Consideration, Read- Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING

Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT –V: Processing Unit

Fundamental Concepts: Register Transfers, Performing Arithmetic orLogic Operation, Fetching A Word From Memory,Execution of Complete Instruction, Hardwired Control,

Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

Text Books

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5thEdition, McGrawHill,2011
2. Computer Architecture and Organization, John P. Hayes ,3rdEdition, McGrawHill,2002

Reference Books

1. Computer Organization and Architecture – William Stallings SixthEdition,Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th EditionPHI/Pearson,2012.
3. Fundamentals or Computer Organization and Design, - SivaraamaDandamudiSpringer Int.Edition,2003.
4. “Computer Organization and Design: The Hardware/Software Interface” by DavidA. Patterson and John L.Hennessy, 1998.
5. J .P. Hayes, "Computer Architecture and Organization",McGraw-Hill,1998.

Course Outcomes:

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

- Understand the architecture of modern computer.
- Understand different instruction types & different addressing modes
- Understand the concepts of I/O Organization and Memory systems.
- Understand the different types of memories
- Learn the different blocks in processing unit

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

TV ENGINEERING

(PROFESSIONAL ELECTIVE –V)

Course Objectives:

The main objectives of this course are

- To study the analysis and synthesis of TVPictures, Composite Video Signal, Receiver Picture Tubes and-Television Camera Tubes
- To study the principles of Monochrome Television Transmitter and Receiver systems
- To study the advanced topics in Television systems.
- To study the various Color Television systems with a greater emphasis on PAL

UNIT –I: FUNDAMENTALS OF TELEVISION

TV transmitter and receivers, synchronization, Basic factors of TV system: aspect ratio, image continuity, interlaced scanning, flicker, picture resolution, Composite video signal, Horizontal and vertical sync details, no of scanning lines, scanning sequence details. Monochromatic Picture tube, Electrostatic focusing, Beam deflection, picture tube characteristics and specifications, monochrome TV camera.

UNIT –II:

MONOCHROME TV TRANSMITTER : TV transmitter - picture signal transmission, sound signal transmission, vestigial side band transmission, TV signal propagation â€“ Interference - TV transmission Antennas.

MONOCHROME TV RECEIVER : RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits.

UNIT –III:

CAMERA TUBES : Basic Principles, Types: Image Orthicon, Vidicon, Plumbicon, Block diagram of broad cast TV transmitter, Block diagram of broadcast TV receiver.

Essentials of Colour Television : Compatibility â€“ colour perception- Three colour theory- luminance, hue and saturation-colour television cameras- values of luminance and colour difference signals-formation of chrominance signal

UNIT –IV: Colour TV display tubes : delta gun, precision in-line and Trinitron colour picture tubes, purity and convergence, purity and static and dynamic convergence adjustments, automatic degaussing circuit, grey scale tracking.

Colour television systems : NTSC colour TV system, limitations of NTSC system, PAL colour TV system, merits and demerits of the PAL system - SECAM colour TV system, merits and demerits of SECAM system.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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UNIT –V: Advanced Colour TV Systems - Cable TV : cable signal sources, cable signal processing, cable signal distribution - digital television - DTH, threedimensional (3D) TV.

Extended Definition television (EDTV), HDTV, LCD Television : LCD technology, LCD matrix types & operation, Plasma Television : conduction of charge, signal processingin plasma TV receivers.

Text Books

1.R.R. Gulati-Modern Television Practice - Principles, Technology and Service - New Age International Publication, 2009

2. R.R. Gulati-Monochrome and Colour TV - New Age International Publication, 2002.

Reference Books

1. S. P.Bali - Colour Television Theory and Practice - TMH, 1994

2. A.M. Dhake - Television and Video Engineering - 2nd Edition - 16th Reprint-2006

Course Outcomes:

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

- Acquire knowledge in Fundamentals of Television, Monochrome TV transmitter and receiver, Camera tubes and colour TV display tubes, Colour TV systems and advanced colour TV systems
- Identify the elements of Television, Monochrome TV transmitter and receiver, Camera tubes and colour TV display tubes, Colour TV systems and advanced colour TV systems.
- Interpret the essentials of colour TV and various colour TV systems
- Acquire knowledge in fundamentals of television, Monochrome TV transmitter and receiver, Camera tubes and colour TV display tubes, Colour TV systems and advanced colour TV systems.
- Compare different display tubes and various colour TV systems.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester **VLSI DESIGN**

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-III)

Course Objectives:

The main objectives of this course are

- To learn the MOS process technology and understand the operation of MOS devices
- To obtain the basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits.
- To obtain the basic circuit parameters such as resistance, capacitance and delay and the scaling factors determining the performance of MOS circuits in silicon.
- To develop a comprehensive understanding of the physical design process and testing for CMOS VLSI circuits
- To impart in-depth knowledge about FPGA and advanced technologies of low power VLSI design.

UNIT –I: INTRODUCTION TO MOS TECHNOLOGY:

Introduction to IC technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, Fabrication process: nMOS, pMOS and CMOS, BiCMOS technology, Production of E-beam Masks, Comparison between CMOS and BiCMOS technology.

UNIT –II:

BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Transconductance, 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 Inverters.

MOS CIRCUIT DESIGN PROCESSES: MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits.

UNIT –III:

BASIC CIRCUIT CONCEPTS: 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 and Gate logic.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –IV:

VLSI DESIGN METHODOLOGIES: Introduction, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality, VLSI Design Styles, Design Quality, Packaging Technology, Computer-Aided Design Technology.

PHYSICAL DESIGN: Introduction to physical design automation, Partitioning, Floorplanning and Placement, Grid Routing and Global Routing, Static Timing Analysis

DESIGN FOR TESTABILITY: Fault types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Automatic Test Pattern Generator, Scan Based Techniques and Built-In Self-Test techniques.

UNIT –V:

FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.

SYNTHESIS: Introduction**,** Logic synthesis, RTL synthesis, High level Synthesis. Synthesis with FPGAs

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

Text Books

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGraw-Hill Education, 2003
3. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2nd edition, 2016

Reference Books

1. Introduction to VLSI Circuits and Systems - John P. Uyemura, John Wiley & Sons, reprint 2009.
2. Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.
3. FinFETs and other multi-gate transistors, Colinge JP, Editor New York, Springer, 2008.

Course Outcomes:

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

- To understand MOS technology and the fabrication process for VLSI circuits.
- To use mathematical methods and circuit models in the analysis of CMOS digital electronic circuits and apply the design rules during the mask layout.
- To apply the scaling factors in determining the efficient MOS circuits for current semiconductor technology.

- To apply industry-standard methodologies to effectively perform physical design tasks, and optimize design metrics, and DFT techniques to check chips functionality.
- To design various applications using FPGA and can implement low power VLSI circuits.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

OPERATING SYSTEMS

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-III)

Course Objectives:

The main objectives of this course are

- Study the basic concepts and functions of operating systems.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes
- I/O management, File systems and system protection.

UNIT –I:

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, Structure of operating System, operating systems services.

UNIT –II:

Process Management – Process concept, The process, Process State Diagram, Process control block, Process Scheduling-Scheduling Queues, Schedulers, Operations on Processes, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms

UNIT –III:

Concurrency: Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization.

Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock.

UNIT –IV:

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation. Virtual Memory Management: Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing**.**

UNIT –V:

File system Interface- The concept of a file, Access Methods, Directory structure, File system mounting. File System implementation- File system structure, allocation methods, free-space management, Overview of Mass-storage structure, Disk scheduling.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text Books

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.

2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011

3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016

Reference Books

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.

2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education", 1996.

3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw-Hill Education, 2007.

Course Outcomes:

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

- Understand the working principles of various components of a computer
- Develop computational thinking and be able to use Python constructs to solve basic problems
- Understand modularization and data structures concepts in Python
- Apply file handling concepts in problem solving
- Solve Real world problems by applying Object Oriented Concepts

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IV Year - I Semester

INDUSTRIAL ROBOTICS
(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-III)

Course Objectives:

The main objectives of this course are

- Understand the components and their working principles of a robotic system.
- Expand this knowledge into the vast area of robotics.
- The students will be exposed to the concepts of robot kinematics, Dynamics, Trajectory planning.
- Mathematical approach to explain how the robotic arm motion can be described
- The students will understand the functioning of sensors and actuators

UNIT –I: ROBOT FUNDAMENTALS:

Automation and Robotics, History of robots, Laws of Robotics, Robot Specifications – Precision, accuracy and repeatability, Anatomy of a Robot – Links, Joints, number of degrees of freedom (DOF), Arm and Wrist configurations, classification by coordinate system and control system. Work Volume, An overview of Robotics – present and future prospects**.**

UNIT –II:

COMPONENTS OF THE INDUSTRIAL ROBOTS: Components, Architecture – Requirements and challenges of end effectors, Types of end effectors - Tools & Grippers - Mechanical, Vacuum, Magnetic etc. Considerations in gripper selection and design, Common types of robotic arms – PUMA, SCARA

MOTION ANALYSIS:

2D and 3D - Homogeneous transformations as applicable to rotation and translation – problems.

UNIT –III:

MANIPULATOR KINEMATICS:

Kinematic Modeling of Manipulator - Forward kinematics, D-H notation – Kinematic relation between adjacent links– problems, Inverse kinematics.

DIFFERENTIAL MOTION AND DYNAMICS:

Differential transformation, manipulator Jacobian – 2-DOF planar arms, Jacobian singularities.Dynamics: Lagrange – Euler and Newton – Euler formulations and comparison

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UNIT –IV: TRAJECTORY PLANNING AND ROBOT PROGRAMMING:

General considerations in path description and generation: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages - VAL programming - description of paths with a robot programming language.

UNIT –V:

ROBOT ACTUATORS AND FEEDBACK COMPONENTS:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

ROBOT APPLICATIONS IN MANUFACTURING:

Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Text Books

1. Groover M P, Industrial Robotics, Pearson Edu. 1st Edition, 1987

2. Mittal R K &Nagrath I J, Robotics and Control, TMH, 2017

Reference Books

1. K. S. Fu, Ralph Gonzalez, C.S.G. Lee, Robotics, McGraw Hill, Rev Edition, 2017

2. Richard D. Klafter, Robotic Engineering: An Integrated Approach, Prentice Hall, 1st Edition, 1989.

Course Outcomes:

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

- To learn about knowledge for the design of robotics.
- To learn about knowledge for the design of robotics.
- Carry out kinematic and dynamic analysis for simple serial kinematic chains.
- Perform trajectory planning for a manipulator by avoiding obstacles and develop programming principles, languages for a robot control system.
- Select appropriate actuators and sensors for a robot based on specific application.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

EMBEDDED SYSTEM

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-IV)

Course Objectives:

The main objectives of this course are

- The basic concepts of an embedded system are introduced
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated

  Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed. And Fundamental issues in hardware software co-design were presented and explained.
- Embedded system implementation and testing tools are introduced and discussed

UNIT –I: INTRODUCTION:

Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware

UNIT –II: CHARACTERISTICS&EMBEDDED HARDWARE DESIGN:

Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system. Analog and digital electronic components, I/O types and examples, Serial &Parallel communication device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT –III: EMBEDDED FIRMWARE DESIGN:

Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT –IV:

REAL TIME OPERATING SYSTEM:

Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Task communication, Task synchronisation, Device Drivers

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co- Design, Computational models in embedded design, Hardware software Trade-offs.

UNIT –V: EMBEDDED SYSTEM DEVELOPMENT AND TESTING

The integrated development environment, Types of files generated on cross-compilation, De-assembler/De-compiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, The main software utility tool, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Laboratory Tools

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

Reference Books:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

Course Outcomes:

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

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
- Analyze the hardware components required for an embedded system and the design approach of an embedded hardware
- Distinguish the various embedded firmware design approaches on embedded environment
- Understand how to integrate hardware and firmware of an embedded system using real time operating system
- Understand how to embedded system development and its testing

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester

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DESIGN AND ANALYSIS OF ALGORITHMS

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-IV)

Course Objectives:

The main objectives of this course are

- Upon completion of this course, students will be able to do the following:
- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

UNIT –I:

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

UNIT –II:

Divide and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms (Quick Sort).

UNIT –III:

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT –IV:

Dynamic Programming: All - Pairs Shortest Paths, Single – Source Shortest paths General Weights, String Editing, 0/1 Knapsack, Reliability Design.

UNIT –V:

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Coloring. Branch and Bound: The Method, Least cost (LC) Search, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch

and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson**.**

Text Books:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press
2. Introduction to Algorithms, Thomas H. Cormen, PHI Learning

Reference Books:

1. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman
2. Algorithm Design, Jon Kleinberg, Pearson.

Course Outcomes:

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

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situationcalls for it.
- Describe the dynamic-programming paradigm and explain when an algorithmic design Situation calls for it.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

MACHINE LEARNING

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-IV)

Course Objectives:

The main objectives of this course are

- Define ML and understand their relationship with data
- Understand different types of supervised learning and build various regression and classification models
- Understand basic math fundamentals of this domain and intuitively understand basic math fundamental behind each technique
- Understand performance metrics
- Explain the mechanism of unsupervised learning and practice various clustering techniques in Python.
- Comprehend text mining and its applications

UNIT –I:

Introduction

Motivation, Applications of Machine Learning - Well-Posed Learning Problems - Designing a Learning System - Issues in Machine Learning - Types of Machine Learning

Supervised Learning - Regression Techniques Basic concepts and applications of Regression - Simple Linear & Multiple Regression - Gradient Descent - Evaluation Measures for Regression Techniques - overfitting - underfitting - Regularization - Train-test-split, k-fold cross validation - Hyperparameter tuning

UNIT –II:

Supervised Learning - Classification Techniques Basic concepts and applications of classification - Naïve Bayes Classification, Logistic Regression, KNearest Neighbors, Classification Trees, Support Vector Machines, Evaluation Measures for Classification Techniques.

UNIT –III:

Unsupervised Learning

Definition, K-Means, Hierarchical clustering techniques. Dimensionality reduction using PCA. Feature Engineering – selection, factor analysis.Time series modeling (time series data types, stationarity and ARIMA modeling)

UNIT –IV:

Natural Language Processing / Text mining Introduction. Applications. Chatbots, virtual agents (Alexa, Google Assistant, Siri). Importance, Applications, NLP Subproblems. Components of Natural Language. Steps to get text data into workable format.Terms Frequency, Inverse Document Frequency, Bag of Words, ngram, One hot encoding. Notion of corpus. Intro to NLTK

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UNIT –V:

Neural Networks

Biological Neurons and Biological Neural Networks, Perceptron Learning, Activation Functions, Multilayer Perceptron, Back-propagation Neural Networks, Convolution Neural Network.

Text Books:

1. Tom Mitchell, Machine Learning, TMH
2. C. Bishop, Pattern Recognition and Machine Learning, Springer
3. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

Reference Books:

1. Build an AI Assistant with Wolfram Alpha and Wikipedia in Python.https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-inpython-d9bc8ac838fe2
2. Joseph Howse, Prateek Joshi, Michael Beyeler -Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)
3. Curated Datasets on Kaggle https://www.kaggle.com/datasets4.AurélienGéron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017

Course Outcomes:

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

- Understand the importance of Machine Learning
- Apply regression and classification techniques for machine learning examples
- Comprehend supervised and unsupervised machine learning techniques.
- Apply the neural network and dimensionality reduction techniques for machine learning applications.
- Design and implement machine learning algorithms to solve real-world application problems

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

FUNDAMENTALS OF ENTERPRENEURSHIP
(HUMANITIES AND SOCIAL SCIENCE ELECTIVE-I)

Course Objectives:

The main objectives of this course is

- The objective of the course is to make students understand the fundamentals of entrepreneurship and make students to take their career in entrepreneurship

UNIT –I: Fundamentals of Entrepreneurship:

Entrepreneurship; Entrepreneurial Traits, Types of Entrepreneurs; Evolution of Entrepreneurship; Myths of Entrepreneurship; Difference between Inventors & Entrepreneurs; Role of Entrepreneurship; Entrepreneurial Ethics & Social Responsibilities & Ease of doing business in India.

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UNIT –II:

Creativity, Innovation& Start-Ups: Introduction; Creativity & Entrepreneurship; Components of Creativity; Characteristics of Creative People; Sources of New Ideas; Techniques for Generating Ideas. Innovation & the Entrepreneur: The innovation Process; Types of Innovation; Major Misconceptions of Innovation; Principles of Innovation.

Start-Ups: Start-Ups; Types of Start-Ups; Start-Ups in India; start-Ups failures & reasons; Managing start-Ups during down turn

UNIT –III: Legal Aspects of Business:

Procedures for setting up a Business in India; Legal Aspects governing businesses in India-IP law, labor law, safety law, contract law, corporate law & taxation law.

UNIT –IV: Business Plan:

Business plan; Drivers of Business plan; Basics of Business plan; Reasons for Failure of Business plans; Growth strategies for Ventures: Franchising, Licensing, Joint Ventures, Mergers & Acquisitions.

UNIT –V: Institutions that facilitate Entrepreneurship & Entrepreneurship Development:

National Institute for MSME, NIESBUD; Ministry of MSME; EDI; National Entrepreneurship Network (NEN); National science & Technology Entrepreneurship Development Board (NSTEDB); ISB: Wadhwani Centre for

Entrepreneurship Development (WCED).

Text Books:

1. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.
2. VSP Rao, Kuratko: "Entrepreneurship", Cengage Learning, New Delhi

Reference Books:

1. Rajeev Roy: "Entrepreneurship", Oxford University Press, New Delhi, 2012
2. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya House, 2015.

Course Outcomes:

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

- Understand the concept and importance of entrepreneurship.
- Know the various means of generating business ideas
- Know the various legal aspects involved in forming the business
- Able to write a business plan.
- Know the role of Government and Various Agencies in promoting entrepreneurship

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester

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BUSINNESS ENVIRONMENT

(HUMANITIES AND SOCIAL SCIENCE ELECTIVE-I)

Course Objectives:

The main objectives of this course is

- Student should be able to outline how an entity operates in a business environment.

UNIT –I: Business Environment:

Importance at national and international level – problems and challenges– factors both internal and external influencing business environment, Industrial policies since independence and their significance

UNIT–II:

Structure of Indian economy: Nature and significance – Economic systems – structure of Indian industry – nature – challenges – social justice –competition Act 2002.

Fiscal Policy: Nature and significance – public revenues – Critical analysis of the recent fiscal policy of Government of India.

UNIT –III: India's Trade Policy: Nature–bilateral and multilateral trade agreements, International business environment: Nature – significance– challenges and mechanisms-Overview of IMF, WTO-disputes settlement mechanism – dumping and antidumping measures

UNIT –IV: Legal Frame: special features of the SICA (special provisions) 1985, BIFR, Consumer protection act 1986, Environmental laws (pertaining to the control and prevention of Air and Water pollution), the Essential Commodities Act 1955 & GST Act 2017.

UNIT –V: Disinvestment mechanism: problems and procedures- new industrial policy 1991- NITI Ayog- Balance of Payments – Causes for disequilibrium in Balance of Payments – Correction measures

Text Books:

1. Aswathappa K:"Essentials of business environment" Himalaya Publishing House, New Delhi,2011
2. Francis Cherunilam"Business Environment: Text&Cases"HPH, 2012

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Reference Books:

1. Shaikh Saleem: "**Business Environment**", Pearsons, New Delhi
2. Veena Keshav Pailwar: "**Economic Environment of Business**", PHI Learning, New Delhi,2012
3. Vivek Mittal: "**Business Environment Text and Cases**", Excel Books New Delhi, 2011
4. Sundaram and Black: "**International Business Environment Text and Cases**", PHI PrivateLimited, NewDelhi
5. Avid W Conklin: "**Cases in Environment of Business**", Sage Publication India Private Ltd,New Delhi
6. Raj Kumar: "**International Business Environment**", Excel Publication, New Delhi, 2012.
7. Palle Krishna Rao: "**WTO-Text and Cases**", Excel Publication, New Delhi

Course Outcomes:

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

- To understand the overall business environment and evaluate its various components in business decision making
- To improve the students ability in recognizing and managing legal risks in business decision making
- The course is designed to expose the student to the career fields in the area of business

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year - I Semester

MANAGERIAL ECONOMICS & MANAGEMENT SCIENCE
(HUMANITIES AND SOCIAL SCIENCE ELECTIVE-I)

Course Objectives:

The main objectives of this course are

- The purpose of this course is to apply micro economic concepts and techniques in evaluating business decisions.
- To familiarize with the process of management and to provide basic insight into management practices.

UNIT –I: Introduction to Managerial Economics and demand Analysis

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting.

UNIT –II: Production and Cost Analysis

Concept of Production function- Cobb-Douglas Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts :opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs–Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)Managerial significance and limitations of Breakeven point.

UNIT –III:

Introduction to Markets & Pricing Policies: Market structures: Perfect competition, Monopoly and Monopolistic and oligopoly – Features -Price-Output Determination. Methods of Pricing- Limit Pricing, Market Skimming Pricing and Internet Pricing Models.

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital – Capitalization – Meaning of Capital budgeting - need for capital budgeting- Techniques of Capital budgeting – Traditional and Modern methods.

UNIT –IV: Introduction to Management:

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Concept –nature and importance of Management –Functions of Management – Henry Fayol's 14 principles of management- F.W.Taylor Management Principles-Theories of Motivation – Decision making process-– Types of Organizational structure.

UNIT –V: Contemporary Management Practices:

Basic concepts of MRP, Total Quality Management (TQM), Six sigma, Business process Re-engineering and Bench Marking, Balanced Score Card.

Text Books:

1. L.M.Prasad- Principles and Practice of Management, Sultan Chand & Sons, New Delhi
2. Koontz &Weihrich: 'Essentials of management' TMH 2011

Reference Books:

1. Managerial Economics-Theory & Applications-D.M.Mithani, HPH, New Delhi
2. Financial Management-G.Sudharsan Reddy-HPH, New Delhi
3. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
4. Prof. J.V.Prabhakararao, Prof. P. Venkatrao. 'Managerial Economics and Financial Analysis', Ravindra Publication
5. Dr. A. R. Aryasri, Management Science' TMH 2011

Course Outcomes:

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

- Gain knowledge in basic economic tools in managerial economics and demand analysis.
- Analyze the production, cost concepts of a firm.
- Understand the relationship of pricing, markets and capital budgeting in big industries.
- Students will acquire the knowledge on management functions
- To familiarize with the process of management and to provide basic insights into contemporary management practices

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester

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VLSI DESIGN LAB

List of Experiments

PART (A): Front-end Level Implementation (Any Seven Experiments)

Note: The students need to develop Verilog /VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary Synthesizer

1. Realization of Logic gates
2. 4-bit adder/subtractor
3. 4-bit ripple carry and carry look ahead adder
4. 16:1 MUX through 4:1 MUX
5. 3:8 decoder realization through 2:4 decoder
6. 8:3 encoder
7. 4-bit Multiplier
8. 8-bit parity generator and checker
9. Flip-Flops
10. 8-bit synchronous up-down counter

EDA Tools/Hardware Required:

1. EDA Tool that supports FPGA programming including Xilinx Vivado /Altera (Intel)/ Cypress/Equivalent Industry standard tool.
2. Desktop computer with appropriate Operating System that supports the EDA tools

PART (B): Back-end Level Design and Implementation (Any Five Experiments)

Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using Industry standard EDA Tools.

Design and Implementation of the following

1. Universal Gates
2. An Inverter
3. Full Adder
4. Full Subtractor
5. Multiplexer

6. Decoder
7. D-Flip-flop
8. Differential Amplifier
9. Ring Oscillator
10. Static RAM cell

EDA Tools/Hardware Required:

1. Synopsys/Mentor Graphics/ Cadence /Tanner or Equivalent Industry Standard/CAD Tool.
2. Desktop computer with appropriate Operating System that supports the EDA tools.

Course Outcomes:

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

- Simulate and synthesis various combinational circuits
- Simulate and synthesis various sequential circuits
- Simulate basic gates using EDA tools
- Implement schematic layout of various digital CMOS circuits using EDA tools

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TRACK-I (HONOR)

CMOS VLSI DESIGN

Course Objectives

The main objectives of this course are

- To learn the MOS process technology and understand the related VLSI technology and design in semiconductor industry standards.
- To understand the design principles and operational characteristics of NMOS and CMOS digital circuits, including pass transistor and transmission gate.
- To obtain the basic circuit parameters such as resistance, capacitance and delay and the scaling factors determining the performance of MOS circuits in silicon.
- To explore advanced CMOS logic design techniques and understand the design principles of static and dynamic memory.
- To impart in-depth knowledge about FPGA design flow, architecture, technologies and popular FPGA families.

UNIT –I: MOS TECHNOLOGY AND VLSI

Introduction to IC technology and Moore's Law, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, and Fabrication process: nMOS, pMOS and CMOS, VLSI Design Flow, Levels of Abstraction, VLSI Design Styles, Packaging Technology and Computer-Aided Design Technology**.** .

UNIT –II: NMOS AND CMOS CIRCUIT DESIGN PROCESS

MOS CIRCUITS: NMOS Inverter, Pass transistor, Transmission gate. Alternative forms of pull-up, The CMOS Inverter, NAND, NOR gates and compound gates.

DESIGN PROCESSES: MOS Layers, Stick Diagrams, Design Rules and Layout Diagrams for NOT, NAND and NOR gates and compound gates.

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UNIT –III: BASIC CIRCUIT CONCEPTS AND SCALING

BASIC CIRCUIT CONCEPTS: 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, and Inverter Delays.

SCALING: Scaling models and scaling factors, scaling factors for device parameters

UNIT –IV: SUBSYSTEM DESIGN

LOGIC DESIGN: Switch logic, Gate logic, other forms of CMOS logic: Pseudo-nMOS logic, DCVS logic, Dynamic CMOS logic, Clocked CMOS logic, CMOS domino logic, n-p CMOS logic

MEMORY DESIGN: 6T SRAM, 3T Dynamic RAM, 1T Dynamic RAM

UNIT-V: FPGA DESIGN

FPGA design flow, Basic FPGA architecture, FPGA Technologies-SRAM, Antifuse and EPROM/EEPROM, Introduction to FPGA Families- Altera flex 8000, Xilinx XC4000, Spartan-2, Virtex.

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 McGraw-Hill Education, 2003.
3. S.M. Sze (2003), VLSI Technology, 2nd Edition, Tata McGraw Hill, New Delhi.

Reference Books:

1. Introduction to VLSI Circuits and Systems - John P. Uyemura, John Wiley & Sons, reprint 2009.
2. CMOS VLSI Design: A Circuits and Systems Perspective, Fourth Edition, Neil H. E. Weste and David Money Harris. Addison-Wesley, Pearson Education, 1999.
3. Modern VLSI Design – Wayne Wolf, 3rd Edition, Prentice Hall, 1997.

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Course Outcomes:

After completing this course, the students will be able to

- To understand MOS technology and the fabrication process for VLSI circuits in semiconductor industry standards.
- To implement NMOS and CMOS digital electronic circuits and apply the design rules during the mask layout design.
- To apply the scaling factors in determining the efficient MOS circuits for current semiconductor technology.
- To demonstrate proficiency in designing CMOS logic circuits and memory subsystems, meeting specified performance and power requirements.
- To design and implement digital circuits on FPGAs using appropriate design tools and selects suitable FPGA families for specific applications.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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TRACK-I (HONOR)

LOW POWER VLSI DESIGN

Course Objectives:

The main objectives of this course are

- To understand various power dissipation sources in VLSI design and their impact on CMOS digital circuits.
- To learn simulation modeling tools and techniques for analyzing power consumption in DSP systems.
- To explore methods for reducing power consumption in VLSI through circuit-level optimizations and specialized design techniques.
- To examine techniques for reducing power usage in VLSI circuits at the logic level, focusing on gate organization, signal control, and encoding methods.
- To explore power reduction techniques at the architecture and system levels in the development of energy-efficient VLSI systems.

UNIT –I: Introduction to Low Power VLSI and Sources of Power Dissipation

Needs for Low Power VLSI, Charging and Discharging Capacitance, Short-circuit Current in CMOS Circuit, CMOS Leakage Current, Static Current, Principles of Low Power Design, Low Power Figure of Merits. Sources of power dissipation on Digital Integrated circuits, Emerging Low power approaches, Dynamic dissipation in CMOS

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UNIT –II: Simulation Power Analysis

SPICE Circuit Simulation, Discrete Transistor Modeling and Analysis-Tabular Transistor Model and Switch Level Analysis, Gate-level Logic Simulation, Architecture-level Analysis-Power Models Based on Activities, Power Model Based on Component Operations and Abstract Statistical Power Models, Data Correlation Analysis in DSP Systems-Data Correlation Analysis in DSP Systems-Dual Bit Type Signal Model and Data path Module Characterization and Power Analysis, Monte Carlo Simulation

UNIT –III: Circuit Level Power Reduction Techniques

Transistor and Gate Sizing-Sizing an Inverter Chain, Transistor and Gate Sizing for Dynamic Power Reduction and Transistor Sizing for Leakage Power Reduction, Equivalent Pin Ordering,Network Restructuring and Reorganization-Transistor Network Restructuring, Partitioning and Reorganization, Special Latches and Flip-

flops-Self-gating, Combinational and Double Edge Triggered Flip-flops, Low Power Digital Cell Library-Cell Sizes and Spacing and Varieties ofBoolean Functions, Adjustable Device Threshold Voltage**.**

UNIT –IV: Logic Level Power Reduction Techniques

Gate Reorganization, Signal Gating, Logic Encoding- Binary versus Gray Code and Bus Invert Encoding, State Machine Encoding- Transition Analysis, Output Don't-care Encoding and Design Trade-offs in State Machine Encoding-computation Logic- Pre-computation Condition, Alternate Pre-computation Architectures and Design Issues in Pre-computation Logic Technique

UNIT –V: Architecture and System Level Power Reduction Techniques

Power and Performance Management- Microprocessor Sleep Modes, Performance Management and Adaptive Filtering, Switching Activity Reduction-Guarded Evaluation, Bus Multiplexing and Glitch Reduction by Pipelining, Parallel Architecture with Voltage Reduction. Special Techniques- Power Reduction in Clock Networks-Clock Gating techniques, Other Clock Power Reduction Techniques.

Text Books:

1. Practical Low Power Digital VLSI Design - Gary K. Yeap, Kluwer Academic Press,2002.
2. Low-Power VLSI Circuits and Systems, Ajit Pal, Springer Publishers.
3. Low-Voltage, Low-Power VLSI Subsystems - Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

Reference Books:

1. Low-Voltage, Low-Power VLSI Subsystems - Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.
2. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International,1998.
3. Low Power CMOS VLSI Circuit Design - Kaushik Roy, Sharat C. Prasad, John Wiley &Sons, 2000.

Course Outcomes:

After completing this course, the students will be able to

- Identify the sources of power dissipation in digital IC systems & understand the impact of power on system performance and reliability.
- Model power consumption and conduct comprehensive power analysis using various simulation methods to optimize power in DSP systems.
- Apply advanced strategies in VLSI circuits to achieve significant reductions in power usage for energy-efficient designs.

- Implement effective logic-level power reduction techniques and analyze design trade-offs to achieve significant reductions in power usage of digital systems.
- Implement advanced power reduction methods at architectural level for enabling efficient design of low-power VLSI systems with optimized performance

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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TRACK-I (HONOR)

VLSI PHYSICAL DESIGN

Course Objectives:

The main objectives of this course are

- To understand the essential steps required in the physical design of Application Specific Integrated Circuits (ASIC) and synthesis techniques.
- To learn about the fundamental components of Static Timing Analysis (STA) such ad timing constraints, delay models and path analysis.
- To explore various techniques and algorithms used for floor planning and placement in physical design process.
- To understand the impact of clock tree synthesis and routing decisions on overall design performance, power consumption and timing closure.
- To impart in-depth knowledge about verification and testing in meeting the constraints of VLSI physical design.

UNIT –I: INTRODUCTION TO ASIC'S AND SYNTHESIS

ASIC design flow, Logic synthesis and optimization, Design levels, Basic steps of synthesis, Logic synthesis: Specification, Design description, Design constraints, Logic circuit, Logic synthesis steps.

.

UNIT –II: STATIC TIMING ANALYSIS (STA)

Introduction to STA, Timing paths, Setup and Hold time & violations, timing path delays, Interconnect delay models, wire load models, Maximum clock frequency.

UNIT –III : PHYSICAL DESIGN- FLOOR PLANNING & PLACEMENT

Basic steps of VLSI physical design, Standard cells, Input-output pads, Pad placement, Power planning, Macro placement, Clock planning, Basic floor planning steps, Global placement and Detail placement.

UNIT –IV: PHYSICAL DESIGN- CLOCK TREE SYNTHESIS & ROUTING

Clock tree synthesis, Power analysis, Standard cell placement and Clock tree synthesis steps, Special routing, Global routing, Detail routing, Extraction, Routing and parasitic extraction steps.

UNIT –V: VERIFICATION AND TESTING

Introduction, Functional Verification, Timing Verification, Physical Verification, ASIC Verification Steps, Functional

Test, Scan Test, Boundary Scan Test, Fault Detection, Parametric Test, Current and Very Low-level Voltage Test, Wafer Acceptance Test, Memory Test, Parallel Module Test, Test Development Steps during Design Phase.

Text Books:

1. Physical Design Essentials: An ASIC Design Implementation Perspective Khosrow Golshan Conexant Systems, Inc, springer Publication, ISBN 0-387- 36642, 2007.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGraw-Hill Education, 2003.
3. V. Taraate "Digital Logic Design Using Verilog: Coding and RTL Synthesis", Springer; 2016.

Reference Books:

1. An Introduction to VLSI Physical Design, m. Sarrafzadeh, c. K. Wong, McGraw-Hill series in computer science.
2. M.J. S. Smith, "Application Specific Integrated circuits", Pearson education, 2010.
3. Nano-CMOS circuit and physical design, ban p. Wong, Anurag Mittal, Yu Cao, Greg Starr, a john Wiley & sons, inc.

Course Outcomes:

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

- To apply synthesis techniques to efficiently transform RTL designs into gate-level netlist for ASIC implementation.
- To apply Static Timing Analysis (STA) principles and techniques effectively to analyze and optimize the timing of VLSI designs.
- To perform floor planning and placement for VLSI designs using industry-standard tools.
- To perform clock tree synthesis and routing for VLSI designs using industry-standard tools.
- To apply verification and testing techniques to check chips functionality and can implement effective low power VLSI circuits.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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TRACK-I (HONOR)

VLSI VERIFICATION AND TESTING

Course Objectives:

The main objectives of this course are

- To understand the synthesis concept, principles and process flow in VLSI design.
- To analyze the various model checking and designing verification processes in digital design.
- To acquire the knowledge of fundamental concepts of testing principles and methodologies in VLSI design.
- To explore different fault simulation models, algorithms and testability measures for VLSI design applications.
- To illustrate the framework of Built-in-self test and Boundary scan methods in digital circuits.

UNIT –I: SYNTHESIS AND TEMPORAL

Introduction, High Level Synthesis (HLS) Overview, Scheduling in High Level Synthesis (HLS), Resource Sharing and Binding in HLS; Logic Synthesis, Introduction to formal methods for design verification, Temporal Logic: Introduction and Basic Operations on Temporal Logic.

UNIT –II: MODEL CHECKING AND VERIFICATION

Syntax and Semantics of CTL, Equivalences between CTL Formulas, Introduction to Model Checking, Model Checking Algorithms, Model Checking with Fairness; Binary Decision Diagram: Introduction and Construction, Ordered Binary Decision Diagram (OBDD), Operation on OBDD, OBDD for state Transition systems.

UNIT –III: INTRODUCTION TO TESTING

Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing; Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault

UNIT –IV: FAULT SIMULATION AND TESTABILITY MEASURES

Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation and Fault Simulation, Statistical Methods for Fault Simulation; SCOAP Controllability and Observability, High Level Testability Measures.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V: DESIGN FOR TESTABILITY

SCAN DESIGN: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan. BIST**:** The Economic Case for BIST, Random Logic BIST, Memory BIST, Delay Fault BIST.

BOUNDARY SCAN STANDARD: Motivation, System Configuration with Boundary Scan, Boundary Scan Description Language

Text Books:

1. D. D. Gajski, N. D. Dutt, A.C.-H. Wu and S.Y.-L. Lin, High-Level Synthesis: Introduction to Chip and System Design, Springer, 1st edition, 1992.
2. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits -M.L. Bushnell, V. D. Agrawal, Kluwer Academic Pulishers.
3. Samiha Mourad and Yervant Zorian, “Principles of Testing Electronic Systems”, Wiley (2000).

Reference Books:

1. Digital Systems and Testable Design - M. Abramovici, M.A.Breuer and A.D Friedman, Jaico Publishing House.
2. Digital Circuits Testing and Testability - P.K. Lala, Academic Press.
3. S. Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Prentice Hall, 2nd edition, 2003.

Web Reference:

1.VLSI Design Verification and Test NPTEL Video lectures by Prof Arnab Sarkar , IIT Guwahati, Weblink: https://archive.nptel.ac.in/courses/117/103/117103125/

Course Outcomes:

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

- Understand the fundamentals of synthesis in VLSI design and apply this approach in the design flow.
- Develop advanced analytical skills in evaluating designing verification processes and apply model checking methodologies in VLSI design verification and testing.
- Apply the testing strategies in analog and digital designs and recognize the real-world significance of testing in chip design.
- Apply simulation techniques, fault algorithms, and testability metrics for fault free simulation in digital circuits.
- Implement BIST techniques and boundary scan standards for digital and mixed signal circuits and systems

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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TRACK-II (HONOR)

MICROELECTRONICS METERILAS

Course Objectives:

The main objectives of this course are

- Fundamentals of materials and its behaviour
- Understanding of device fabrication and its process
- Development of integrated circuit using new material and its characterization

UNIT –I: Introduction to Semiconductor Devices

Introduction- material conductivity - Quantum mechanics - energy bands - crystalline structures - Density of states - band structures - Fermi - Dirac function - material classification - Band structure - electrons and holes - doping - Scattering - mobility - Diffusion transport - Einstein relation - Carrier generation and recombination- continuity equation**.**

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UNIT –II: Crystal Growth, Wafer Preparation, Epitaxy and Oxidation

Review of Semiconductor theory - Electronic Grade Silicon - Czochralski Crystal Growing - Silicon Shaping Processing consideration - Vapor Phase Epitaxy - Molecular Beam Epitaxy - Silicon on Insulators – Epitaxial Evaluation – Growth Mechanism and Kinetics – Thin Oxides – Oxidation Techniques and Systems – Oxide Properties.

UNIT –III: Lithography and Relative Plasma Etching

Optical Lithography – Electron Lithography – X-Ray Lithography - Ion Lithography Plasma -Properties – Feature Size - Control and Anisotropic Etch Mechanism – Relative Plasma Etching Techniques and Equipments.

UNIT –IV: Deposition, Diffusion, Lon Implementation and Metallization:

Deposition Processes – Polysilicon – Plasma Assisted Deposition – Models of Diffusion in Solids – Fick's One Dimensional Diffusion Equation – Atomic Diffusion Mechanism – Measurement Techniques – Range Theory – Implantation Equipment. Annealing Shallow Junction – High Energy Implantation – Physical Vapor Deposition – Patterning.

UNIT –V: VLSI Process Integration, Analytical, Assembly Techniques And Packaging Of VLSI Devices

NMOS IC Technology – CMOS IC Technology – MOS Memory IC Technology – Bipolar IC Technology – IC Fabrication. Analytical Beams – Beams Specimen interaction – Chemical Methods – Package Types baking Design Considerations – VLSI Assembly Technology – Package Fabrication Technology.

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Text Books:

1. D. S. Grewal , "Nanotechnology", Orient Longman's, 2008
2. S.M.Sze, "VLSI Technology ", McGraw-Hill, 2nd edition, 1988.

Reference Books:

1. Duoglas A Pucknell and KamaranEshragian," Basic VLSI design", 3rd edition, PHI, 1994
2. Wayne wolf, " Modern VLSI design", 2nd edition, Prentice Hall Ptr, 1998

Course Outcomes:

After undergoing the course students will be able to

- Describe the structure of basic integrated circuits and the processes used to fabricate them.
- Apply fundamental principles to microelectronics fabrication.
- Relate technological limitations of integrated circuits to fundamental principles or engineering limitations.
- Be aware of possible future trends in the processing and structure of integrated circuits.
- Identify state-of-the-art developments in the relevant area and to form innovative opinions on specific issues.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
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TRACK-II (HONOR)

SI PROCESSING TEHNOLOGY

Course Objectives:

The main objectives of this course are

- To give the steps involved in the fabrication of integrated circuits and devices.
- Learn **various** Statistical methods & Process modeling

UNIT –I: Introduction to Semiconductor Manufacturing

Historical Evolution: Manufacturing and Quality Control, Semiconductor Processes, Integrated Circuit Manufacturing

Modern Semiconductor Manufacturing: Unit Processes, Process Sequences, Information Flow, Process Organization

Goals of Manufacturing: Cost, Quality, Variability, Yield, Reliability

Manufacturing Systems: Continuous Flow, Batch Processes, Single Work piece, Discrete Parts

UNIT –II: Overview of Technology & Process Monitoring

Unit Processes: Oxidation, Photolithography, Etching, Doping, Deposition, Planarization

Process Integration: Bipolar Technology, CMOS Technology, BiCMOS Technology, Packaging

Process Monitoring: Process Flow and Key Measurement Points Wafer State Measurements: Blanket Thin Film, Patterned Thin Film, Particle/Defect Inspection, Electrical Testing,Equipment State Measurements: Thermal Operations, Plasma Operations, Lithography Operations, Implantation, Planarization

UNIT –III: Statistical Fundamentals & Yield Modeling

Probability Distributions: Discrete Distributions, Continuous Distributions, Poisson Approximation to the Binomial, Normal Approximation to the Binomial, Normal Distribution, Estimation, Hypothesis Testing

Yield Modelling: Yield Components, Functional Yield Models, Functional Yield Model Components, Parametric Yield, . Yield Simulation, Design Centering

UNIT –IV: Statistical Experimental Design & Process Modelling

Comparing Distributions, Analysis of Variance: Sums of Squares, ANOVA Table, Randomized Block Experiments, Two-Way Designs Factorial Designs: Two-Level Factorials, Fractional Factorials, Analyzing Factorials, Advanced Designs, Taguchi Method.Regression Modelling : Single-Parameter Model, Two-Parameter Model, Multivariate Models, Nonlinear Regression, Regression Chart, Response Surface Methods, Plasma Etching Example, Evolutionary Operation,

Principal-Component Analysis, Intelligent Modelling Techniques, Process Optimization

UNIT –V: Advanced Process Control and Equipment Diagnosis

Algorithmic Methods: Hippocrates, MERLIN, Expert Systems: PIES, PEDX, And Neural Network Approaches: Process Control Neural Network, Pattern Recognition in CVD Diagnosis, Hybrid Methods: Time-Series Diagnosis, Hybrid Expert System

Text Books:

1. "Fundamentals of Semiconductor Manufacturing and Process Control" by G. May and C. Spanos,"

Reference Books:

1. Fundamentals of Semiconductor Fabrication by G. May and Simon M.Sze

Course Outcomes:

After completing this course, the students will be able to

- Demonstrate an understanding of fundamental knowledge of engineering analysis (includes process control in semiconductor manufacturing and semiconductor device reliability)
- Demonstrate an understanding of unit Processes
- Demonstrate an understanding of statistical Fundamentals & Yield Modeling
- Demonstrate an understanding of Process Modelling and Statistical Experimental Design
- Understand the advanced Process control methods and experiment systems

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
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TRACK-II (HONOR)

MODELLING OF SI TRASISTORS

Course Objectives:

The main objectives of this course are

- To introduce the operating principles BJT
- To introduce the operating principles FETS
- To introduce various drift ,diffusion , transport models

UNIT –I:

BIPOLAR JUNCTION TRSISTOR : BJT- I-V relation and gain, Ebers-Moll model, Non-idealities in BJT, Gummel Poon Model, HBT, BJT Transient and small signal behavior, Metal-Semiconductor contact (Schottky Barrier/Diode, Ohmic Contacts) and capacitance characteristics, Thermionic emission current flow and fermi-level pinning

UNIT –II:

FILED EFFECT TRASISTORS: JFET, MESFET, HEMT , MOS Band diagram and C-V characteristics, Threshold voltage and Interface charges, MOSFET I-V, gradual channel approximation and frequency response, non-idealities and CMOS

SEMICLASSICAL TRANSPORT THEORY -: Distribution Function, Boltzmann Transport Equation (BTE), relaxation-Time Approximation (RTA), Scattering and Mobility.

UNIT –III:

DRIFT-DIFFUSION (DD) MODEL-1 : Drift-Diffusion Model Derivation and dielectric relaxation time, Taylor series expansion and Finite Difference method, Normalization, Scaling and Linearization of Poisson's Equation and Scharfetter–Gummel Discretization of the Continuity Equation

UNIT –IV :

DRIFT-DIFFUSION (DD) MODEL-2 : Generation and Recombination models, Derivation of SRH model, Boundary conditions, Gummel's Iteration Method and Newton's Method, Drift-Diffusion Application example

HYDRODYNAMIC MODELING : As extension of DD model, Carrier Balance, Energy balance and momentum balance Equations, Direct solution scheme through Monte Carlo simulations

UNIT-V

QUANTUM TRANSPORT MODELS: Tunneling, Schrodinger equation and free particle, potential step, potential barrier, Transfer Matrix Approach, Quantum Mechanical corrections to standard approach. Examples through

commercial device simulation tools, Models for DD, Hydrodynamic simulations, Mobility and G-R models, Selected Examples

Text Books:

1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014
2. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley&Sons, 2006.

Reference Books:

1. D Vasileska, SM. Goodnick, G Klimeck, "Computational Electronics: Semiclassical and Quantum Device Modeling and Simulation," CRC Press 2010.
2. Selberherr Siegfried, "Analysis and Simulation of Semiconductor Devices", 1984

Course Outcomes:

After completing this course, the students will be able to

- Understand the representation of various models in BJTS
- Understand Transport theory and modeling of FETS
- Understand various drift –diffusion models
- Understand hydrodynamic modeling
- Understand quantum modeling

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
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TRACK-II(HONOR)

MICROELECTRONICS THIN FIIMS

Course Objectives:

The main objectives of this course are

- Understand about the various physical and chemical deposition methods
- Understand the Physical methods s: Thermal evaporation, Cathodic sputtering, Molecular beam epitaxy and Laser ablation methods.
- Understand the Chemical methods: Electrolytic deposition, Chemical vapor deposition.

UNIT –I: Introduction

Thin films an overview – Film growth stages – Nucleation – Island structure – Coalescence – Channel and continuous film – crystal structure – crystal lattice and unit cell – Crystal planes and Miller indices – Crystal system and symmetry – Interplanar spacing**.**

.

UNIT –II: Thin Film Deposition Techniques

Thin Films – Introduction to Vacuum Technology – Deposition Techniques – Physical Methods – Resistive Heating, Electron Beam Gun, Laser Gun Evaporation and Flash Evaporations, Sputtering – Reactive Sputtering, Radio-Frequency Sputtering – Chemical Methods – Spray Pyrolysis – Preparation of Transparent Conducting Oxides – Applications.

UNIT –III: Fabrication

Physical vapour deposition – Thermal evaporation – Electron beam evaporationMolecular beam epitaxy – Sputtering techniques – Pulsed laser deposition – Chemical vapour deposition: – Spray pyrolysis – Chemical bath deposition – Electro chemical deposition – Sol – gel technique – Spin coating – SILAR method

UNIT –IV: Characterization Techniques

X – Ray Diffraction (XRD) – Powder and single crystal – Fourier transform Infrared analysis (FT-IR) – Elemental analysis – Elemental dispersive X-ray analysis (EDAX) – Scanning Electron Microscopy (SEM) – UV-Vis-NIR Spectrometer – Vickers Micro hardness.

UNIT –V: Applications

Discrete resistive components – Thermistor, Strain gauge element – Capacitor – Hall probe element – Active devices – Micro electronics, Integrated circuits and other applications – Interference filters – Anti – reflection coatings – Thin film

gas sensors – Solar cell applications.

Text Books:

1. A. Goswami, Thin film Fundamental, New Age International (P) Ltd, New Delhi (2006)
2. M.Ohring, Materials Science of Thin Films (Academic press, Boston, 2002) 2 nd edition

Reference Books:

1. Fundamentals of surface and thin film analysis – Leonard C. Feldman and James W. Mayer.

Course Outcomes:

After completing this course, the students will be able to

- Understand the principle of different thin film growing stages and crystal structures
- Learn various Thin Film Deposition Techniques
- Learn various fabrication Techniques
- Learn various characterization Techniques
- Learn various applications of Microelectronics thin films

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	1	0	4

TRACK-III (HONOR)

ADVANCED DIGITAL SIGNAL PROCESSING

Course Objectives:

The main objectives of this course are

- To learn and understand the concepts of stationary and non-stationary random signals and analysis & characterization of discrete-time random processes
- To enunciate the significance of estimation of power spectral density of random processes
- To introduce the principles of optimum filters such as Wiener and Kalman filters
- To introduce the principles of adaptive filters and their applications to communication engineering
- To introduce the concepts of multi-resolution analysis

UNIT –I: DISCRETE-TIME RANDOM PROCESSES

Random variables - ensemble averages a review, random processes - ensemble averages, autocorrelation and autocovariance matrices, ergodic random process, white noise, filtering random processes, spectral factorization, special types of random processes - AR, MA, ARMA

UNIT –II: SPECTRUM ESTIMATION

Bias and consistency, Non-parametric methods - Periodogram, modified-Periodogram - performance analysis. Bartlett's method, Welch's method, Blackman-Tukey method. Performance comparison. Parametric methods - autoregressive (AR) spectrum estimation - autocorrelation method, Prony's method, solution using Levinson Durbin recursion.

UNIT –III: OPTIMUM FILTERS

Wiener filters - FIR Wiener filter - discrete Wiener Hopf equation, Applications - filtering, linear prediction. IIR Wiener filter - causal and non-causal filters. Recursive estimators - discrete Kalman filter.

UNIT –IV: ADAPTIVE FILTERS

Principles and properties of adaptive filters - FIR adaptive filters. Adaptive algorithms - steepest descent algorithm, the LMS algorithm - convergence. Applications of adaptive filtering - noise cancellation, channel equalization.

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UNIT –V: MULTIRESOLUTION ANALYSIS

Short-time Fourier transform - Heisenberg uncertainty principle. Principles of multi-resolution analysis - sub-band coding, the continuous and discrete wavelet transform - properties. Applications of wavelet transform - noise reduction, image compression

Textbooks:

1.Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York,Indian reprint2008. (UNITI-IV)

2. P. P. Vaidyanathan, "Multirate systems and filter banks", Prentice Hall Inc. 1993 (UNIT V)

.

References:

3. John G. Proakis & Dimitris G.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications‖, Fourth Edition, Pearson Education / Prentice Hall, 2007.

4. Sophoncles J. Orfanidis, "Optimum signal processing", McGraw Hill, 2000

Course Outcomes:

After completing this course, the students will be able to

- Analyze the characteristics of discrete random process
- Understand power spectrum estimation techniques in non-parametric and parametric approach
- Analyze wiener filter and their applications
- Understand adaptive algorithms and their applications
- Analyze the signal using multiresolution analysis with STFT and DWT

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
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TRACK-III (HONOR)

ADAPTIVE SIGNAL PROCESSING

Course Objectives:

The main objectives of this course are

- Adaptive signal processing concerns with processing of signals where the processing parameters are adjusted continuously to suit time varying signal environmental conditions. The study of adaptive signal processing involves development of various adaptation algorithms and assessing them in terms of convergence rate, computational complexity, robustness against noisy data, hardware complexity, numerical stability etc. This course demonstrates the design of important class of adaptive filters, LMS, RLS and Kalman filters.

UNIT –I:

INTRODUCTION: The filtering problem, Adaptive filters, linear filter structures, approaches to the development of linear adaptive filter algorithms, real and complex forms of adaptive filters, non linear adaptive filters, Applications.

STATIONARY PROCESSES AND MODELS: Partial characterization of a discrete time stochastic process, mean ergodic theorem, correlation matrix, correlation matrix of sine wave plus noise, stochastic models, wold decomposition, asymptotic stationarity of an auto regressive process. Yule-Walker equations. Selecting the model order. Complex Gaussian process.

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UNIT –II:

WIENER FILTERS: Linear optimum filtering problem statement, principle of orthogonality, minimum mean squared error, wiener hopf equations, error performance surface. Channel equalization. Linearly constrained minimum variance filter , generalized side lobe cancellers.

UNIT –III:

LINEAR PREDICTION: Forward Linear Prediction, backward Linear Prediction, Levinson-Durbin algorithm, properties of prediction error filters, Schur-Cohntest, auto regressive modeling of a stationary stochastic process, Cholesky factorization, lattice predictors, joint process estimation, block estimation.

Method of steepest descent: Steepest descent algorithm, stability of the Steepest descent algorithm

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UNIT –IV:

LEAST MEAN SQUARE (LMS) ALGORITHM: Over view of the structure and operation of the Least Mean square Algorithm, Least Mean square adaptation Algorithm, stability and performance analysis of the LMS algorithm.

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Normalized Least Mean Square (NLMS) Algorithm, Concept of method of least squares

RECURSIVE LEAST SQUARES (RLS) ALGORITHM: The matrix inversion lemma, the exponentially weighted RLS algorithm, update recursion for the sum of weighted error squares. Convergence analysis of the RLS algorithm.

UNIT –V:

KALMAN FILTERS: Recursive minimum mean square estimation for scalar random variables, statement of the Kalman filtering problem, the innovations process, estimation of the state using the innovations process, filtering, initial conditions, variants of the Kalman filter, extended Kalman filtering

Text Books:

1.Adaptive Filter Theory, S. Haykin, Prentice-Hall, 4-th edition, 2001.

2. Fundamentals of Adaptive Filtering, Ali H. Sayed, John Wiley, 2003

Reference Books:

1. Monson H. Hayes , Statistical Digital Signal Processing And Modeling, Wiley India, 2008.

2. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, Pearson Education / PHI, 2007.

3. B. Farhang-Boroujen, Adaptive Filters: Theory and Applications, John Wiley and Sons, 2013.

Course Outcomes:

After completing this course, the students will be able to

- Explain the importance of signal processing in non-stationary environment.
- Explain the role and importance of adaptive signal processing in communications signal processing
- List and apply the various mathematical models to adaptive signal processing.
- Understand the problem of finding the minimum error criteria.
- Use computer based simulation tools to understand the theoretical concepts of adaptive signal processing in various communication applications

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TRACK-III (HONOR)

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SPEECH SIGNAL PROCESSING

Course Objectives:

The main objectives of this course are

- For humans, speech is a natural way of communicating the ideas. This course is a fundamental course on how to process digital speech signal to extract useful information. The course builds upon the theory of digital signal processing and extends the concepts applied to speech signal in particular. The course also discusses the applications of speech signal processing

UNIT –I: Mechanics of speech:

Speech production: Mechanism of speech production, Acoustic phonetics, The Acoustic Theory of Speech Production: Uniform lossless tube, Effects of losses in the vocal tract, Digital models for speech signals: Vocal tract, Radiation, Excitation, Auditory perception: psycho acoustics. Representations of speech waveform: Sampling of speech signals, Quantization.

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UNIT –II: Time and frequency domain methods for speech processing:

Time domain parameters of Speech signal: Short-Time Energy, Average Magnitude, and Average Zero crossing Rate, Silence Discrimination using ZCR and energy, Short Time Auto Correlation Function, Pitch period estimation using Auto Correlation Function. Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Sampling ratesin time and frequency, Pitch detection, Analysis by Synthesis, Analysis synthesis systems: Phase vocoder, Channel Vocoder, Median Smoothing, Spectrographic displays

UNIT –III: Linear predictive analysis of speech:

Basic Principles oflinear predictive analysis: Auto correlation method, Covariance method, Solution of LPC equations: Cholesky method, Durbin's Recursive algorithm, Application of LPC parameters: Pitch detection using LPC parameters, Formant analysis using LPC parameters, VELP. Relations between the Various Speech Parameters, CELP.

UNIT –IV: Application of speech processing:

Voice response systems: General considerations in the design of voice response systems, A multiple output digital voice response system, Speaker recognition systems: Speaker verification system, Speaker identification system.

UNIT –V: Speech recognition systems:

Isolated digit recognition system, Continuous digit recognition system. Typical applications of computer voice response systems: Wiring communication equipment, Information retrieval systems

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Text Books:

1.. L.R.Rabiner and, R.W.Schaffer, Digital Processing of Speech signals, Prentice Hall, 2004

2. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc., Singapore, 2004

Reference Books:

1. Quatieri, Discrete-time Speech Signal Processing, PrenticeHall,2001

2. L.R. Rabiner and B. H. Juang, Fundamentals of speech recognition, Prentice Hall, 1999.

Course Outcomes:

After completing this course, the students will be able to

- Summarize the mechanism of human speech production and articulation
- Differentiate time and frequency domain methods of speech processing
- Attribute linear predictive analysis for speech signals
- Explain the solutions for LPC equations
- Implement the different algorithms and models involved for speaker and speech recognition systems

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TRACK-III (HONOR)

L	T	P	C
3	1	0	4

BIOMEDICAL IMAGE PROCESSING

Course Objectives:

The main objectives of this course are

- Describe the presentations and properties of digital images and image enhancement methods
- understand advanced image analysis methods including segmentation, registration and morphological analysis
- understand advanced image representation and recognition

UNIT –I: PATIAL DOMAIN PROCESSING

Introduction, Steps in Digital Image Processing -Components –Elements of Visual Perception - Image Sensing and Acquisition - Image Sampling and Quantization -Relationships between pixels - color models- DICOM, Various modalities of Medical Imaging-CT, MRI, PET, Thermography, Angiography, CAD System, Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering**.**

Simulation using MATLAB- Image sampling and quantization, Study of DICOM standards. Histogram Processing and Basic Thresholding functions, Image Enhancement-Spatial filtering**,**

.

UNIT –II: FREQUENCY DOMAIN PROCESSING

Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Notch filter, Wavelets - Sub band coding-Multi resolution expansions Wavelets based image processing. Image Enhancement- Frequency domain filtering. Feature extraction using Wavelet

UNIT –III: MEDICAL IMAGE RESTORATION AND SEGMENTATION

Image Restoration - Inverse Filtering – Wiener filtering. Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Region Growing, Region Splitting, Morphological processing- erosion and dilation, K Means and Fuzzy Clustering. Image segmentation – Edge detection, line detection and point detection. Region based Segmentation. Basic Morphological operations

UNIT –IV: MEDICAL IMAGE COMPRESSION

Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards -JPEG, JPEG2000. Image compression techniques

.UNIT –V: MEDICAL IMAGE REPRESENTATION AND RECOGNITION

Boundary representation - Chain Code- Polygonal approximation, signature, boundary segments -Boundary description –

Shape number -Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching, Content Based Image Retrieval. Analysis of Tissue Structure. Mini project based on medical image processing

Text Books:

1. G.R. Sinha, Bhagwaticharan patel, Medical Image Processing: Concepts and Applications, PHI Learning private limited.2014
2. KayvanNajarian and Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2005.
3. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. William K Pratt, “Digital Image Processing”, John Willey, 2002.
4. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.
5. Geoff Dougherty, Medical Image Processing: Techniques and Applications, Springer Science & Business Media, 25-Jul-2011
6. Isaac N. Bankman, Handbook of Medical Image Processing and Analysis, Science Direct,2nd Edition 2009

Course Outcomes:

After completing this course, the students will be able to

- Discuss digital image fundamentals.
- Examine image enhancement techniques in medical images
- Execute restoration and segmentation techniques in medical images.
- Demonstrate the image wavelet and compression Techniques in medical images.
- Describe the representations of features and recognize the

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TRACK-IV (HONOR)

L	T	P	C
3	1	0	4

ANALYTICAL AND COMPUTATIONAL TECHNIQUES IN ELECTROMAGNETICS

Course Objectives:

The main objectives of this course are

- To use advanced computational techniques to solve partial differential equations and integral equations encountered in electromagnetic boundary value problems.
- To discuss analytical methods and solving of field equations
- To learn finite difference and finite element method
- To learn applications of computational electromagnetics.

UNIT –I: Introduction :

Conventional design methodology, Computer aided design aspects – Advantages. Review of basic fundamentals of Electrostatics and Electro magnetics. Development of Helmhotz equation, energy transformer vectors- Poynting and Slepian, magnetic Diffusion-transients and time harmonic

.

UNIT –II: Analytical Methods:

Analytical methods of solving field equations, method of separation of variables, Roth's method, integral methods-Green's function, method of images.

UNIT –III: Finite Difference Method (FDM)

Finite Difference schemes, treatment of irregular boundaries, accuracy and stability of FD solutions, Finite-Difference Time-Domain (FDTD) method- Uniqueness and convergence

UNIT –IV: Finite Element Method (FEM):

Overview of FEM, Variational and Galerkin Methods, shape functions, lower and higher order elements, vector lements, 2D and 3D finite elements, efficient finite element computations.

UNIT –V: Special Topics

{Background of experimental methods-electrolytic tank, R-C network solution, Field plotting (graphical method)}, hybrid methods, coupled circuit field computations, electromagnetic - thermal and electromagnetic - structural coupled computations, solution of equations, method of moments, Poisson's fields.

Applications: Low frequency electrical devices, static / time-harmonic / transient problems in transformers, rotating machines, actuators. CAD packages.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text Books:

1. Booton R C, Computational Methods for Electromagnetics and Microwaves, (1992).
2. Garg R, Analytical and Computational Methods in Electromagnetics, Artech House (2008)

Reference Books:

1. Itoh T, Numerical Techniques for Microwave and Millimetre-wave Passive Structures, Wiley-Interscience (1989).
2. Peterson A F, Ray S L and Mittra R, Computational Methods for Electromagnetics, Wiley-IEEE Press (1998).
3. Sadiku M N O, Numerical Techniques in Electromagnetics, 2nd Edition, CRC Press (2001).
4. Taflov A and Hagness S C, Computational Electrodynamics, 3rd Edition, Artech House (2005).

Course Outcomes

After completing this course, the students will be able to

- Understand the basic concepts of electromagnetics.
- Understand analytical methods for computing fields
- Understand FDM methods for accuracy and stability
- Understand FEM methods for computations
- Apply analytical and computational techniques to simple real-life problems

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	1	0	4

TRACK-IV (HONOR)

MILLIMETER WAVE TECHNOLOGY

Course Objectives:

The main objectives of this course are

- To develop a brief theoretical foundation of Mm Wave technology, its potential use in Wireless Communications and its standards.
- To learn various channel effects in Mm Wave scenario and exposing the students to baseband techniques, antenna requirements, and Physical layer design and algorithms.
- To get exposed to the goals and challenges of new emerging applications of Mm Wave in Wireless Communications
- To apply the acquired knowledge in the field of Mm Wave Wireless Communication in the future communication technologies.
- To review the literature related to Mm wave for Wireless Communication and to report it ethically

UNIT –I: Introduction:

A Preview of MmWave Implementation Challenges, Emerging Applications of MmWave Communications, MmWave Standardization.

.

UNIT –II: Radio Wave Propagation for MmWave:

Large-Scale Propagation Channel Effects, SmallScale Channel Effects, Spatial Characterization of Multipath and Beam Combining, Angle Spread and Multipath Angle of Arrival, Antenna Polarization, Outdoor and Indoor Channel Models**.**

UNIT –III:Antennas and Array for MmWave Applications:

Fundamentals of On-Chip and In-Package MmWave Antennas, Fundamentals of On-Chip and In-Package MmWave Antennas, InPackage Antennas, Antenna Topologies for MmWave Communications, Techniques to Improve Gain of On-Chip Antennas, Adaptive Antenna Arrays — Implementations for MmWave Communications, Characterization of On-Chip Antenna Performance.

UNIT –IV: Multi-Gbps Digital Baseband Circuits:

Review of Sampling and Conversion for ADCs and DACs, Device Mismatches: An Inhibitor to ADCs and DACs, Goals and Challenges in ADC Design, Encoders, Trends and Architectures for MmWave Wireless ADCs, Digital to Analog Converters.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V: MmWave Physical Layer Design and Algorithms:

Practical Transceivers, High-Throughput PHYs, PHYs for Low Complexity, High Efficiency, Future PHY Considerations, Challenges when Networking mmWave Devices

Text Books:

1. Theodore S. Rappaport, Robert W. Heath Jr., Robert C. Daniels, James N. Murdock, Millimeter Wave Wireless Communications, Prentice Hall, 2014.
2. K.C. Huang & Z. Wang, Millimeter Wave Communication Systems, John Wiley & Sons.

Reference Books:

1. Prakash Bhartia, and Inder Bahl, MmWave Engineering and Applications, WileyInterscience

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.): NPTEL Course Link

https:// nptel.ac.in/courses/117/105/117105139/

Course Outcomes

After completing this course, the students will be able to

- Be able to explain the fundamental concepts of Mm Wave Wireless Communication.
- Be able to analyze various channel effects in Mm Wave communication scenario and understand various design considerations
- To get exposed to the goals and challenges of new emerging applications of Mm Wave in Wireless Communications
- Be able to analyze challenges and various emerging applications of Mm Waves in Wireless Communications research field.
- Be able to review the literature related to Mm wave for Wireless Communication and to report it ethically.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	1	0	4

TRACK-IV (HONOR)

ADVANCED OPTICAL SYSTEMS

Course Objectives:

The main objectives of this course is

- To understand the different kind of losses, signal distortion, SM fibres..

UNIT –I: Overview of Optical fiber Communications

Introduction to fiber optics, Physics of light. Principles of fiber optics: Introduction, light propagation, Skew rays. TIR condition, FTIR, Gooshanchen shift. Effective index method to determine propagation constant, Fibers Modes, V Number analysis for optical fiber, Significance of V-b diagram, Mode Coupling, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off wavelength, line width, propagation velocities. Non-linear effects in optical fiber

UNIT –II: Signal Degradation in Optical fibers

Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity, Group delay, Types of Dispersion - Material dispersion, Wave7 guide dispersion, Intermodal dispersion, Fiber Birefringence, Polarization Mode Dispersion. Introduction to Dispersion compensation techniques, Advanced chromatic dispersion compensation, Advanced PMD compensation (both optical and electrical).

UNIT –III:

Optical Sources: Light emitting diode (LEDs)- structures designing and performance analysis, Quantum efficiency, Power, Modulation, Laser Diodes -Modes & threshold conditions, resonant frequencies, structures, characteristics single mode lasers, Modulation of laser diodes, external quantum efficiency, laser diode rate equations. Source to fiber power launching: - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Various fiber to light coupling techniques, Laser diode to fiber coupling, LED coupling to single mode fiber

Optical detectors- principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Optical receiver: Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers

UNIT –IV: Optical system design

Optical Amplification, Doped fiber amplifier, semiconductor optical amplifier, Analog and digital systems. Coherent optical fiber communication systems. Modulation and line coding. Bandwidth and rise time budgets, Power budget, and dynamic range. Power penalty, Channel capacity measurement

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V: Advanced Optical Systems and Networks

Wavelength Division Multiplexing. Long haul and metro WDM system, WDM system analysis, design and performance evaluation, Introduction to Photonic crystal technology, Photonic crystal fibers, Introduction to Optical Networks, Local area network, Metropolitan-Area N/W,SONET/SDH, Introduction to Free Space optical Communication

Text Books:

1. Gerd Keiser, Optical Fiber Communications, 3rd Edition, McGraw-Hill International edition, 2000.
2. John M. Senior, Optical Fiber Communications, 2nd Edition, PHI, 2002.

Reference Books:

1. D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Fiber Optic Communications, Pearson Education, 2005.
2. Govind P. Agarwal, Fiber Optic Communication Systems, 3rd Edition, John Wiley, 2004.
3. Joseph C. Palais, Fiber Optic Communications, 4th Edition, Pearson Education, 2004
4. Journal articles i.e. IEEE, Springer, IOPscience, Elsevier and Video lectures from nanohub, NPTEL, MIT video lectures

Course Outcomes

After completing this course, the students will be able to

- Develop an understanding of optical fiber, its structure, types, propagation, transmission and non-linear properties.
- Identify and examine the different kinds of losses and signal distortion along with their compensation techniques in optical Fibers
- Classify the Optical sources and detectors and their principle of operation and analyze different coupling techniques.
- Learn about optical amplification
- Design short haul and long haul Analog/ Digital optical communication system with an insight into advanced optical systems

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TRACK-IV (HONOR)

L	T	P	C
3	1	0	4

MICROWAVE NETWORKS

Course Objectives:

The main objectives of this course is

- To understand and gain complete knowledge about microwave components.
- To provide knowledge on microwave components and its S parameters.
- To provide the basic concepts of microwave filters and MICS.
- To understand the concept of faraday rotation and its application on various components.
- To impart the knowledge of designing various types of filters.

UNIT –I:

Microwave Circuits: One port junction, Terminal voltages and currents in multi port junctions, Poynting's energy theorem, Normalized waves and scattering matrix, Properties of [S] matrix, Wave amplitude transmission matrix [A], Impedance matching techniques: Quarter-wave and Tapered line Impedance transformers.

UNIT –II:

Microwave Waveguide Components: Microwave junctions, Bends, Scattering matrix E and H plane tee junctions, Magic-T, Applications of Magic-T, Microwave propagation in ferrites, Principles of Faraday rotation, Gyrator, Isolator and Circulator.

UNIT –III:

Waveguide Components, Mode transducers, Waveguide discontinuities, Terminations, Attenuators and Phase shifters, Rotary joints, Mechanical and gas type switches

UNIT –IV:

Microwave Passive Components: Wave meters, Attenuators, Directional coupler, Scattering matrix of directional coupler, Coaxial and Strip line components: Terminations, Connectors and Transitions, Attenuators and phase shifters, MICS

UNIT –V: Microwave Resonators and Filters: Review of resonant circuits, Principles of microwave resonators, Field analysis of cavity resonators, Narrow band microwave filters, Wideband microwave filters, Some applications, Introduction to YIG filter.

Text Books:

1. R.E. Collins ,"Foundations of Microwave Engg", –, TMH,2001
2. P.A. Rizzi ,"Microwave Engineering", Pearson Education, 2007 16
3. Joseph Helszajn ,"Microwave Engineering - Non-reciprocal active and passive circuits", McGraw Hill, 1992.

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Reference Books:

1. M. Kulkarni ,"Microwave & Radar Engineering ", Umesh Publications, 2003.
2. Gintton,EL," Microwave Measurements", Mc Graw Hill,1979
3. Sucher&Fox, "Microwave Measurements", Vol.1, II, III,Inter science Publishers,Newyork,1963
4. Annapurna Das and Sisir K. Das ,"Microwave Engineering ",TMH, 2000

Course Outcomes

After completing this course, the students will be able to

- Understand the basics of Microwave Circuits and devices
- Analyze microwave circuits using scattering parameters
- Calculate the power distribution in microwave waveguide components
- Describe the operation of attenuator and phase shifter
- Distinguish Narrow band and wide band filters and Design various filters

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	1	0	4

MINOR

ELECTRONIC CIRCUITS

Course Objectives:

The main objectives of this course are

- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To understand the concept of linear wave shaping circuits such as RC low pass and high pass with sinusoidal, step, pulse, square, ramp and exponential inputs.
- Physical structure and characteristics of BJT and FET in various configurations is introduced and low frequency models for BJT and FET are discussed
- The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived.
- Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.

UNIT –I:

Junction Diode Characteristics : Open circuited p-n junction, law of junction, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Diodes: Zener Diode, Breakdown mechanisms, LED, Photo diode, Tunnel Diode

UNIT –II:

WAVESHAPING: High pass, Low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; Diode Clippers and Diode Clampers

UNIT –III:

Transistor Characteristics: BJT: Introduction to transistor, Operating modes of transistor, transistor current components, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations. BJT low frequency model, approximate model, low frequency BJT amplifiers

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types**,** construction, operation, characteristics, comparison between JFET and MOSFET. FET low frequency model, low frequency FET amplifiers

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –IV:

Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, characteristics of negative feedback amplifiers, generalized analysis of feedback amplifiers, performance comparison of feedback amplifiers.

UNIT-V:

Oscillators: oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and wein bridge oscillators with BJT and FET and their analysis, generalized analysis of LC oscillators, Hartley and colpitts oscillators with BJT and FET and their analysis , crystal oscillators

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

Reference Books:

1. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition
2. Electronic Devices and Circuits – A.P.Godse, U.A.Bakshi, Technical publications.
3. Electronic Circuit Analysis – A.P.Godse, U.A.Bakshi, Technical publications.

Course Outcomes

After completing this course, the students will be able to

- Illustrating the formation of a p-n junction and how it can be used as a diode in different modes of operation.
- Design linear wave shaping circuits such as RC, RL and RLC and apply the fundamental concepts of wave shaping, clipping and clamping for various switching and signal generating circuits
- Estimating the behaviour of BJT and FET in various regions of operation based on the analysis of their V-I characteristic plots. Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.
- Comprehend the concept of negative feedback and analyze various feedback topologies
- Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	1	0	4

MINOR

IC DESIGN

Course Objectives:

The main objectives of this course are

- Understand Op-Amp internal structure, characteristics and applications.
- Understand internal structure of IC 555 Timer, PLL.
- Learn the use of Op-Amp in A to D & D to A Converters.
- Learn TTL 74XX and CMOS 40XX series Digital ICs for various types of combinational circuits.
- Learn TTL 74XX and CMOS 40XX series Digital ICs for various types of sequential circuits.

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 Op-Amp: 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.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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

After completing this course, the students will be able to

- Describe the Op-Amp, Op-Amp characteristics and analyse the applications: Linear and Non-linear
- Describe the internal Circuitry of 555 Timer and its operations, PLL.
- Use the Op-Amp in A to D & D to A Converters
- Design different types of combinational logic circuits with digital ICs
- Design different types of sequential logic circuits with digital ICs

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	1	0	4

MINOR

VLSI TECHNOLOGY

Course Objectives:

The main objectives of this course are

- To learn the MOS Process Technology and understand the operation of MOS devices
- To obtain the basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits
- To learn basic MOS circuit stick diagrams and Layout
- To impart the concepts and techniques of modern integrated circuit design and testing in CMOS VLSI.
- To learn the concepts of designing VLSI Subsystems.

UNIT –I: Introduction to MOS Technology

Introduction to IC technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, Fabrication process: nMOS, pMOS and CMOS, BiCMOS technology, Comparison between CMOS and BiCMOS technology,

UNIT –II: Basic Electrical Properties of MOS Circuits

Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Transconductance, Output Conductance and Figure of Merit. The pass transistor, 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, MOS transistor circuit model, Latch-up in CMOS circuits, Bi-CMOS Inverter.

UNIT –III: MOS and BiCMOS Circuit Design Process

MOS Layers, Stick Diagrams, nMOS Design Style, pMOS Design Style, Design Rules and Layout,Lemdabased Design rules, Contact Cuts, Layout Diagrams for MOS circuits.

UNIT –IV: Basic Circuit Concepts and Scaling of MOS circuits

Sheet Resistance Rs, Area Capacitance of Layers, Standard Unit of capacitance Cg, Area capacitance calculations, Driving Large Capacitive Loads, Propagation Delays, Wiring Capacitance, Scaling of Mos Circuits, Scaling models and Scaling Parameters

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V: Subsystem design

Subsystem design principles. Combinational shifters. Adders. ALUs. Multipliers. High density memory. Field programmable gate arrays. Programmable logic arrays. Floor planning methods. Off chip connections.

Text Books:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell andSholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition
2. "Modern VLSI design systems on silicon," Wayne Wolf, Pearson Educational Asia,1998,2nd Edition, ISBN: 81-7808-128-8.
3. "Introduction to VLSI Circuits and systems", John P.Uyemura, John wiely and sons, 2002, ISBN: 9971-51-417-6.

Reference Books:

1. "Application specific integrated circuits", Michael John Sebastian Smith Pearson Educational Asia, 1997, Low priced Indian edition, ISBN: 81-7808-007-9.

Course Outcomes:

After completing this course, the students will be able to

- Identify the various IC fabrication methods.
- Use mathematical methods and circuit models in the analysis of CMOS digital electronic circuits.
- Express the Layout of simple MOS circuit using Lambda based design rules.
- Apply the scaling factors in determining the efficient MOS circuits for current semiconductor technology.
- Design the concepts of VLSI Subsystems.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	1	0	4

MINOR

EMBEDDED SYSTEMS

Course Objectives:

The main objectives of this course are

- The basic concepts of an embedded system are introduced
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated

  Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed. And Fundamental issues in hardware software co-design were presented and explained.

- Embedded system implementation and testing tools are introduced and discussed

UNIT –I: INTRODUCTION

Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface

UNIT –II: CHARACTERISTICS&EMBEDDED HARDWARE DESIGN

Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system. Analog and digital electronic components, I/O types and examples, Serial &Parallel communication device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT –III: EMBEDDED FIRMWARE DESIGN

Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT –IV:

REAL TIME OPERATING SYSTEM:

Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Task communication, Task synchronization

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co- Design, Computational models in embedded design .

UNIT-V:EMBEDDED SYSTEM DEVELOPMENT AND TESTING

The integrated development environment, Simulators, Emulators and Debugging, Boundary Scan, The main software utility tool, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Laboratory Tools

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

Reference Books:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

Course Outcomes:

After completing this course, the students will be able to

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
- Analyze the hardware components required for an embedded system and the design approach of an embedded hardware
- Distinguish the various embedded firmware design approaches on embedded environment
- Understand how to integrate hardware and firmware of an embedded system using real time operating system
- Understand how to embedded system development and its testing

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	4

III Year - I Semester

BASICS OF ELECTRONIC AND DIGITAL CIRCUITS

(Open Elective Course/Job oriented elective-I for students other than ECE)

Course Objectives:

The main objectives of this course are

- Study the physical phenomena and electrical characteristics of diodes and the application of diodes as rectifiers with and without filters.
- The principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor with characteristics and transistor biasing methods
- Small signal analysis of BJT and FET transistor amplifiers in different configuration and basic principle of different oscillator circuits with their analysis.
- The concept of linear wave shaping circuits such as RC low pass and high pass with sinusoidal, step, pulse, square inputs and the non-linear wave shaping circuits such as clippers and clampers with their transfer characteristics.
- The principle of working, operation and waveforms of various multi vibrators and its applications.

UNIT –I: DIODE, RECTIFIERS AND FILTERS

Diode: Open circuited p-n junction, biased p-n junction-forward bias and reverse bias, PN junction Diode and V-I Characteristics, Zener Diode and V-I Characteristics

Rectifier - half wave rectifier, full wave rectifier and bridge rectifier-operation, input and output waveforms. Filters– Inductor filter, capacitor filter and L-section filter-operation, input and output waveforms.

Filters–Inductor filter, capacitor filter and L-section filter-operation, input and output waveforms

UNIT –II: TRANSISTOR AND BIASING

BJT: Junction transistor, transistor current components, transistor configurations, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations.

FET: FET types, construction, operation, characteristics, MOSFET-types, construction, operation, characteristics.

Transistor Biasing: Need for biasing, operating point, load line analysis, BJT biasing methods-basic stability, fixed bias, and collector to base bias, self-bias.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –III: AMPLIFIERS AND OSCILLATORS

BJT Amplifier: Transistor hybrid model, determination of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB and CE amplifiers using exact analysis, Comparison of transistor amplifiers.

FET Amplifier: FET small signal model, analysis of CS and CD amplifiers, comparison of FET amplifiers.

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift, LC Oscillators-Hartley and Colpitt's oscillators with BJT.

UNIT –IV: WAVE SHAPING

Linear Wave shaping: Low pass, High pass RC circuits, their response for sinusoidal, step, pulse, square inputs, RC network as differentiator and integrator

Non-Linear Wave Shaping: Clippers: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, Transistor clippers, Emitter coupled clipper.

Clampers: Positive clamper and negative clamper, clamping circuit theorem.

UNIT-V: MULTIVIBRATOR (Qualitative treatment only):

Bistable Multivibrator: Collector coupled bistable multivibrator - fixed bias and self-bias bistable multivibrators, Triggering of binary circuits.

Monostable Multivibrator: Collector coupled monostable multivibrator-circuit, operation and waveforms, Triggering of monostable multivibrator, Applications of monostable multivibrator.

Astable Multivibrator: Collector coupled a stable multivibrator-circuit, operation and waveforms, Application of a stable multivibrator.

Text Books:

1. Jacob Millman, C. Halkies, C. D. Parikh, Integrated Electronics, Tata Mc Graw Hill, 2009.
2. A. Anand Kumar, Pulse and Digital Circuits, PHI, 2005.

Reference Books:

1. J. Millman, C. Halkias, Electronic Devices and Circuits, Tata Mc-Graw Hill, 2nd Edition, 2010.
2. J. Millman and H. Taub, Pulse, Digital and Switching Waveforms, McGraw-Hill, 3rd Edition, 2017.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes:

After completing this course, the students will be able to

- Understand the formation of p-n junction and how it can be used in different modes of operation and know the construction, working principle of rectifiers with and without filters.
- Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations and bias the transistor for various applications such as amplifier, switch etc.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations and different oscillators.
- Design linear and non-linear wave shaping circuits and apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Understand the concept of different multivibrators and apply to various pulse and digital circuits.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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3	0	0	4

III Year - I Semester

PRINCIPLES OF COMMUNICATION SYSTEMS

(Open Elective Course/Job oriented elective-I for students other than ECE)

Course Objectives:

The main objectives of this course are

- Familiarize with the fundamentals of analog and digital communication systems.
- Understand and analyze concepts of Analog Modulation schemes: AM, FM.
- Understand and analyze concepts digitization of signals: sampling, quantizing and encoding.
- Evolve the concept of quantization noise for sampled and encoded signals and study the concepts of reconstruction from these samples at a receiver.

UNIT –I: AMPLITUDE MODULATION

Introduction to communication system, Need for modulation, Amplitude Modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Envelop detector, Noise in AM.

UNIT –II:

DSBSC Modulation: Time and Frequency – Domain description, Balanced modulator, Coherent detection, Costas Receiver.

SSB and VSB Methods of Modulation: SSB Modulation, VSB Modulation, Time and Frequency – Domain description, Frequency- Division Multiplexing.

UNIT –III: ANGLE MODULATION: 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, Noise in FM.

UNIT –IV: PULSE ANALOG MODULATION: Introduction, The Low pass Sampling process, Pulse Amplitude Modulation, PWM, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, Comparison of FDM and TDM.

UNIT-V: SAMPLING AND QUANTIZATION: Why Digitize Analog Sources?

Pulse– Code Modulation: Sampling, Quantization, Encoding, Quantization Noise, Differential pulse code modulation Delta Modulation, Adaptive delta modulation, Comparison between PCM, DM, ADM and DPCM.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text Books:

1. H Taub & amp; D. Schilling, Gautam Sahe, Principles of Communication Systems, TMH, 3rd Edition, 2007.

2. Simon Haykins & Moher, Communication Systems, John Willey, 5th Edition, 2010.

Reference Books:

1. George Kennedy and Bernard Davis, Electronics & amp; Communication System, TMH, 2004.

2. B. P. Lathi, Modern Digital and Analog Communication Systems, Oxford University Press., 4th Edition, 2011.

Course Outcomes:

After completing this course, the students will be able to

- Describe the basic principle of communication system.
- Differentiate various Analog modulation and demodulation schemes and their spectral characteristics.
- Analyze noise characteristics of various analog modulation methods.
- Demonstrate and solve communication system parameters for various types of modulation and demodulation techniques.
- Differentiate between various types of pulse modulation

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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III Year – II Semester

DATA COMMUNICATIONS

(Open Elective Course/Job oriented elective-II for students other than ECE)

Course Objectives:

The main objectives of this course are

- To focus on information sharing and networks
- To introduce flow of data, categories of network, different topologies.
- To focus on different coding schemes.
- To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices etc

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.

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. Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw-Hill, 5th Edition, 2013.
2. Kurose James F, Keith W, Computer Networking A Top-Down Approach, Pearson Education, 6th Edition, 2017.

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja, Communication Networks - Fundamental Concepts and Key architectures, Tata McGraw-Hill, 2nd Edition, 2004.
2. William Stallings, Data and Computer Communication, Pearson Education, 8th Edition, 2007.

Course Outcomes:

After completing this course, the students will be able to

- Explain the various components of data communication.
- Explain the fundamentals of digital communication and switching.
- Compare and contrast data link layer protocols.
- Summarize IEEE 802.xx standards.
- Analyze the principles of Networking and applications

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	4

III Year – II Semester

FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS

(Open Elective Course/Job oriented elective-II for students other than ECE)

Course Objectives:

The main objectives of this course are

- To understand the organization and architecture of Micro Processor.
- To understand addressing modes to access memory.
- To understand the programming principles for 8086 and 8051.
- To understand the interfacing of MP with IO as well as other devices.
- Study the features of 8051 Microcontroller, its instruction set and also other controllers like PIC controllers.

UNIT-I: Introduction to Microprocessor Architecture

Introduction and evolution of Microprocessors– Architecture of 8086– Register Organization of 8086–Memory organization of 8086– General bus operation of 8086– Introduction to 80286–80386 and 80486 and Pentium.

UNIT-II:

Minimum and Maximum Mode Operations

Instruction set, Addressing modes–Minimum and Maximum mode operations of 8086.

8086 PROGRAMMING: Instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT –III: I/O Interface

8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devicesto8086using8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086 DMA controller (8257)– Architecture–Interfacing 8257 DMA controller, Interfacing of 8259–Keyboard/display controller (8279)–Architecture–Modes of operation–Command words of 8279– Interfacing of 8279.

UNIT-IV: Introduction to 8051 Micro Controller Overview of 8051 Micro Controller– Architecture– Register set– I/O ports and Memory Organization–Interrupts–Timers and Counters– Serial Communication.

UNIT-V: Pic Microcontroller

Introduction, characteristics of PIC microcontroller, PIC microcontroller families, memory organization, parallel and serial input and output, timers, Interrupts.

Text Books:

1. Douglas V Hall, Microprocessors and Interfacing, Mc–Graw Hill, 3rd Edition, 2017.
2. Kenneth J. Ayala, Dhananjay V. Gadre, Cengage Learninbg, The 8051 Microcontroller & Embedded Systems Using Assembly and C, 2nd Edition, 2007.

Reference Books:

1. R. S. Kaler, A Textbook of Microprocessors and Micro Controllers, I.K. International Publishing House Pvt. Ltd., 1st Edition, 2013.
2. Ajay V. Deshmukh, Microcontrollers– Theory and Applications, Tata McGraw–Hill, 2005.
3. Krishna Kant, Microprocessors and Microcontrollers- Architecture, Programming and System Design, PHI Learning Private Limited, 2nd Edition, 2014

Course Outcomes:

After completing this course, the students will be able to

- Understand the microprocessor capability in general and explore the evaluation of microprocessors.
- Understand the addressing modes of microprocessors.
- To program mp and mc.
- Interface mp and mc with other electronic devices.
- Understand the micro controller capability.
- Understand the design Microcontroller for simple Applications.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	4

IV Year – I Semester

PRINCIPLES OF SIGNALS AND SYSTEMS

(Open Elective Course/Job oriented elective-III for students other than ECE)

Course Objectives:

The main objectives of this course are

- To introduce the terminology of signals and systems.
- To introduce Fourier series and Fourier Transform through signal analysis.
- To analyze the linear systems in time and frequency domains.
- To introduce Laplace transform as mathematical tool to analyze continuous-time signals and systems.
- To introduce Sampling theorem and to study z-transform to analyze discrete-time signals and systems.

UNIT-I:

INTRODUCTION: Definitions of Signals and Systems, Classification of Signals, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling, Complex exponential and sinusoidal signals, Singularity functions: unit impulse and properties, step function, signum function and ramp function. Classification of Systems.

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, Complex Fourier spectrum. Fourier transform (F.T) of standard signals, Fourier transform of periodic signals, properties of Fourier transform.

UNIT-III:

SAMPLING: Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, effect of under sampling – Aliasing, impulse sampling, Natural and Flat top Sampling Related Problems.

ANALYSIS OF LINEAR SYSTEMS: Linear time invariant (LTI) system, impulse response, Concept of convolution in time domain and frequency domain, Causality and Stability Conditions, Transfer function of a LTI system, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF,BPF and BSF characteristics

UNIT-IV: LAPLACE TRANSFORM:

Review of Laplace transform (L.T), Relation between L.T and F.T. of a signal, Concept of region of convergence (ROC) for Laplace transforms, Properties of Laplace transform, Laplace transform of certain signals using waveform synthesis, Inverse Laplace transform, Solution of differential equations using L.T.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V: Z–TRANSFORM:

Concept of Z- Transform (Z.T) of a discrete sequence. Distinction between Laplace, Fourier and Z-transforms. Region of convergence in Z-Transform, Properties of Z-transforms, Inverse Z-transform.

Text Books:

1. B.P. Lathi, Signals, Systems & Communications, BS Publications, 2003.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, Signals and Systems, PHI, 2nd Edition, 2015.
3. I. Ravi Kumar, Signals and Systems, PHI, 2009.

Reference Books:

1. Simon Haykin and Van Veen, Signals & Systems, Wiley, 2nd Edition, 2007.
2. BP Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2nd Edition, 2009.
3. K Raja Rajeswari, B VisweswaraRao, Signals and Systems, PHI, 2009.
4. Michel J. Robert, Fundamentals of Signals and Systems, MGH, International Edition, 2008.

Course Outcomes:

After completing this course, the students will be able to

- Understand and differentiate among various classes of signals and Systems.
- Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform
- Apply sampling theorem to convert continuous-time signals to discrete time signal and various representations of LTI systems.
- Apply Laplace transform to analyze discrete-time signals and systems.
- Apply Z-transform to analyze discrete-time signals and systems.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year – I Semester

IOT AND APPLICATIONS

(Open Elective Course/Job oriented elective-III for students other than ECE)

Course Objectives:

The main objectives of this course are

- To introduce the terminology, technology and its applications.
- To introduce the concept of M2M (machine to machine) with necessary protocols.
- To introduce the Python Scripting Language which is used in many IoT devices.
- To introduce the Raspberry PI platform, that is widely used in IoT applications.
- To introduce the implementation of web-based services on IoT devices.

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Physical Design of IoT, IoT Protocols, IoT communication models, IoT Communication APIs, Networking basics, Machine to-Machine Communications. IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols. Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II : IOT SYSTEM MANAGEMENT

Software defined networks (SDN), network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETOPEER, M2M to IoT, Definition and differing characteristics, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

UNIT-III: IOT ARCHITECTURAL AND WIRELESS TECHNOLOGIES FOR IOT

Building architecture, design principles and needed capabilities, IoT architecture outline, standards considerations. Reference Architecture and Reference Model. Wireless Technologies for IoT: Protocol Standardization for IoT, M2M, RFID&NFCprotocol.

UNIT-IV: IOT PHYSICAL DEVICES

Introduction to different IoT tools, IoT Physical Devices and Endpoints, Introduction to Raspberry PI, Interfaces (serial, SPI, I2C). Programming – Python program to Interface Raspberry PI with external gadgets, reading inputs from pins, and controlling output.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-V: CLOUD ANALYTICS

Introduction to cloud computing, Role of Cloud Computing in IoT, Cloud-to Device Connectivity. IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API.

Text Books:

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547.
2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014, ISBN: 9789350239759.

Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, A press Publications, 2013.

Course Outcomes:

After completing this course, the students will be able to

- Understand the broad scope and applications of IoT.
- Understand and differentiate between M2M and IoT, IoT network characteristics and device management.
- Understand IoT Architecture and reference models and also different protocols such as NFC, RFID, and M2M.
- Understand Raspberry Pi and Python Programming concepts.
- Understand the role of cloud concepts in IoT, its advantages and applications.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	4

IV Year – I Semester

VLSI SYSTEM DESIGN

(Open Elective Course/Job oriented elective-IV for students other than ECE)

Course Objectives:

The main objectives of this course are

- To learn the MOS Process Technology and understand the operation of MOS devices
- To obtain the basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits
- To learn basic MOS circuit stick diagrams and Layout
- To impart the concepts and techniques of modern integrated circuit design and testing in CMOS VLSI.
- To learn the concepts of designing VLSI Subsystems.

UNIT-I: Introduction to MOS Technology

Introduction to IC technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, Fabrication process: nMOS, pMOS and CMOS, BiCMOS technology, Comparison between CMOS and BiCMOS technology

UNIT-II: Basic Electrical Properties of MOS Circuits

Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Transconductance, Output Conductance and Figure of Merit. The pass transistor, 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, MOS transistor circuit model, Latch-up in CMOS circuits, Bi-CMOS Inverter.

UNIT III- MOS and BiCMOS Circuit Design Process

MOS Layers, Stick Diagrams, nMOS Design Style, pMOS Design Style, Design Rules and Layout,Lemdabased Design rules, Contact Cuts, Layout Diagrams for MOS circuits.

UNIT-IV: Basic Circuit Concepts and Scaling of MOS circuits

Sheet Resistance Rs, Area Capacitance of Layers, Standard Unit of capacitance Cg, Area capacitance calculations, Driving Large Capacitive Loads, Propagation Delays, Wiring Capacitance, Scaling of Mos Circuits, Scaling models and Scaling Parameters

UNIT-V: Subsystem design

Subsystem design principles. Combinational shifters. Adders. ALUs. Multipliers. High density memory. Field programmable gate arrays. Programmable logic arrays. Floor planning methods. Off chip connections.

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. "Modern VLSI design systems on silicon," Wayne Wolf, Pearson Educational Asia,1998,2nd Edition, ISBN: 81-7808-128-8.
3. "Introduction to VLSI Circuits and systems", John P.Uyemura, John wiely and sons, 2002, ISBN: 9971-51-417-6.

Reference Books:

1. "Application specific integrated circuits", Michael John Sebastian Smith Pearson Educational Asia, 1997, Low priced Indian edition, ISBN: 81-7808-007-9.

Course Outcomes:

After completing this course, the students will be able to

- Identify the various IC fabrication methods.
- To use mathematical methods and circuit models in the analysis of CMOS digital electronic circuits.
- Express the Layout of simple MOS circuit using Lambda based design rules.
- To apply the scaling factors in determining the efficient MOS circuits for current semiconductor technology.
- To design the concepts of VLSI Subsystems.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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IV Year – I Semester

INFORMATION THEORY AND CODING

(Open Elective Course/Job oriented elective-IV for students other than ECE)

Course Objectives:

The main objectives of this course are

- To define and apply the basic concepts of information theory (entropy, channel capacity etc.)
- To learn the principles and applications of information theory in communication systems
- To study various data compression methods and describe the most common such methods
- To understand the theoretical framework upon which error-control codes are built

UNIT I: Information Theory:

Discrete messages, Information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

UNIT- II Source Coding:

Introduction, Shannon's theorem, Shannon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, Gaussian channel capacity, bandwidth –S/N trade off. Source Coding For Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm.

UNIT- III Linear Block Codes:

Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes.

UNIT- IV Binary Cyclic Codes:

Polynomial Representation of Code words, Generator Polynomial, Systematic Codes, Generator Matrix, Syndrome Calculation and Error Detection, Decoding of Cyclic Codes.

UNIT -V Convolution Codes:

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

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text Books:

1. T. M. Cover, J. A. Thomas, Elements of Information Theory, Wiley, 2nd Edition, 2006.
2. R. Togneri, C.J.S deSilva, Fundamentals of Information Theory and Coding Design, Chapman and Hall/CRC, 1st Edition, 2003.

Reference Books:

1. R. J. McEliece, The Theory of Information and Coding, Cambridge Uinversity Press, 2004.
2. R. Bose, Information Theory Coding and Cryptography, Tata McGraw Education, 2002.

Course Outcomes:

After completing this course, the students will be able to

- Calculate entropy, joint entropy, relative entropy, conditional entropy, and channel capacity of a system.
- Analyze different source coding techniques and Differentiate between lossy and lossless compression techniques.
- Compute and analyze different error control coding schemes for the reliable transmission of digital information over the channel.
- Compute and analyze binary cyclic codes.
- Compute and analyze convolution codes.