Jawaharlal Nehru Technological University Anantapur College of Engineering

Pulivendula –516 390 (A.P) India

B.Tech. in Electrical and Electronics Engineering

Course Structure and Syllabi

Under R20 Regulations

Effective from AY 2021-22

ELECTRICAL & ELECTRONICS ENGINEERING

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

B.Tech I Year I Semester

Semester –1					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ABS05	Linear Algebra and Calculus	BS	3-0-0	3
2	20ABS03	Chemistry	BS	3-0-0	3
3	20AEE01	Electrical Circuits-I	ES	3-0-0	3
4	20AME01	Engineering Graphics	ES	1-0-4	3
5	20AHS01	Communicative English	HS	3-0-0	3
6	20AEE02	Electrical Circuits-I lab	ES	0-0-3	1.5
7	20ABS04	Chemistry Lab	BS	0-0-3	1.5
8	20AHS02	Communicative English Lab	HS	0-0-3	1.5
				Total	**19.5**

B.Tech I Year II Semester

Semester – 2					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ABS06	Differential Equations and Vector Calculus	BS	3-0-0	3
2	20ABS10	Applied Physics	BS	3-0-0	3
3	20ACS08	C Prog. & Data Structures	ES	3-0-0	3
4	20AEE04	Semiconductor Devices & Circuits	ES	3-0-0	3
5	20ABEE03	Electrical & Electronics Engineering Workshop	ES	1-0-4	3
6	20ACS09	C Prog. & Data Structures Lab	ES	0-0-3	1.5
7	20ABS11	Applied Physics Lab	BS	0-0-3	1.5
8	20AEE05	Semiconductor Devices & Circuits lab	ES	0-0-3	1.5
				Total	**19.5**

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B.Tech II Year I Semester

Semester – 3					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ABS12	Complex Variables & Transforms	BS	3-0-0	3
2	20AEE06	Electric Circuits – II	PC	3-0-0	3
3	20AEE08	Control Systems	PC	3-0-0	3
4	20AEE10	Performance of DC Machines	PC	3-0-0	3
5	20AHS03	Universal Human Values	MC	3-0-0	3
6		Humanities Elective 1	HS	3-0-0	3
	20AHS04	Managerial Economics & Financial Analysis			
	20AHS05	Entrepreneurship & Incubation			
7	20AEE11	Energy Auditing (Skill Oriented Course -I)	SC	1-0-2	2
8	20AEE07	Electric Circuits - II Lab	PC	0-0-3	1.5
9	20AEE09	Control Systems Lab	PC	0-0-3	1.5
10	20ACS04	Python Programming Lab	PC	0-0-3	1.5
11	20AMC01	NSS activities	MC	0-0-2	**0**
				Total	**24.5**

B.Tech II Year II Semester

Semester – 4					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ABS15	Numerical Methods, Probability and Statistics	BS	3-0-0	3
2	20AEE12	Electromagnetic Field Theory	ES	3-0-0	3
3	20AEE13	Electrical Power Generation and Distribution	PC	3-0-0	3
4	20AEE14	Analog Electronic Circuits	PC	3-0-0	3
5	20AEE16	Performance of Transformers and Induction Machines	PC	3-0-0	3
6	20AEE19	Design of Solar PV and Wind Systems (Skill Oriented Course – II)	SC	1-0-2	2
7	20AEE17	DC Machines Lab	PC	0-0-3	1.5
8	20AEE15	Analog Electronic Circuits Lab	PC	0-0-3	1.5
9	20AEE18	Simulation of Electrical Systems Lab	PC	0-0-3	1.5
10	20AMC02	Aptitude and Reasoning Skills	MC	3-0-0	0
11	20ABS09	Environmental Science	MC	3-0-0	0
				Total	**21.5**
Mandatory Community Service Project/ Internship during Summer Vacation					

- Eligible & interested students are permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Honours or a Minor from V Semester onwards.
- A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

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B.Tech III Year I Semester

Semester - 5					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20AEE51	Performance of Synchronous and Special Machines	PC	3-0-0	3
2	20AEE52	Electrical Power Transmission and Utilization	PC	3-0-0	3
3	20AEE53	Power Electronics	PC	3-0-0	3
4	20AEE54	Professional Elective – I	PE	3-0-0	3
	20AEE54A	System Reliability Concepts			
	20AEE54B	Analysis of Linear Systems			
	20AEE54C	AI techniques in Electrical Engineering			
5	20AEE55	Open Elective – I (Interdisciplinary)	OE	3-0-0	3
6	20AEE50	Design of Electrical layouts for Buildings (Skill oriented course – III)	SC	1-0-2	2
7	20AEE57	AC Machines Lab	PC	0-0-3	1.5
8	20AEE58	Renewable Energy Lab	PC	0-0-3	1.5
9	20AHS11	Indian Constitution	MC	3-0-0	0
10	20AEE59	Evaluation of Community Service Project/Internship	PR	-------	1.5
				Total	**21.5**

Open Elective I (Interdisciplinary)

Branch	Subject Code	Subject
Mathematics	20ABS55A	Fuzzy Set Theory, Arithmetic and Logic
Physics	20ABS55B	Functional Nanomaterials for Engineers
Chemistry	20ABS55C	Chemistry of Energy Materials
CIVIL	20ACE55A	Basics of Civil Engineering
ME	20AME55A	3D Printing
	20AME55B	Smart Materials
ECE	20AEC55A	Fundamentals of Electronics and Communication Engineering
	20AEC55B	Transducers and Sensors
CSE	20ACS55A	Fundamentals of Internet of Things
	20ACS55B	E-Marketing
	20ACS55C	Computer Architecture and organization

Note: A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.

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B.Tech III Year II Semester

Semester - 6					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20AEE61	Power System Operation and Control	PC	3-0-0	3
2	20AEE62	Electrical and Electronic Measurements	PC	3-0-0	3
3	20AEE63	Switchgear and Protection	PC	3-0-0	3
4	20AEE64	Professional Elective – II(MOOC-I)	PE	3-0-0	3
5	20AEE65	Open Elective –II (Interdisciplinary)	OE	3-0-0	3
6	20AEE66	Power Electronics Lab	PC	0-0-3	1.5
7	20AEE67	Electrical Measurements Lab	PC	0-0-3	1.5
8	20AEE68	Power Systems Lab	PC	0-0-3	1.5
9	20AHS10	Soft Skills (Skill Oriented Course – IV)	SC	1-0-2	2
10	20AEE60	Design Thinking for Innovative Problem Solving	MC	3-0-0	0
				Total	**21.5**
Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation					

Note: Student shall register for MOOC Course in NPTEL/SWAYAM in concurrence with the department before commencement of semester. The advanced courses should opt which is not repetitive regular courses and syllabus.

Open Elective II (Interdisciplinary)

Branch	Subject Code	Subject Name
Mathematics	20ABS65A	Numerical Techniques
Physics	20ABS65B	Materials Characterization Techniques
Chemistry	20ABS65C	Polymers and their applications
CIVIL	20ACE65A	Environmental Impact Assessment
ME	20AME65A	Programming of Robots and Control
	20AME65B	Non-Conventional sources of Energy
ECE	20AEC65A	Introduction to Microcontrollers & Applications
	20AEC65B	Principles of Digital Signal Processing
CSE	20ACS65A	Machine Learning Applications
	20ACS65B	Object Oriented Programming
	20ACS65C	Web Design

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B.Tech IV Year I Semester

Semester - 7					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20AEE71	Professional Elective – III	PE	3-0-0	3
	20AEE71A	Power Semi-Conductor Drives			
	20AEE71B	Switched mode Power Converters			
	20AEE71C	Electrical Distribution Systems			
2	20AEE72	Professional Elective – IV	PE	3-0-0	3
	20AEE72A	Digital Electronics and Logic Design			
	20AEE72B	Power Quality			
	20AEE72C	Instrumentation			
3	20AEE73	Professional Elective –V	PE	3-0-0	3
	20AEE73A	HVDC and Flexible AC Transmission systems			
	20AEE73B	Smart Grid Technologies			
	20AEE73C	Fundamentals of Electric Vehicles			
4	20AEE75	Open Elective – III -**ANNEXURE-III**	OE	3-0-0	3
5	20AEE76	Open Elective – IV (MOOC-II)	OE	3-0-0	3
6		Humanities Elective – II	HS	3-0-0	3
	20AHS12	Management Science			
	20AHS13	Business Environment			
7	20AEE70	Design of Electric Vehicle (Skill oriented course –V)	SC	1-0-2	2
8	20AEE79	Evaluation of Internship	PR	-------	3
				Total	**23**

Open Elective-IV shall opt any of branch which shall not match with regular course and syllabus.

Open Elective III (Interdisciplinary)

Branch	Subject Code	Subject Name
Mathematics	20ABS75A	Mathematical Modeling
Physics	20ABS75B	Sensors and Actuators for Engineering Applications
Chemistry	20ABS75C	Chemistry of Nano-materials and applications
CIVIL	20ACE75A	Disaster Management and Mitigation ✓
ME	20AME75A	Introduction to Composite Materials
	20AME75B	Customer Relationship Management
ECE	20AEC75A	Fundamentals of Image Processing
	20AEC75B	Basics of VLSI Design
CSE	20ACS75A	Applications of AI
	20ACS75B	Mobile Application Development

B.Tech IV Year II Semester

Semester - 8					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20AEE99	Full Internship & Project work	PR	---------	12
				Total	**12**

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Courses offered for Honours degree

S.No.	Course Code	Course Title	Offered in Semester	Prerequisite if any	Contact Hours per week		Credits
					L	T	
1	20AEEH01	Intelligent Control Techniques			4	0	4
2	20AEEH02	Machine Modeling and Analysis			4	0	4
3	20AEEH03	Restructured Power Systems			4	0	4
4	20AEEH04	Modern Power Electronics			4	0	4
5	20AEEH05	MOOC Course					2
6	20AEEH06	MOOC Course					2

Title of the Minor Degree
(Disciplines to which the Minor is offered)

S.No.	Branch	Name of the Minor degree	Course Code	Course Title	Offered in Semester	Contact Hours per week			Credits
						L	T	P	
1	EEE	Electrical Systems	20AEEM01	Basic Electric Circuits and Analysis	V	3	1	0	4
2			20AEEM02	Principles of Electrical Measurements	V	3	1	0	4
3			20AEEM03	Basics of Power Electronics and Devices	VI	3	1	0	4
4			20AEEM04	Fundamentals of Control Systems	VI	3	1	0	4
5			20AEEM05	MOOC Course	VII				2
6			20AEEM06	MOOC Course	VII				2
1	CE	Construction Technology	20ACEM01	Building Materials	V	3	1	0	4
2			20ACEM02	Building Construction	V	3	1	0	4
3			20ACEM03	Building planning and Drawing	VI	3	1	0	4
4			20ACEM04	Surveying	VI	3	1	0	4
5			20ACEM05	MOOC Course	VII				2
6			20ACEM06	MOOC Course	VII				2
1	ME	3D printing	20AMEM07	Materials science for Engineers	V	3	1	0	4
2			20AMEM08	Computer Aided Machine Drawing	V	3	1	0	4
3			20AMEM09	3D Printing materials	VI	3	1	0	4
4			20AMEM10	Applications of 3D Printing	VII	3	1	0	4
5			20AMEM11	MOOC Course	VI				2
6			20AMEM12	MOOC Course	VII				2
1	ME	Robotics and Automation	20AMEM13	Introduction to Robotics	V	3	1	0	4
2			20AMEM14	Industrial Automation	V	3	1	0	4
3			20AMEM15	Hydraulic and Pneumatic circuits	VI	3	1	0	4
4			20AMEM16	Programming and control of Robot	VII	3	1	0	4
5			20AMEM17	MOOC Course	VI				2
6			20AMEM18	MOOC Course	VII				2

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1	ME	Industrial Engineering	20AMEM19	Production Planning and Control	V	3	1	0	4
2			20AMEM20	Marketing Management	VI	3	1	0	4
3			20AMEM21	Customer Relationship Management	VI	3	1	0	4
4			20AMEM22	Six Sigma & Lean Manufacturing	VII	3	1	0	4
5			20AMEM23	MOOC Course	V				2
6			20AMEM24	MOOC Course	VII				2
1	ECE	Electronics & Communication Engineering	20AECM01	Electronic Circuits	V	3	1	0	4
2			20AECM02	Digital Electronics	V	3	1	0	4
3			20AECM03	Principles of Communications	VI	3	1	0	4
4			20AECM04	Electronic Instrumentation	VI	3	1	0	4
5			20AECM05	MOOC Course	VII				2
6			20AECM06	MOOC Course	VII				2
1	CSE	Web Design & Development	20ACSM01	User Interface Design	V	3	1	0	4
2			20ACSM02	Advanced Java Script	VI	3	1	0	4
3			20ACSM03	Content Management & Distributed systems	VI	3	1	0	4
4			20ACSM04	Mongo DB	VII	3	1	0	4
5			20ACSM05	MOOC Course	V				2
6			20ACSM06	MOOC Course	VII				2
1	CSE	Data Science	20ACSM07	Data Science	V	3	1	0	4
2			20ACSM08	Data Analytics using Python and Lab	V	3	0	2	4
3			20ACSM09	Data Visualization	VII	3	1	0	4
4			20ACSM10	Machine Learning	VI	3	1	0	4
5			20ACSM11	MOOC Course	VI				2
6			20ACSM12	MOOC Course	VII				2

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF MATHEMATICS
I B.TECH – I SEMESTER (R20)
(Common to all Branches of Engineering)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Linear Algebra and Calculus	3	0	-	3

COURSE OBJECTIVES	
1	This course will illuminate the students in the concepts of calculus and linear algebra.
2	To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications

COURSE OUTCOMES	
CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications
CO2	Utilize mean value theorems for real life problems
CO3	Familiarize with functions of several variables which is useful in optimization
CO4	Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2 and 3- dimensional coordinate systems.
CO5	Students will learn the utilization of special functions.

SYLLABUS

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, Normal form, solving system of non-homogeneous and homogeneous linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalization of a matrix.

Unit II: Infinite series and Mean Value Theorems

Infinite series:

Series, Convergence and divergence, Geometric series, Integral test, P- series, comparison test, ratio test, root test.

Mean Value Theorems:

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem (without proof). Expansions of functions: Taylor's and Maclaurin's series, indeterminate forms and L-Hospital rule (Limits).

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Mathematics

Unit III: Multivariable calculus

Functions of several variables – Limit and Continuity, Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers for three variables.

Unit IV: Multiple Integrals

Double integrals, change of order of integration, areas enclosed by plane curves, Triple Integrals, Volume of solid as double integral and as triple integral, change of variables in double integral and Triple integral.

Unit V: Special Functions- Beta and Gamma functions

Beta and Gamma functions and their properties, relation between beta and gamma functions. Derichlet's integral and its applications (Areas and Volumes of solids).

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

References:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc-Grawhill publishing company Ltd., New Delhi.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA

B.Tech – I Yr I sem (R20)

L	T	P	C
3	0	0	3

Chemistry

(EEE, ECE and CSE)

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry, Spectroscopy and polymers
- To introduce instrumental methods and modern engineering materials.

Unit 1: Structure and Bonding Models: (10 hrs)

Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, applications to hydrogen, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of N_2, O_2, CO and NO, π-molecular orbitals of butadiene and benzene, calculation of bond order.

Learning Outcomes:

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

- **apply** Schrodinger wave equation to hydrogen atom (L3)
- **recall** molecular orbital theory and energy level diagrams of atoms (L1)
- **illustrate** the molecular orbital energy level diagram of different molecular species (L2)
- **explain** the calculation of bond order of O_2 and CO molecules (L2)
- **discuss** the basic concept of molecular orbital theory (L3)

Unit 2: Modern Engineering materials: (12 hrs)

i). Understanding of materials: Crystal field theory – salient features – splitting in octahedral, tetrahedral and square planar geometry. Properties of coordination compounds- oxidation state, coordination number, magnetic properties and colour.

ii). Semiconductor materials, superconductors- basic concept, band diagrams for conductors, semiconductors and insulators, effect of doping on band structures.

iii). Supercapacitors: Introduction, basic concept-classification – applications.

iv). Nanochemistry: Introduction, classification of nanometerials, properties and applications of fullerenes, carbon nanotubes and graphene nanoparticles.

Learning Outcomes:

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

- **explain** splitting of in octahedral and tetrahedral geometryof complexes (L2).
- **recall** applications of semiconductors, super conductors, nanomaterials (L1)
- **discuss** the magnetic behaviour and colour of coordination compounds (L3).
- **explain** the band theory of solids for conductors, semiconductors and insulators (L2)
- **demonstrate** the application of fullerenes, carbon nano tubes and graphene nanoparticles (L2).

Unit 3: Electrochemistry and Applications: (12 hrs)

Introduction to electrochemistry, electrodes – concepts of reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode); Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, pH metry, potentiometry- potentiometric titrations (redox titrations), concept of conductivity- Specific, equivalent & molar conductance and.cell constant, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors (glucose potentiometric sensor), amperometric sensors(Estimation of Uric Acid (UA))

Primary cells – Zinc-air, Na-Air batteries, secondary cells – Nickel-Cadmium (NiCd),and lithium ion batteries- working of the batteries including cell reactions; fuel cells: hydrogen-oxygen, methanol fuel cells – working of the cells and applications.

Learning Outcomes:

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

- **apply** Nernst equation for calculating electrode and cell potentials (L3)
- **recall** applications of various batteries (L1).
- **explain** the theory of construction of battery and fuel cells (L2)
- **solve** problems based on cell potential (L3)

Unit 4: Polymer Chemistry: (10 hrs)

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

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres. Calculation of molecular Weight of polymer by weight average and number average methods, polydispersity index

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

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

Learning Outcomes:

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

- **explain** the different types of polymers and their applications (L2)
- **find** number average and weight average of polymer (L1)
- **explain** the preparation, properties and applications of Bakelite, Nylon-6,6, and carbon fibres (L2)
- **describe** the mechanism of conduction in conducting polymers (L2)
- **discuss** Buna-S and Buna-N elastomers and their applications (L2)

Unit 5: Instrumental Methods and Applications (8 hrs)

Regions of electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible, IR Spectroscopies- Principle, selection rules and applications. Solid-Liquid Chromatography–TLC, retardation factor.

Learning outcomes:

After completion of Unit IV, students will be able to:

- **explain** the different types of spectral series in electromagnetic spectrum (L2)
- **understand** the principles of UV-Vis, IR Spectroscopy (L2)
- **find** retention time and volumes of samples (L1)
- **explain** the various applications of analytical instruments (L2)

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.

2. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S.Chand Publication, New Delhi 2012.

Reference Books:

1.G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.

2. J.D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.

3. K. Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, Pearson Publication Pvt. Ltd.

4. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

Course Outcomes:

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

- **compare** the materials for construction of battery and electrochemical sensors (L2)
- **recall** properties and applications of polymers and engineering materials (L1)
- **explain** the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers. (L2)
- **explain** the principles of spectrometry, TLC in separation of solid and liquid mixtures (L2)
- **apply** the principle of Band diagrams in application of conductors and semiconductors (L3)

JNTUA COLLEGE OF ENGINEERING :(AUTONOMOUS), PULIVENDULA

I B.TECH

COMMUNICATIVE ENGLISH (R20)

(Common to All Branches of Engineering)

L	T	P	C
3	0	0	3

1. 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*. 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.

2. COURSE OBJECTIVES

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

3. COURSE OUTCOMES

CO1	Retrieve the knowledge of basic grammatical concepts.
CO2	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken and the improve the fluency of English..
CO3	Apply grammatical structures to formulate sentences and correct word forms
CO4	Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO5	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
CO6	Create a coherent paragraph interpreting a figure/graph/chart/table.

4. SYLLABUS:

UNIT –I

***Reading*: What Is My Name? —P Sathyavathi**

- ***Writing:*** Paragraph writing
- ***Listening***: Listening for theme-main
- ***Functional English***: Greeting, taking leave and introducing oneself and others
- ***Grammar:*** Parts of speech- Nouns –classification-usages- Pronouns - classifications-usages-
- ***Vocabulary*:** Homonyms- Homophones- Homographs

Non Detailed Study: Listening Skills from **English and Soft Skills**

UNIT-II

***Reading* : The Kitchen — Vimala**

- ***Writing*** : Essay Writing –Descriptive Essays
- ***Listening*** : Listening for theme -1
- ***Functional English***: Making requests
- ***Grammar:*** Types of sentences- Question Tags
- ***Vocabulary*** : Synonyms - Antonyms

Non detailed Study: Teamwork Skills from **English and Soft Skills**

UNIT-III

***Reading* : Adivasis — Kancha Ilaiah**

- ***Writing*** : Statement of Purpose
- ***Listening:*** Listening for main ideas
- ***Functional English:*** Inviting -Apologizing
- ***Grammar:***– Kinds of verbs – Auxiliaries- Tenses,
- ***Vocabulary*** : Prefixes –Suffixes – One-word substitutes

Non detailed Study: Assertive Skills from **English and Soft Skills**

UNIT-IV

***Reading*: The Bet – Anton Chekhov**

- ***Writing:*** Letter Writing –Official letters-business Letters-Application Letters
- ***Listening***: Listening for details
- ***Functional English:*** Interrupting - Asking for and giving opinions
- ***Grammar:*** Adjectives- Conjunctions- Articles – Active & Passive Voice
- ***Vocabulary***: Phrasal verbs -Idioms

Non detailed Study: Learning Skills from **English and Soft Skills**

UNIT-V

Reading **: The Gift of the Magi - O. Henry**

- ***Writing:*** Information Transfer
- ***Listening*** : Listening for opinions
- ***Functional English*** : Asking for the time and directions
- ***Grammar:*** Prepositions- Reported Speech
- ***Vocabulary*** : Commonly confused words

Non detailed Study : Emotional Intelligence Skills from **English and Soft Skills**

5. Prescribed Text books:

[1] **Detailed text: English for Fluency**, K Purushottam, Orient Black Swan,2013.

[2] **Non detailed text: English and Soft Skills**, S P Dhanavel, Orient Black Swan 2013Edition.

6. REFERENCES:

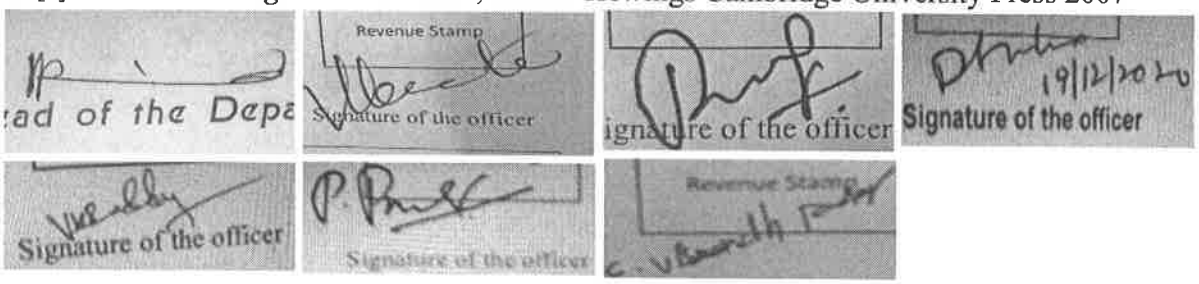
[1] **A Practical Course in Effective English Speaking Skills**. J.K.Gangal, PHI, New Delhi.2012

[2] **Fundamentals of Technical Communication,** Meenakshi Raman, Oxford University Press,2015.

[3] **Spoken English,** R.K. Bansal & JB Harrison, Orient Longman,2013, 4Th edition.

[4] **Murphy's English Grammar** with CD, Murphy, Cambridge University Press,3 Rd edition.

[5] **Advanced English Grammar** , Martin Hewings Cambridge University Press 2007



B.Tech I Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME01 - ENGINEERING GRAPHICS

(Common to EEE, ECE)

L	T	P	C
1	0	4	3

Course Objectives:

- To bring awareness that Engineering Drawing is the Language of Engineers.
- To familiarize how industry communicates technical information.
- To teach the practices for accuracy and clarity in presenting the technical information.
- To develop the engineering imagination essential for successful design.
- To train the usage of 2D and 3D modeling

UNIT – 1: Introduction to Engineering Graphics **8 Hrs**

Principles of Engineering Graphics and their significance – Conventions in drawing – Lettering – BIS conventions.

a) Conic sections including the rectangular hyperbola – general method only.
b) Cycloids, Epicycloids and Hypocycloids.
c) Involutes

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand basic principles of engineering graphics (L2)
- Identify the various BIS conventions (L3)
- Draw conic sections used in engineering graphics (L3)
- Draw cycloids and involutes (L3)

UNIT – II: Projection of Points, Lines and Planes **8 Hrs**

Projection of points in any quadrant, Lines inclined to one and both planes, Finding true lengths, Angle made by line. Projections of regular plane surfaces.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics of projections. (L2)
- Find the true lengths of line when the line inclined to both the planes. (L5)
- Draw projections of regular plane surfaces (L3)

UNIT – III: Projections of Solids **8 Hrs**

Projections of Solids : Projections of regular solids inclined to one and both planes by rotational and auxiliary views method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify 2D projections of regular solids (L1)
- Draw projections of regular solids when inclined to both the planes. (L3)

UNIT – IV: Sections of Solids **7 Hrs**

Section planes and sectional view of right regular solids – Prism, Cylinder, Pyramid and Cone. True shapes of the sections.

Learning Outcomes:
At the end of this unit, the student will be able to

- Use section plane to show the sectional view of regular solids. (L3)
- Draw sectional view of prism and cylinder (L3)
- Draw true shape of sections.(L3)

UNIT – V: Development of Surfaces: **10 Hrs**

Development of surfaces of right regular solids – Prism, Cylinder, Pyramid, Cone and their sectional parts

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand basics of development of surfaces (L1)
- Draw development of surface of prism and cylinder(L3)
- Draw development of surface of cone and their sectional parts(L3)

Text Books:

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009.
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009.
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000.
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013.
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

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

- Draw various curves applied in engineering. (L3)
- Show projections of Lines, planes and solids. (L1)
- Draw the sections of solids and development of surfaces of solids. (L3)
- Use computers as a drafting tool. (L3)
- Draw isometric and orthographic drawings. (L3)

B.Tech I Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS01 - PROBLEM SOLVING & PROGRAMMING

(ECE)

L	T	P	C
3	0	0	3

Course Objectives:

- Introduce the internal parts of a computer, and peripherals.
- Introduce the Concept of Algorithm and use it to solve computational problems.
- Identify the computational and non-computational problems.
- Teach the syntax and semantics of a C Programming language.
- Demonstrate the use of Control structures of C Programming language.
- Illustrate the methodology for solving Computational problems.

UNIT – I: Computer Fundamentals **8hrs**

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Introduction to Operating systems, and Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand why C is a useful scripting language for developers. **L1**
- To learn how to design and program C applications.. **L1**

UNIT – II: Introduction to problem solving **8hrs**

Introduction to problem solving: Introduction, the problem-solving aspect, Design and implementation of algorithms – Topdown design, Analysis of Algorithms, the efficiency of algorithms, the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn how to solve the programs in C. **L2**
- To learn about algorithms. **L2**
- To learn how to use algorithms in C programs. **L2**

UNIT – III: Types, Operators, and Expressions **8hrs**

Types, Operators, and Expressions: Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.

Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Do-while, break and continue, goto and labels.

Functions and Program Structure: Basics of functions, functions returning non-integers, external variables, scope variables, header variables, register variables, block structure, initialization, recursion, the C processor.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn Types, Operators, and Expressions in C. **L3**
- To learn how to write functions and pass arguments in C. **L3**

UNIT – IV: Factoring methods **7 Hrs**

Factoring methods: Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers, generating prime numbers.

Pointers and arrays: Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions, complicated declarations.

Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the k^{th} smallest element.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn how to build Factoring methods. **L3**
- To learn about pointers and arrays. **L3**
- To learn how to use array techniques. **L3**

UNIT – V: Sorting and Searching

Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.

Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.

Some other Features: Variable-length argument lists, formatted input-Scanf, file access, Error handling-stderr and exit, Line Input and Output.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn how to sorting in C. **L4**
- To learn how to Searching in C. **L5**

Text Books:

1. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.

Reference Books:

1. RS Bichkar "Programming with C", 2012, Universities Press.
2. Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage.
3. Byron Gottfried and Jitender Kumar Chhabra, "Programming with C", 4th Edition, 2019, McGraw Hill Education.

Course Outcomes:

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

- Identify the different peripherals, ports and connecting cables in a PC. **L2**
- Illustrate the working of a Computer. **L3**
- Select the components of a Computer in the market and assemble a computer. **L4**
- Solve complex problems using language independent. **L3**

JNTUA COLLEGE OF ENGINEERING :(AUTONOMOUS), PULIVENDULA
I B.TECH
COMMUNICATIVE ENGLISH LABORATORY (R20)
(Common to All Branches of Engineering)

L	T	P	C
0	0	3	1.5

Course Objectives

- students will be exposed to a variety of self-instructional, learner friendly modes of language learning
- students will learn better pronunciation through stress, intonation and rhythm
- students will be trained to use language effectively to face interviews, group discussions, public speaking
- students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes

- CO1: Listening and repeating the sounds of English Language
- CO2: Understand the different aspects of the English language proficiency with emphasis on LSRW skills
- CO3: Apply communication skills through various language learning activities
- CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- CO5: Evaluate and exhibit acceptable etiquette essential in social and professional settings
- CO6: Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Unit 1

1. Phonetics-Importance -Introduction to Sounds of Speech
2. Vowels and Consonants Sounds
3. Phonetic Transcription

Learning Outcomes

At the end of the module, the learners will be able to

- understand different accents spoken by native speakers of English
- employ suitable strategies for skimming and scanning on monitor to get the general idea of a text and locate specific information
- learn different professional registers and specific vocabulary to describe different persons, places and objects

Unit 2

1. Word Stress & Intonation
2. Communication skills
3. Role Play & JAM

Learning Outcomes
At the end of the module, the learners will be able to

- produce a structured talk extemporarily
- comprehend and produce short talks on general topics
- participate in debates and speak clearly on a specific topic using suitable discourse markers

Unit 3

1. Describing people/objects/places
2. Speeches for Special Occasions
3. Etiquettes of Telephonic Communication

Learning Outcomes
At the end of the module, the learners will be able to

- Learn different ways of greeting and introducing oneself/others
- summarize the content with clarity and precision and take notes while listening to a talk/lecture and make use of them to answer questions
- replenish vocabulary with one word substitutes, homonyms, homophones, homographs to reduce errors in speech and writing

Unit4

1. Group Discussions
2. Debates
3. Interviews Skills

Learning Outcomes
At the end of the module, the learners will be able to

- Learn different ways of asking information and giving directions
- Able to transfer information effectively
- understand non-verbal features of communication

Unit 5

1. Resume writing & Practicing
2. Oral Presentations
3. Writing Video Speeches as it is & Book reviews – oral and written

Learning Outcomes

At the end of the module, the learners will be able to

- make formal oral presentations using effective strategies
- learn different techniques of précis writing and paraphrasing strategies
- comprehend while reading different texts and edit short texts by correcting common errors

Suggested Software

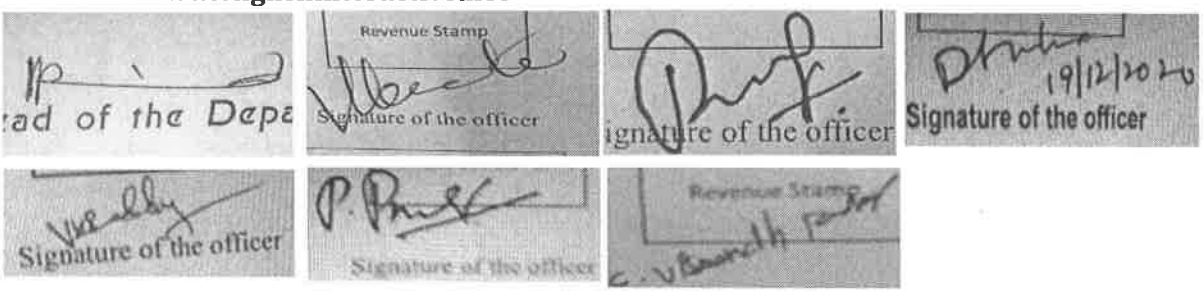
- Orell
- Walden Infotech
- Young India Films

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links

- **www.esl-lab.com**
- **www.englishmedialab.com**
- **www.englishinteractive.net**



JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA

B.Tech – I Yr I Sem (R20)

L T P C
0 0 3 1.5

Chemistry Lab
(EEE, ECE and CSE)

Course Objectives:

- Verify the fundamental concepts with experiments

List of Experiments:

1. Conductometric titration of strong acid vs. strong base.
2. Conductometric titration of weak acid vs. strong base.
3. Determination of cell constant and conductance of solutions.
4. Potentiometry - determination of redox potentials and emfs.
5. Acid-base totration by pH metry.
6. Determination of Strength of an acid in Pb-Acid battery.
7. Preparation of polymer- bakelite.
8. Verification Lambert-Beer's law.
9. Estimation of manganese by colorimetry.
10. Separation of organic mixtures by Thin layer chromatography.
11. Identification of simple organic compounds by IR.
12. Preparation of nanomaterials by precipitation.
13. Estimation of Ferrous Iron by Dichrometry.

Course Outcomes:

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

- **determine** the cell constant and conductance of solutions (L3)
- **find** conductivity of acid and base (L1)
- **prepare** polymer Bakelite materials (L2)
- **measure** the strength of an acid present in secondary batteries (L3)
- **analyse** the IR spectra of some organic compounds (L3)

B.Tech I Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS02 - Problem Solving & Programming Laboratory

(ECE)

L	T	P	C
0	0	3	1.5

Course Objectives:

- 1. Introduce the internal parts of a computer, and peripherals.
- 2. Introduce the Concept of Algorithm and use it to solve computational problems
- 3. Identify the computational and non-computational problems
- 4. Teach the syntax and semantics of a C Programming language
- 5. Demonstrate the use of Control structures of C Programming language
- 6. Illustrate the methodology for solving Computational problems

List of Experiments:

1. Assemble and disassemble parts of a Computer
2. Design a C program which reverses the number
3. Design a C program which finds the second maximum number among the given list of numbers
4. Construct a program which finds the k^{th} smallest number among the given list of numbers.
5. Design an algorithm and implement using C language the following exchanges
   $a \leftarrow b \leftarrow c \leftarrow d$
6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
7. Implement the C program which computes the sum of the first n terms of the series
   Sum = 1 – 3 + 5 -7 + 9
8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
9. Design an algorithm and implement using a C program which finds the sum of the Infinite series $1 - x^2/2! + x^4/4! - x^6/6! + ...$
10. Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
12. Develop an algorithm which computes the all the factors between 1 to 100 for a given Number and implement it using C.
13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
14. Design a C program which reverses the elements of the array.
15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The starts for each number should be printed horizontally.
16. Implement the sorting algorithms

a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort.

17. Illustrate the use of auto, static, register and external variables.
18. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
19. Design a C program which sorts the strings using array of pointers.

Course Outcomes:

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

- 1. Identify the different peripherals, ports and connecting cables in a PC (L2) **L2**
- 2. Illustrate the working of a Computer (L3) **L3**
- 3. Select the components of a Computer in the market and assemble a computer (L4) **L4**
- 4. Solve complex problems using language independent notations (L3) **L3**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF MATHEMATICS
I B.TECH – II SEMESTER (R20)
(Common to all Branches of Engineering)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Differential Equations and Vector Calculus	3	0	-	3

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

COURSE OUTCOMES	
CO1	Solve the linear differential equations related to various engineering fields
CO2	Solve the differential equations reducible to linear, and finds the relevant applications.
CO3	Identify solution methods for partial differential equations that model physical processes
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence
CO5	Estimate the work done against a field, circulation and flux using vector calculus and also to establish the relations between them using vector integral theorems.

SYLLABUS

UNIT I: Differential Equations

First order and first degree differential equations – Formation, Exact, Linear and Bernoulli equations. Applications to Newton's law of cooling and law of natural growth and decay.

Non-homogeneous Linear Differential Equations of second Higher Order with constant coefficients with RHS terms of the type $e^{ax+b}, \sin(ax+b), \cos(ax+b)$, polynomials in x, $e^{ax}V(x), xV(x)$ where $V(x)$ is a function of x, Method of variation of parameters.

UNIT II: Equations Reducible to Linear Differential Equations with constant coefficients and Applications

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients.

Applications: Mass spring system and L-C-R Circuit problems.

UNIT III: Partial Differential Equations

Linear partial differential equations of first order, non-linear PDEs of first order (standard forms). Solutions to homogenous linear partial differential equations with constant coefficients, Rules for finding the complementary function and the particular integral.

UNIT IV: Vector differential Calculus

Scalar and vector point functions, Del applied to scalar point functions: Gradient, Del applied to vector point functions: Divergent and Curl and their properties.

Del applied to twice to point functions and Del applied to products of point functions (Identities).

UNIT V: Vector integral Calculus

Line integral- Circulation -work done - potential function, Surface integral-flux, volume integral.

Vector integral theorems: Green's theorem in the plane, Stoke's theorem, Gauss Divergence theorem (all theorems without proof) and related problems.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

References:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc-Grawhill publishing company Ltd., New Delhi.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA

B. Tech. I Year Syllabus (R20 Regulation)

Applied Physics

(ECE, EEE & CSE)

L T P C
3 0 0 3

	COURSE OBJECTIVES
1	To make a bridge between the physics in school and engineering courses.
2	To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3	To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibres along with engineering applications.
4	To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
5	To enlighten the concepts of Quantum Mechanics and to provide fundamentals of de'Broglie waves, quantum mechanical wave equation and its applications, the importance of free electron theory and band theory of solids.
6.	Evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

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

Interference- Principle of superposition – Interference of light –Interference by wavefront and amplitude division - Interference in thin films (Reflection Geometry) – Colours in thin films – Newton's Rings – Determination of wavelength of light source and refractive index of liquid.

Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit - Diffraction grating – Grating spectrum.

Polarization- Introduction – Types of polarization – Polarization by reflection, refraction and double refraction (Qualitative) - Nicol's Prism - Half wave and Quarter wave plates with applications.

Unit Outcomes:

The students will be able to

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

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

Lasers- Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – CO_2 laser – Semi conductor Laser - Applications of lasers.

Fiber optics- Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Fiber optic communication system – Losses in optical fibers – Applications.

Unit Outcomes:

The students will be able to

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

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

Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Orientation polarizations (Qualitative), Ionic and Electronic Polarizations – Lorentz internal field – Clausius-Mossotti equation – Dielectric breakdown – Dielectric Loss – Piezoelectricity and Ferro electricity.

Magnetic Materials- Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and Permeability – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, Para, Ferro, Ferri & Antiferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius-Mosotti relation in dielectrics (L2)
- **Apply** the concept of polarization to materials like piezoelectric and ferroelectrics (L3)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic devices (L3)

Unit IV: Quantum Mechanics, Free Electron Theory and Band theory of Solids **10hrs**

Quantum Mechanics- Dual nature of matter (de Broglie hypothesis) – Schrodinger's time independent wave equation – Significance of wave function – Particle in a one-dimensional infinite potential well.

Free Electron Theory- Classical free electron theory – Quantum free electron theory – Equation for electrical conductivity – Fermi-Dirac distribution – Density of states (Qualitative) – Fermi energy.

Band theory of Solids- Bloch's Theorem (Qualitative) – Kronig-Penney model (Qualitative) – E vs k diagram – Classification of crystalline solids – Effective mass of electron – m^* vs k diagram – Concept of hole.

Unit Outcomes:

The students will be able to

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

Unit – V: Semiconductors and Superconductors **10hrs**

Semiconductors- Introduction – Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors – Density of charge carriers – Dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents – Einstein's equation – Direct and indirect band gap semiconductors – Hall effect – Applications of semiconductors.

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) – High T_c superconductors – Applications of superconductors.

Unit Outcomes:

The students will be able to

- **Classify** the energy bands of semiconductors (L2)
- **Interpret** the direct and indirect band gap semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)
- **Identify** applications of semiconductors in electronic devices (L2)
- **Explain** how electrical resistivity of solids changes with temperature (L2)
- **Classify** superconductors based on Meissner's effect (L2)
- **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

Text books:

1. Engineering Physics by M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy S.Chand Publications, 11th Edition (2019).
2. Engineering Physics" by D.K. Bhattacharya and Poonam Tandon, Oxford press (2018).

Reference Books:

1. Engineering Physics – Shatendra Sharma, Jyotsna Sharma, Pearson Education, (2018)
2. Introduction To Solid State Physics, Charles Kittel, 8th Ed.,Wiley India Edition.
3. Engineering Physics by M.R. Srinivasan, New Age international publishers (2014).
4. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers (2018).
5. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press (2016).
6. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill (2014).

COURSE OUTCOMES	
CO1	**Study** the different realms of physics and their applications in both scientific and technological systems through physical optics. (L2)
CO2	**Identify** the wave properties of light and the interaction of energy with the matter (L3). **Asses** the electromagnetic wave propagation and its power in different media (L5).
CO3	**Understands** the response of dielectric and magnetic materials to the applied electric and magnetic fields. (L3)
CO4	**Study** the quantum mechanical picture of subatomic world along with the discrepancies between the classical estimates and laboratory observations of electron transportation phenomena by free electron theory and band theory. (L2)
CO5	**Elaborate** the physical properties exhibited by materials through the understanding of properties of semiconductors and superconductors. (L5)

B.Tech I Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC01 - NETWORK THEORY

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

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

UNIT – I: INTRODUCTION TO ELECTRICAL CIRCUITS

Passive components and their V-I relations, Energy sources - Ideal, Non-ideal, Independent and dependent sources, Source transformation Kirchoff's laws, Star–to-Delta or Delta-to-Star Transformations, Mesh analysis and Nodal analysis problem solving, Super node and Super mesh for DC Excitations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Gain knowledge on basic network elements, voltage and current laws **L1**
- Apply Kirchhoff's laws, network reduction techniques on simple electrical circuits with dependent & independent sources **L3**
- Solve complex circuits using mesh and nodal analysis techniques **L3**

UNIT – II: NETWORK THEOREMS

Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity theorem, Millman theorem, Miller Theorem, Compensation theorem - problem solving using dependent sources also, Duality and dual networks.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand significance of duality and dual networks **L2**
- Select appropriate theorem for network simplification **L6**
- Determine maximum power transfer to the load **L5**

UNIT – III: AC CIRCUITS AND TRANSIENTS

A.C Circuits: Characteristics of Sine wave, phase relation in pure Resistor, Inductor and Capacitor, Impedance, Admittance, Series and Parallel circuits, Power, problem solving using R-L-C elements with DC excitation and AC excitation.

Transients: Steady state and Transient response, DC Response of R-L, R-C and R-L-C, circuits, Sinusoidal Response of R-L, R-C and R-L-C circuit, Circuit elements in S-domain.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand behavior of circuit elements under switching conditions **L2**
- Analyze response of RL, RC & RLC circuits in time & frequency domains **L4**
- Evaluate initial conditions in RL, RC & RLC circuits **L5**

UNIT – IV: RESONANCE AND COUPLED CIRCUITS

Resonance: Series Resonance, Voltages and Currents in a Series Resonant Circuit, Quality factor and its effect on Bandwidth, Parallel resonance, Magnification.

Coupled Circuits: Introduction to Coupled circuits, Self Inductance , Mutual inductance, dot convention, Coefficient of Coupling, Series and Parallel connection of Coupled Coils.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand magnetically coupled circuits **L1**
- Determine resonant frequency and bandwidth of a simple series or parallel RLC circuit **L5**
- Determine voltages and currents in a resonant circuit **L5**

UNIT – V: TWO PORT NETWORKS & NETWORK FUNCTIONS

Two-Port Networks: Two port networks, Open circuit Impedance (Z) parameters, Short circuit Admittance (Y) parameters, Transmission (ABCD) parameters, Inverse Transmission (A'B'C'D') parameters, Hybrid (h) parameters, Inverse hybrid (g) parameters, Inter- relationships of different parameters, Inter-connection of two-port networks, T and π Representation.

Concept of complex frequency, driving point and transfer functions for one port and two port network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function

Learning Outcomes:

At the end of this unit, the student will be able to

- Determine network parameters for given two port network. **L5**
- Relate different two port network parameters. **L3**
- Represent transfer function for the given network. **L1**

Text Books:

1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw HillEducation, 2013.
2. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.

Reference Books:

1. D. Roy Choudhury, "Networks and Systems", New Age International Publications,1998.
2. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
3. Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.
4. Network Analysis by A. Sudhakar and Shyammohan S palli. McGraw-Hill, 5th Edition.

Course Outcomes:

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

- Solve network problems using mesh and nodal analysis techniques **L3**
- Analyze networks using Thevenin, Norton, Maximum power transfer, Superposition, Miller and Millman theorems **L4**
- Compute responses of first order and second order networks using time & frequency domain analysis **L5**
- Design resonant circuits for given bandwidth **L6**
- Utilize Z, Y, ABCD and h parameters for analyzing two port circuit behavior **L4**

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

I B.Tech – II Sem (ECE)

L	T	P	C
3	0	0	3

ELECTRICAL TECHNOLOGY

Course Objectives: Student can be able to know

- The constructional features of DC machines, different types of DC machines and their characteristic.
- The constructional details of single phase transformer and their performance characteristics by conducting suitable tests.
- The analysis of three phase balanced and unbalanced circuits, Three phase induction motors and their characteristics.
- The constructional feature and operation of synchronous machines.

UNIT- I DC Generators

Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators- Applications

Unit Outcomes:

- To know about principle of operation of a DC machine working as a generator
- To distinguish between self and separately excited generators and classification
- To know how emf is developed
- To distinguish between critical field resistance and critical speed
- To know about various characteristics of different types of generators

UNIT – II DC Motors

Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses – Calculation of Efficiency - Swinburne's Test.

Unit Outcomes:

- To know about principle of operation of DC machine working as a motor
- To know about torque developed and how to control speed of DC shunt motor
- To know about necessity of starter
- To know about various load characteristics of various types of DC motors

UNIT-III SINGLE PHASE TRANSFORMERS & THREE PHASE A.C. CIRCUITS

Introduction - Single Phase Transformers- Constructional Details and Applications - Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency-Regulation- OC and SC Tests - Predetermination of Efficiency and Regulation. Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems.

Unit Outcomes:

- To understand the principle of operation of 1-ϕ transformer
- To understand computation and predetermination of regulation of a 1-ϕ transformer
- To know about basics of three phase circuits
- To distinguish between phase voltages, currents, line values and phase values and balanced and unbalanced three phase circuits and power measurement

UNIT-IV 3-PHASE INDUCTION MOTORS

Polyphase Induction Motors-Construction Details and Applications of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation- Torque Slip Characteristics – Losses and efficiency.

Unit Outcomes:

- To know about principle of operation of three phase induction motor
- To distinguish between squirrel cage and slip ring induction motors
- To know about various losses and computation of efficiency of induction motor
- To know about the torque developed by the induction motor
- To understand various characteristics of induction motor

UNIT – V SYNCHRONOUS MACHINES

Principle and Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Applications , Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

Unit Outcomes:

- To know about principle of working of alternator
- To distinguish between salient pole and cylindrical rotor machines
- To know about emf equation
- To know about predetermination of regulation of alternator by synchronous impedance method
- To know about principle of operation of synchronous motor

Course Outcomes:

After completing the course, the student should be able to do the following:

CO1: Able to calculate the e.m.f. generated on DC Generator also able to control speed of different DC motors.

CO2: Able to conduct open circuit and short circuit tests on single phase transformer for knowing their characteristics.

CO3: Able to analyse three phase circuits, three induction motor operating principle and know their torque slip characteristics.

CO4: Able to have knowledge on synchronous machine with which he/she can able to apply the above conceptual things to real-world problems and applications

TEXT BOOKS:

1. I.J.Nagrath & D.P.Kothari, "Electric Machines", 7th Edition, Tata Mc Graw Hill, 2005
2. T.K.Nagsarkar and M.S. Sukhija, " Basic Electrical Engineering", 3rd Edition, Oxford University Press2017.
3.

REFERENCE BOOKS:

1. B. R. Gupta, "Fundamentals of Electric Machines", Vandana Singhal, 3rd Edition, New age International Publishers, 2005.
2. S. Kamakashiah, "Electromachanics – III", overseas publishers Pvt. Ltd.
3. V.K. Mehta and Rohit Mehta, "Principles of Electrical Engineering", S.Chand Publications, 2005.

B.Tech I Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC03- ECE WORKSHOP

L	T	P	C
1	0	4	3

Course Objectives: The objectives of the course are to make the students learn about

- To introduce electronic components, measuring instruments and tools used in electronic workshop.
- To give hands on experience with the use of laboratory equipment.
- To equip with the knowledge of understanding data sheets.
- To give working experience with prototype board, solder and de-solder the electronic components on a project board.
- To introduce EDA tools
- To provide knowledge in understanding working of various communication systems

Theory Concepts

- Introduce the materials required and construction of basic electronic components.
- Explain the usage of electronic workshop tools.
- Explain the applications and testing procedure of electronic components.
- Explain the working of basic electronic measuring instruments (Block diagram approach).
- Explain the basic communication systems (Block diagram approach) and their applications.

List of Exercises / Experiments

1. Familiarization/Application of commonly used Electronic Workshop Tools : Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
2. Familiarization/Application of testing and measuring instruments like Voltmeter, Ammeter, Multimeter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
3. Familiarization/Identification of electronic components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, color coding, package, symbol, cost etc.
4. Testing of electronic components like Resistor , Capacitor , Diode , Transistor etc. using Multimeter.
5. Study of CRO and to i) find the Amplitude and Frequency using CRO ii) measure the Unknown Frequency & Phase difference using CRO
6. Interpret data sheets of discrete components and IC's, estimation and costing.
7. Introduction to EDA Tools: MULTISIM/PSPICE/TINA schematic capture tool, learning of basic functions of creating a new project, getting and placing parts, connecting placed parts, simulating the schematic, plotting and analyzing the results.
8. Assembling and testing of simple electronic circuits on breadboards, assembling and soldering components on a PCB (Kit Assembling)
9. Familiarization of the following electronic systems
   - Assembling and dismantling of desktop computer/laptop/mobile phones.
   - PA system with different microphones, loud speakers, mixer etc.
10. Demonstrate working of various Communication Systems like Radio receiver, Television and Mobile communication system

References:

1. Dr. B.S. Chowdhry & Ahsan A. Ursani, The First Practical Book on Electronic Workshop, Mehran Infotech Consultants, Hyderabad.
2. Paul Horowitz & Ian Robinson, "Laboratory Manual for Art of Electronics", Cambridge University Press.
3. S M Dhir, Electronic Components & Materials, 2nd Edition, Tata McGraw - Hill Publishing Company Limited
4. Dr.S.K.Bhattacharya, Dr. S.Chatterji, Textbook of Projects in Electrical, Electronics, Instrumentation and Computer Engineering, S. Chand Publishers., New Delhi.
5. Sengupta R., Textbook of Principles and Reliable Soldering Techniques, New Age International Ltd.

Course Outcomes:

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

- Identify discrete components and ICs. **L1**
- Perform soldering- de-soldering techniques. **L3**
- Assemble simple electronic circuits over a PCB. **L1**
- Perform measurements using various electronic instruments such as Cathode ray oscilloscope, multimeter and function generator. **L3**
- Testing of various components. **L5**
- Interpret specifications (ratings) of the component. **L1**
- Demonstrate working of various communication systems. **L1**

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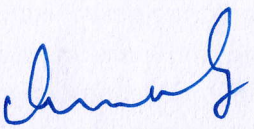

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

I B.Tech – II Semester (ECE)

L	T	P	C
0	0	3	1.5

NETWORKS AND ELECTRICAL TECHNOLOGY LAB

Course Objectives:

- To gain hands on experience in verifying network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters
- To study performance of DC generators and DC motors
- To study performance of 1-ϕ transformer and 3-ϕ Induction motors
- To study performance of on Alternator

LIST OF EXPERIMENTS

Any Six from the following experiments

1. Verification of Superposition & Reciprocity Theorem
2. Verification of Thevenin's and Norton's Theorem
3. Verification of Maximum Power Transfer Theorem
4. Measure and calculate RC time constant for a given RC circuit
5. Measure and calculate RL time constant for a given RL circuit
6. Design a series RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
7. Measure and calculate Z, Y parameters of two-port network.
8. Measure and calculate ABCD & h parameters of two-port network.

Any Six from the following experiments

1. OCC of a separately excited DC generator
2. Load characteristics of DC shunt generator
3. Load characteristics of DC shunt motor
4. Swinburne's test
5. Speed control of DC shunt motor
6. OC & SC tests on a 1-ϕ transformer
7. Load test on Squirrel cage Induction motor
8. Predetermination of regulation of alternator by Synchronous impedance method

Course Outcomes:

- Verify network theorems
- Measure time constants of RL & RC circuits
- Design resonant circuit for given specifications
- Characterize and model the network in terms of all network parameters
- To understand various characteristics of DC generators and DC motors
- To predetermine the efficiency and regulation of a 1-ϕ transformer
- To understand various characteristics of Induction motors and Synchronous machines

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::
PULIVENDULA
B.Tech I Year Syllabus (R20 Regulation)
Applied Physics Laboratory
(ECE, EEE & CSE)

L T P C
0 0 3 1.5

Course Objectives:

- Understands the concepts of interference, diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
- Illustrates the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

Note: In the following list, out of 15 experiments, any 10 experiments must be performed in a semester

List of Applied Physics Experiments

1. Determination of the thickness of thin object using wedge shape method
   Experimental outcomes:
   Operates optical instrument like travelling microscope. (L2)
   Estimate the thickness of the wire using wedge shape method (L2)
   Identifies the formation of interference fringes due to reflected light from non-uniform thin film. (L2)
2. Determination of the radius of curvature of the lens by Newton's rings
   Experimental outcomes:
   Operates optical instrument like travelling microscope. (L2)
   Estimate the radius of curvature of the lens (L2)
   Identifies the formation of interference fringes due to reflected light from non-uniform thin film. (L2)
   Plots the square of the diameter of a ring with no. of rings (L3)
3. Determination of wavelengths of various spectral lines of mercury source using diffraction grating in normal incidence method
   Experimental outcomes:
   Operates optical instrument like spectrometer. (L2)
   Estimate the wavelength of the given source (L2)
   Identifies the formation of grating spectrum due diffraction. (L2)
4. Determination of dispersive power of prism.
   Experimental outcomes:
   Operates optical instrument like spectrometer. (L2)
   Estimate the refractive index and dispersive power of the given prism (L2)
   Identifies the formation of spectrum due to dispersion. (L2)
5. Determination of wavelength using diffraction grating by laser source.
   Experimental outcomes:
   Operates various instrument (L2)
   Estimate the wavelength of laser source (L2)
   Identifies the formation of grating spectrum due diffraction. (L2)
6. Determination of particle size by laser source.
   Experimental outcomes:
   Operates various instrument (L2)
   Estimate the Particles size using laser (L2)
   Identifies the application of laser (L2)
7. Determination of numerical aperture and acceptance angle of an optical fiber
   Experimental outcomes:
   Operates various instruments and connect them as per the circuit. (L2)
   Estimate the numerical aperture and acceptance angle of a given optical fiber. (L2)
   Identifies the significance of numerical aperture and acceptance angle of an optical fiber in various engineering applications. (L2)
8. Determination of dielectric constant and Curie temperature of a ferroelectric material.
   Experimental outcomes:
   Operates various instruments and connect them as per the circuit. (L2)
   Estimate thedielectric constantof the given substance. (L2)
   Identifies the significance of dielectric constant in various devices. (L2)

9. Study of variation of Magnetic field along the axis of a current carrying coil – Stewart-Gee's Method.

Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)

Estimate the magnetic field along the axis of a circular coil carrying current. (L2)

Plots the intensity of the magnetic field of circular coil carrying current with distance (L3)

10. Measurement of magnetic susceptibility by Gouy's method

Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)

Estimate the magnetic susceptibility of the given material. (L2)

Identifies the significance of magnetic susceptibility in various engineering applications. (L2)

11. Study of B-H curve of Ferromagnetic material

Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)

Estimate the hysteresis loss, coercivity and retentivity of the ferromagnetic material. (L2)

Classifies the soft and hard magnetic material based on B-H curve. (L2)

Plots the magnetic field H and flux density B (L3)

12. Determination of the resistivity of semiconductor by four probe method

Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)

Estimate the resistivity of a semiconductor. (L2)

Identifies the importance of four probe method in finding the resistivity of semiconductor. (L3)

13. Study of Energy gap of a material using p-n junction diode

Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)

Estimate the energy gap of a semiconductor. (L2)

Illustrates the engineering applications of energy gap. (L3)

Plots 1/T with log R (L3)

14. Determination of mobility of charge carriers in semiconductor by Hall Effect.

Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)

Estimate the charge carrier concentration and mobility in a semiconductor. (L2)

Illustrates the applications of Hall Effect. (L3)

Plots the voltage with current and voltage with magnetic field (L3)

15. Determination of losses in optical fiber.

Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)

Estimate the numerical aperture and acceptance angle of a given optical fiber. (L2)

Identifies the significance of losses in optical fiber and its engineering applications. (L2)

Course Outcomes:

The students will be able to

- **Operate** optical instruments like microscope and spectrometer (L2)
- **Determine** thickness of a hair/paper with the concept of interference (L2)
- **Estimate** the wavelength of different colors using diffraction grating and resolving power (L2)
- **Plot** the intensity of the magnetic field of circular coil carrying current with distance (L3)
- **Evaluate** the acceptance angle of an optical fiber and numerical aperture (L3)
- **Determine** the resistivity of the given semiconductor using four probe method (L3)
- **Identify** the type of semiconductor i.e., n-type or p-type using hall effect (L3)
- **Calculate** the band gap of a given semiconductor (L3)

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

B.Tech I Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME04 - ENGINEERING WORKSHOP

(ECE)

L	T	P	C
0	0	3	1.5

Course Objectives:

- To bring awareness about workshop practices for Engineers.
- To familiarize how wood working operations can be performed.
- To teach the practices for sheet metal operations.
- To develop the technical skills related to fitting and electrical wiring.

Section 1 : Wood Working

Familiarity with different types of woods and tools used in wood working and make following joints

a) Half – Lap joint
b) Mortise and Tenon joint
c) Corner Dovetail joint or Bridle joint
d) Wood turning operation

Section 2 : Sheet Metal Working

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing & Riveting

Section 3 : Fitting

Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b) Dovetail fit c) Contour Fitting
d) Bicycle tire puncture and change of two wheeler tyre

Section 4 : Electrical Wiring

Familiarities with different types of basic electrical circuits and make the following connections

a) Parallel and series b) Two way switch c) Godown lighting d) Tube light
e) Three phase motor f) Soldering of wires

Text Books:

1. K.Venkata Reddy., Workshop Practice Manual, 6/e BS Publications.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2/e, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2/e, PHI 2010.

Course Outcomes:

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

- Apply wood working skills in real world applications. (L6)
- Apply fitting operations in various applications. (L6)
- Build different parts with metal sheets in real world applications. (L5)
- Demonstrate soldering and brazing. (L4)
- Apply basic electrical engineering knowledge for house wiring practice. (L6)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
II Year B.Tech. I-Sem (R20)
20ABS12-COMPLEX VARIABLES AND TRANSFORMS
(Common for EEE& ECE)

L	T	P	C
3	0	0	3

Course Objectives:

- To gain the knowledge of the basic probability concepts and acquire skills in handling situations (L3)
- Involving more than one random variable and functions of random variables. (L3)
- To understand the principles of random signals and random processes. (L2)
- To be acquainted with systems involving random signals. L(3)
- To gain knowledge of standard distributions that can describe real life phenomena. (L4)

UNIT – 1: Complex Variables – Differentiation:
Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations in Cartesian and Polar coordinates (without proof), analytic functions, harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method. Properties of elementary functions of exponential, trigonometric, hyperbolic, and logarithm.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand functions of Complex variable and its properties. L1
- Find derivatives of complex functions. L3
- Understand the analyticity of complex functions. L2

UNIT – II: Complex Variables – Integration:
Line integral-Contour integration, Cauchy's integral theorem (with proof), Cauchy Integral formula, Cauchy Integral formula for derivatives (All theorems without Proof).
Power series expansions: Taylor's series and Laurent's series (without proof); zeros of analytic functions, singularities.
Residues: Evaluation of residue by formula and by Laurent's series, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi-circle with *f(z)* not having poles on real axis).

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the integration of complex functions. L2
- Apply Cauchy's integral theorem and Cauchy's integral formula. L3
- Understand singularities of complex functions. L2
- Evaluate improper integrals of complex functions using Residue theorem. L3

UNIT – III: Laplace Transforms:
Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the concept of Laplace transforms and finds the Laplace transforms of elementary functions. L2
- Find the Laplace transforms of general functions using its properties. L3
- Understand Laplace transforms of special functions (Unit step function, Unit Impulse & Periodic). L2
- Apply Laplace transforms to solve Differential Equations. L3

UNIT – IV: Fourier series:

Fourier coefficients (Euler's formulae) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions. Complex form of Fourier series.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand finding Fourier series expression of the given function. L2
- Determine Fourier coefficients (Euler's) and identify existence of Fourier series of the given function. L3
- Expand the given function in Fourier series given in Half range interval. L3

UNIT – V: Fourier transforms & Z Transforms:

Fourier Integrals & Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral.

Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem – Finite Fourier Sine and Cosine transforms.

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z - transforms.

Learning Outcomes:

At the end of this unit, the student will be able to

- Find Fourier Sine and cosine integrals and Understand Fourier transforms. L3
- Apply properties of Fourier transforms. L3
- Apply Z transforms to solve difference equations. L3

Text Books:

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna publishers.
2. Advanced Engineering Mathematics, R K Jain and S R K Iyengar, Narosa Publishing House, New Delhi.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V.Ramana, Higher, "Engineering Mathematics", McGraw Hill publishers.
2. Alan Jeffrey, "Advanced Engineering Mathematics", Elsevier.

Course Outcomes:

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

- Understand the elementary functions of complex variable. L1
- Understand the analyticity of complex functions and conformal mappings. L2
- Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours. L3
- Understand the usage of Laplace Transforms, Fourier Transforms and Z transforms. L3
- Evaluate the Fourier series expansion of periodic functions. L3

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B.Tech II Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC04 - ELECTRONIC DEVICES AND CIRCUITS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

1. To provide a comprehensive idea about semiconductors, working of PN junction diode.
2. To acquire knowledge about special diodes and applications of PN junction diode like rectifiers, clippers and clampers.
3. To explain the construction and working of Bipolar junction transistors and Field effect transistors.
4. To introduce various biasing and stabilization circuits.
5. To analyze BJT modeling using h-parameters and to find h-parameters of BJT in different configurations.

UNIT – I:

Semiconductors: Intrinsic and extrinsic semiconductors, mobility and conductivity, Fermi level and carrier concentration of semiconductors, Mass action law, variation of semiconductor parameters with temperature, Drift and diffusion currents, continuity equation, Hall Effect.

PN junction diode: Band structure of PN Junction, Quantitative Theory of PN Diode, types of PN junction diode, VI Characteristics, PN diode current equation, Diode resistance, Transition and Diffusion Capacitance, effect of temperature on PN junction diode, Illustrative problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the semiconductor materials properties and their importance in semiconductor devices **L2**
- Summarize the working of PN Junction diode and its parameters **L2**

UNIT – II:

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

Diode applications: Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics, Clipping and Clamping circuits, Voltage doubler , Illustrative problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the usage of special diodes in different applications **L1**
- Compare the working of rectifier circuits with and without filters **L2**

UNIT – III:

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

Field Effect Transistors: The Junction Field Effect Transistor (Construction, Principle of Operation), Pinch off Voltage, VI Characteristics, CG,CS and CD configurations, FET as Voltage Variable Resistor, Comparison between BJT and FET, MOSFET Construction, VI Characteristics and working in depletion and enhancement mode.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the construction, operation, characteristics and applications of BJT & FET's **L1**
- Compare the working of BJT & FET's in different configurations **L2**

UNIT – IV:

BIASING AND STABILISATION: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self Bias, Bias Stability, Stabilization against Variations in I_{CO} V_{BE} and β, Bias Compensation Using Diodes and Transistors, Thermal Runaway, Condition for Thermal Stability in CE configuration, Illustrative problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the importance of DC, AC Load lines & Biasing **L1**
- Apply biasing and compensation circuits for providing stability against variations in I_{CO}, V_{BE} and β **L3**

UNIT – V:

SMALL SIGNAL ANALYSIS OF AMPLIFIERS: BJT Modeling using h-parameters, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Analysis of CE, CB and CC configurations using h-Parameters, Comparison of CB, CE and CC configurations, Simplified Hybrid Model, Illustrative problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Determine and measure h-parameters of a BJT. **L1**
- Analyze CE, CB & CC Configuration's using h-parameters **L4**

Text Books:

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008.

Reference Books:

1. Electronics Devices and Circuits Theory, R.L.Boylestad, Lousis Nashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012.
3. Solid State Electronic Devices, Ben G. Streetman and Sanjay Banerjee Prentice Hall, 2000

Course Outcomes:

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

1. Get a comprehensive idea about semiconductors, working of PN junction diode. **L2**
2. Acquire knowledge about special diodes and applications of PN junction diode like rectifiers, clippers and clampers. **L1**
3. Understand the construction and working of bipolar junction transistors and Field effect transistors. **L2**
4. Compare the working of various biasing and stabilization circuits. **L2**
5. Analyze and find h-parameters of BJT in different configurations. **L4**

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B.Tech II Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC06 - DIGITAL LOGIC AND DESIGN

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To discuss different simplification methods for minimizing boolean functions
- To learn simplification of Boolean functions and their realization using logic gates.
- To gain knowledge on VHDL fundamentals, compilers, simulators and synthesis tools.
- To understand and design various combinational logic circuits.
- To study the design of sequential logic circuits in synchronous and asynchronous modes.
- To introduce programmable logic devices and to realize switching functions using

UNIT – I:

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Quine –McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply basic laws & De Morgan's theorems to simplify Boolean expressions **L3**
- Compare K- Map&Q-M methods of minimizing logic functions **L5**

UNIT – II:

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

The VHDL Hardware Description Language: Design flow, program structure, libraries and packages. Structural design elements, data flow design elements, behavioral design elements.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply Boolean algebra for describing combinational digital circuits **L3**
- Analyze standard combinational circuits such as adders, subtractors and code converters etc. **L4**
- Learn the Hardware Description Language (VHDL) **L1**

UNIT – III:

Combinational Logic Design 2: Decoders (3 to 8, octal to decimal), Encoders, Priority Encoders, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers and their HDL models, HDL modeling of code converters. Multi-level implementation of multiplexer, demultiplexer , decoder, encoder.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply Boolean algebra for describing combinational digital circuits. **L3**
- Design and analyse various Combinational logic circuits. **L6**

UNIT – IV:

Sequential Logic Design: Latches, Flipflops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, flipflop conversions, set up and hold times, Ripple and Synchronous counters, Shift registers, and their HDL models.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe behaviour of Flip-Flops and Latches. **L1**
- Design sequential circuits using flip flops , registers and counters. **L6**

UNIT – V:

Finite state machines: Introduction to FSM, Moore and Mealy sequence detector and its HDL model.

Programmable Logic Devices: ROM, Programmable Logic Devices (PLDs), Introduction to logic families and their comparisons.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe functional differences between different types of memories (L1). **L1**
- Compare different types of Programmable Logic Devices (L2). **L4**

Text Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. J. Bhasker, "A VHDL Primer," 3rd Edition, Pearson Education/ PHI.

Reference Books:

1. Thomas L. Floyd, "Digital Fundamentals", Pearson, 11th edition, 2015.
2. Digital Design- Morris Mano, PHI, 4th Edition,2006

B.Tech II Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC08 - SIGNALS AND SYSTEMS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To introduce terminology of signals and systems.
- To present Fourier tools through the analogy between vectors and signals.
- To teach concept of sampling and reconstruction of signals.
- To present linear systems in time and frequency domains.
- To teach Laplace and z-transform as mathematical tool to analyze continuous and discrete-time signals and systems.

UNIT – I:

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

Learning Outcomes:

At the end of this unit, the student will be able to

•Describe continuous time signal and discrete time signal **L2**

• State principles of vector spaces and concept of orthogonality **L1**

UNIT – II:

Fourier Series and Fourier Transform; Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, standard signals and periodic signals, properties of Fourier transforms, Fourier transforms involving impulse and Signum functions. Introduction to Hilbert Transform.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify system properties based on impulse response and Fourier analysis **L3**
- Analyze the spectral characteristics of signals **L4**

UNIT – III:

Sampling : Sampling theorem, graphical and analytical proof for band limited signals, impulse sampling, sampling with zero order hold, Nyquist criterion, reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

Analysis of Linear Systems: Linear system, impulse response, response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Convolution: time domain, frequency domain and graphical representation. Transfer function of a LTI system.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe fundamentals of sampling (impulse modulation), including the implications of the sampling theorem (**L2**
- Illustrate signal sampling and its reconstruction **L2**

UNIT – IV:

Filter characteristics of linear systems, Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

Correlation of signals: Cross-correlation and auto-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compare and contrast the systems in time and frequency domain **L5**
- Determine relation between auto-correlation and Power density spectrum **L3**

UNIT – V:

Transform Techniques : 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 Laplace transforms, Laplace transform of certain signals using waveform synthesis.

Discrete time signal representation using complex exponential and sinusoidal components , 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, Inverse Z-transform, properties of Z-transforms.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply transform techniques to analyze discrete-time signals and systems **L3**
- Evaluate response of linear systems to known inputs by using Laplace transforms **L5**

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. 2009.

Reference Books:

1. Simon Haykin and Van Veen, Signals & Systems, Wiley, 2nd Edition.
2. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms,and Applications, 4 th Edition, PHI, 2007.
3. BP Lathi, Principles of Linear Systems and Signals Oxford University Press, 2015.

Course Outcomes:

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

- List different types of signals and systems **L1**
- Identify system properties based on impulse response and Fourier analysis **L3**
- Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back **L3**
- Classify systems based on their properties and determine the response of LTI system using convolution **L4**
- Discuss relationships among the various representations of LTI systems **L5**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AHS04 - MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to all Branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To inculcate the basic knowledge of micro economics and financial accounting.
- To make the students learn how demand is estimated for different products, input- output relationship for optimizing production and cost.

UNIT – I

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the nature and scope of Managerial Economics and its importance. **L1**
- Understand the concept of demand and its determinants. **L2**

UNIT – II

Theory of Production: Production Function- Isoquants and Isocosts, MRTS, Cobb-Douglas Production function.

Cost Analysis: Cost concepts, Opportunity cost, Fixed Vs Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break even analysis -Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEP.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the production function, Input-Output relationship and different cost concepts. **L1**
- Apply the least-cost combination of inputs. **L2**

UNIT – III

Introduction to Markets: Market structures: Types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition. Price-Output Determination under Perfect Competition, Monopoly, Monopolistic Competition.

Pricing Policies: Methods of Pricing-Marginal Cost Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Bundling Pricing, and Peak Load Pricing. Internet Pricing Models: Flat rate pricing, Usage sensitive pricing, Transaction based pricing, Priority pricing, charging on the basis of social cost, Precedence model, Smart market mechanism model.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply the price output relationship in different markets. **L1**
- Evaluate price-output relationship to optimize cost, revenue and profit. **L2**

UNIT – IV

Types of Industrial Organization: Characteristic features of Industrial organization, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, State/Public Enterprises and their types.

Capital Budgeting: Introduction to capital, Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions (Examples of capital budgeting) - Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), IRR and Net Present Value Method (simple problems).

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the concept of capital budgeting and its importance in business. **L1**
- Contrast and compare different investment appraisal methods. **L2**

UNIT – V

Introduction to Financial Accounting: Introduction to Double-entry system, Journal, Ledger, Trial Balance- Final Accounts (with simple adjustments) - Limitations of Financial Statements.

Interpretation and analysis of Financial Statement: Ratio Analysis – Liquidity ratios, Profitability ratios and solvency ratios – Preparation of changes in working capital statement and fund flow statement.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the concept, convention and significance of accounting. **L1**
- Apply the fundamental knowledge of accounting while posting the journal entries. **L2**

Text Books:

1. **J.V. Prabhakar Rao**: Managerial Economics and Financial Analysis, Maruthi Publications, 2011.
2. **Prof. C.Viswanatha Reddy:** 'Financial Accounting-1' Himalaya Publishing House, Newdelhi.

Reference Books:

1. **A R Aryasri** - Managerial Economics and Financial Analysis, TMH 2011.
2. **Suma damodaran**- Managerial Economics, **Oxford** 2011.
3. **S.A. Siddiqui & A.S. Siddiqui**, Managerial Economics and Financial Analysis, New Age International Publishers, 2011.
4. **N. Appa Rao. & P. Vijaya Kumar**: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi, 2011.

Course Outcomes:

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

- Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives. **L1**
- Be able to perform and evaluate payback period and capitalized cost on one or more economic alternatives. **L2**
- Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives. **L3**
- Evaluate the capital budgeting techniques. **L4**
- Students can analyze how to invest their capital and maximize returns. **L5**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AHS05 - ENTERPRENUARSHIP AND INNOVATION MANAGEMENT

(Common to all Branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To enable students understand the opportunities available to start a business.
- To impart knowledge about various sources of support (Financial and Non-financial) available to start an enterprise.

UNIT – 1: FUNDAMENTALS OF ENTREPRENEURSHIP

Fundamentals of Entrepreneurship – Evolution and Theories of Entrepreneurship – Characteristics of Entrepreneurs –Myths of Entrepreneurship – Kakinada Experiment -Elements of leadership –Role of Entrepreneurs in Indian economy – Social and Ethical Perspectives of Entrepreneurship - Corporate entrepreneurship – Social Entrepreneur, women Entrepreneurship - Opportunities & challenges.

Learning Outcomes:

At the end of this unit, the student will be able to

- Define entrepreneurship and the characteristics of an entrepreneur. **L1**
- Explain the significance of entrepreneurship in the economic development of a nation. **L2**

UNIT – II: IDEATION AND EVALUATION OF BUSINESS IDEAS

Opportunity identification – Ideations process - Sources of business ideas – Role of creativity – Sources of Innovation - Business Idea Evaluation - Product/ Service design – Design Thinking - Customer Value Proposition (CVP) – Business models.

Case study: Business cases of OYO, Paytm and Flipkart/ Smartmart.

Activity: Idea generation in groups and CVP.

Learning Outcomes:

At the end of this unit, the student will be able to

- Select the right business ideas. **L1**
- Explain the business idea evaluation process **L2**

UNIT – III: Business Organizations and Venture Establishment

Forms of business organisations/ownership – Techno-economic feasibility assessment – Financial feasibility – Market feasibility – Preparation of Business plan – Business canvas & Lean canvas – Challenges & Pitfalls in selecting new venture.

Activity: Preparation of business plan (draft).

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall different forms of business organizations. **L1**
- Develop business canvas. **L2**

UNIT – IV: Introduction to Innovation

Creativity, Invention and innovation, Types of Innovation, Relevance of Technology for Innovation, The Indian innovations and opportunities.

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to develop new ideas to discover new ways of looking problems and opportunities. **L1**
- Apply technology to innovation. **L2**

UNIT – V: Promoting and managing innovation

Innovators and Imitators, Patents, Trademarks, Intellectual Property, Exploring, Executing, Leveraging and renewing innovation, Enhancing Innovation Potential & Formulating strategies for Innovation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Intellectual Property Licensing. **L1**
- Summarize the importance of IPR. **L2**

Text Books:

1. Robin Lowe and Sue Marriott, Enterprise: Entrepreneurship and Innovation Concepts, Contexts and Commercialization.
2. John Bessant and Joe Tidd, Innovation and Entrepreneurship.

Reference Books:

1. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.
2. Peter F. Drucker, Innovation and Entrepreneurship.
3. EDII "Faculty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.
4. Philips, Bonefiel and Sharma (2011), Social Entrepreneurship, Global vision publishing house, New Delhi.

Course Outcomes:

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

- Choose entrepreneurship as an alternative career. **L1**
- Distinguish between corporate and social entrepreneurs. **L2**
- Examine and build customer value proposition. **L3**
- Analyze feasibility of business ideas. **L4**
- Compare various supports schemes provided by GOI. **L5**

B.Tech II Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC05 - ELECTRONIC DEVICES AND CIRCUITS LABORATORY

L	T	P	C
1	0	4	3

Course Objectives: The objectives of the course are to make the students learn about

1. To verify the VI Characteristics of PN Junction Diode, Zener Diode, FET, SCR & UJT
2. To demonstrate the working of Half Wave and Full Wave Rectifiers without and with filters.
3. To analyze the characteristics of BJT and FET in various configurations.
4. Differentiate the working of BJT and FET as amplifier in various configurations.

List of Experiments: (Any 12 Experiments are to be conducted)

1. P-N Junction Diode Characteristics
2. Zener Diode as voltage regulator
3. Half Wave Rectifiers (without and with filter)
4. Full Wave Rectifiers (without and with filter)
5. CB Characteristics
6. CE Characteristics
7. CC Characteristics
8. FET Characteristics
9. SCR Characteristics
10. UJT Characteristics
11. CE Amplifier
12. CC Amplifier
13. FET-CS Amplifier
14. FET –CD Amplifier
15. Clippers
16. Clampers

Course Outcomes:

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

1. Use PN Junction Diode, Zener Diode, FET, SCR & UJT for practical applications. **L3**
2. Demonstrate the working of Half wave & Full wave rectifiers without and with filters. **L4**
3. Analyze the characteristics of BJT and FET in various configurations. **L4**
4. Differentiate the working of BJT and FET as amplifier in various configurations **L2**

B.Tech II Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC07 - DIGITAL LOGIC AND DESIGN LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

1. To get the knowledge about functionality of various digital circuits(logicgates, adders, subtractors, converters, multiplexers and comparators.)
2. To use computer-aided design tools for development of complex digital logic circuits
3. To understand the functionality of various Digital ICs.

Note: Implement using digital ICs.

List of Experiments: (Any 4 Experiments are to be conducted)

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter
6. Design and realization of 8x1 MUX using 2x1 MUX
7. Design and realization of 4 bit comparator

List of Experiments: (Any 8 Experiments are to be conducted)

Write a VHDL code to Simulate and synthesize the following in Gate level, Data flow and Behavioral Modeling styles.

1. Logic Gates.
2. Adders and Subtractors.
3. Multiplexers and De-multiplexers.
4. Encoders, Decoders, Comparator.
5. Implementation of logic function using Multiplexers and Decoders.
6. Arithmetic and Logic Unit.
7. Flip-Flops.
8. Up, Down and UP/Down Counters.
9. Sequence Detector using Mealy and Moore type state machines.

Course Outcomes:

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

1. Understand the functionality of various digital circuits **L2**
2. Use computer-aided design tools for development of digital logic circuits **L3**
3. Learn the functionality of various Digital ICs **L1**

B.Tech II Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC09 - SIGNALS AND SYSTEMS LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

1. To provide practical exposure to generate and simulate basic signals.
2. To analyze signals and sequences using Fourier, Laplace and Z-transforms.
3. To write programs for signal processing applications.

List of Experiments (All the experiments are to be simulated using MATLAB or equivalent software)

1. Write a program to generate various Signals and Sequences
2. Write a program to perform operations on Signals and Sequences
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal and reconstruct the signal.
4. Write a program to find Fourier transform of a given signal. Write a program to convolve two discrete time sequences.
5. Write a program to find autocorrelation and cross correlation of given sequences.
6. Write a program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
7. Write a program to generate discrete time sequence.
8. Write a program to find magnitude and phase response of first order low pass and high pass filter.
9. Write a program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
10. Write a program to generate Complex Gaussian noise and find its mean, variance, PDF and PSD.
11. Generate a Random data (with bipolar) for a given data rate .
12. To plot pole-zero diagram in S-plane / Z-plane of given signal/sequence and verify its stability

Course Outcomes:

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

1. Generate signals and sequences to the systems to perform various operations **L3**
2. Analyse signals using Fourier, Laplace and Z-transforms **L4**
3. Write programs for signal processing applications **L6**

B.Tech II Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS13-DATA STRUCTURES AND PYTHON PROGRAMMING

(ECE)

L	T	P	C
1	0	2	1.5

Course Objectives:

- To introduce different data structures for solving the problems.
- To demonstrate modeling the given problem as a graph
- To use iterations and generators.
- To test objects and handle changing requirements.

UNIT – I: STACKS, QUEUES AND LINKED LIST **8hrs**

Introduction: Stacks, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists, Additional List Operations, Doubly Linked Lists.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand why Python is a useful scripting language for developers **L1**
- To learn how to design and program Python applications. **L1**

UNIT – II: SEARCHING AND SORTING TECHNIQUES & TREE **8hrs**

Searching and Sorting Techniques: Linear and Binary search, Insertion, selection, quick, merge, and bubble sort.

Trees: Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Heap Tree.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn how to use lists, tuples, and dictionaries in Python programs **L2**
- To learn how to identify Python object types **L2**
- To learn how to use indexing and slicing to access data in Python programs **L2**

UNIT – III: GRAPHS AND HASHING **8hrs**

Graphs: The graph abstract data type, Elementary graph operations, Minimum cost spanning trees, transitive closure.

Hashing: Introduction, Static hashing, dynamic hashing.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn how to write loops and decision statements in Python **L3**
- To learn how to write functions and pass arguments in Python **L3**

UNIT – IV: INTRODUCTION, DATA TYPES EXPRESSIONS AND CONTROL STRUCTURES **7 Hrs**

Introduction, Data Types and Expressions: The Python programming language, First program in Python, Literals, Variables and Identifiers, Operators, Expressions and Data types. **Control Structures:** Control structures, Boolean expressions, Selection control and Iterative control.	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• To learn how to build and package Python modules for reusability	**L3**
• To learn how to read and write files in Python	**L3**
• To learn how to design object□oriented programs with Python classes	**L3**
UNIT – V: LISTS, DICTIONARIES,TUPLES AND SETS	
Lists: List structures, Lists in Python, Iterations over lists, Assigning and copying lists, List comprehensions. **Dictionaries, Tuples and Sets:** Dictionary types in Python, Implementation of Dictionary, Tuples, Set data type - the Set data type in Python, Implementation of sets. **Design With Functions** : Program routines, Functions, Recursion-Recursive functions,	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• To learn how to use class inheritance in Python for reusability	**L4**
• To learn how to use exception handling in Python applications for error handling	**L5**
Text Books:	
1. **"The Complete Reference C":** Fourth Edition Herbert Schildt Osborne/McGraw-Hill.	
2. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2016	
3. "C Programming and Data Structures", by E. Balaguruswamy, McGraw-Hill.	
4. "Data Structures using C", by Reema Thareja, 2nd Edition, OXFORD Press.	
5. "Fundamentals of Data Structures in C", Horowitz, Sahni, Anderson-freed, 2nd Edition, 2011, Universities Press.	
6. Mark Lutz, "Programming Python," O'Reilly Publications, Fourth Edition, 2011.	
Reference Books:	
1. RS Bichkar "Programming with C", 2012, Universities Press.	
2. Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage	
3. Byron Gottfried and Jitender Kumar Chhabra, "Programming with C", 4th Edition, 2019,McGraw Hill Education.	
4. Kenneth Lambert and B.L. Juneja, *Fundamentals of Python,* Cengage Learning, Third Edition, 2012.	
Course Outcomes:	
At the end of this Course the student will be able to	
• Develop the applications using stacks and queues.	**L2**
• Evaluate Expressions & Construct the linked list for various applications	**L3**
• Compare different searching, sorting and tree structures.	**L3**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AHS03 - UNIVERSAL HUMAN VALUES

(Common to all branches)

L	T	P	C
3	0	0	0

Course Objectives:

- Exposure to the value of life, society and harmony.
- Leading towards holistic perspective based on self-exploration about themselves (human being), family, and society and nature/existence.
- Bringing transition from the present state to Universal Human Order.
- Instill commitment and courage to act.
- Know about appropriate technologies and management patterns.

UNIT –I : HUMAN VALUES 12 Hrs

Importance of UHV- Morals-Values –Ethics- definitions and differences-Integrity-Work Ethic-Service learning –Respect for others –Caring and Sharing – Honesty – self confidence-Courage-Co Operation –Commitment – Empathy –Character-Spirituality- Moral dilemmas.

Learning Outcomes:

At the end of this unit, the student will be able to

Understand the concept of morals, Ethics. **L1**

Able to analyse Moral dilemmas. **L2**

UNIT – II: PERSONALITY DEVELOPMENT 12 Hrs

Concept Of Personality- Types-Determinants-Intrapersonal Skills-meaning-types- Techniques -Interpersonal Skills- meaning-types- Techniques-SWOT Analysis -Building Right Attitude.-Communication skills-Non Verbal Communication skills.

Learning Outcomes:

At the end of this unit, the student will be able to

Analysing SWOT. **L1**

Knowing about self personality. **L2**

UNIT – III : ENGINEERING AS EXPERIMENTATION 12 Hrs

Engineering as an Experimentation-Engineers as Responsible Experimenters -Codes Of Ethics and Industrial Standards-Case Study: The Challenger-Confidentiality-Conflicts of Interests-Risk and Analysis methods-Safety and Safety Measures.

Learning Outcomes:

At the end of this unit, the student will be able to

Understand the concept of Ethics in industry. **L1**

Able to assesment safety standards. **L2**

UNIT – IV : FAMILY AND SCOCIETY **12 Hrs**

Family -Importance –Types-Functions-Influences and generation gap- Premarital counseling-Good family-Characteristics-Building a healthy family- Parents and Children -Honouring Parents-Society Definition—Types-Roles-Responsibilities-Social Evils-reasons-remedies.

Learning Outcomes:

At the end of this unit, the student will be able to

Development of a holistic perspective based on self-exploration about themselves. **L1**

Strengthening of self-reflection. **L2**

UNIT – V : GLOBAL ISSUES **12 Hrs**

Globalization: Globalization-MNCs-Technology-Cross culture issues- Environmental Ethics-Disasters- global pandemics-Computer Ethics and Net Etiquettes -Human and Employee Rights-Weapons Development -Ethics and Research-Intellectual Property Rights(IPR).

Learning Outcomes:

At the end of this unit, the student will be able to

Understand various cross culture issues. **L1**

Identifying Employee Rights. **L2**

Text Books:

1. **"Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.**
2. **Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.**
3. **"Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGrawHill– 2003.**
4. **"Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana Maruthi Publications.**
5. **"Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications.**

Reference Books:

1. **"Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.**
2. **"Professional Ethics and Human Values" by Prof.D.R.Kiran.**

Course Outcomes:

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

- Define terms like Natural Acceptance, Happiness and Prosperity. **L1**
- Know about appropriate technologies and management patterns Understand awareness of oneself, and ones surroundings (family, society, nature). **L2**
- Apply what they have learnt to their own self in different day-to-day settings in real life. **L3**
- Relate human values with human relationship and human society. **L4**
- Justify the need for universal human values and harmonious existence. **L5**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
II Year B.Tech. II-Sem (R20)

20ABS16 - PROBABILITY THEORY & RANDOM PROCESS

(ECE)

L	T	P	C
3	0	0	3

Course Objectives:

- To gain the knowledge of the basic probability concepts and acquire skills in handling situations (L3)
- Involving more than one random variable and functions of random variables. (L3)
- To understand the principles of random signals and random processes. (L2)
- To be acquainted with systems involving random signals. L(3)
- To gain knowledge of standard distributions that can describe real life phenomena. (L4)

UNIT – 1:Probability theory and Random Variable:

Probability Introduced Through Sets and Relative Frequency: Experiments and SampleSpaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency.

Joint and Conditional Probability, Total Probability, Bayes' Theorem, Independent Events, Problem Solving.

Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Expectation, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties, Problem Solving.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the fundamental concepts of probability theory, random variables, and conditional probability. **L2**
- Evaluate the different probability distribution and density functions. **L3**

UNIT – II: Operations on Single Random Variable and Multiple Random Variables:

Operations on Single Random Variable: Introduction, Expectation of a random variable, Moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function, transformations of random variable.

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence, Sum of Two RandomVariables, Sum of Several Random Variables, Central Limit Theorem (without Proof), Equal and Unequal Distributions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply the knowledge to the sum of random variables, central limit theorem in communication system **L3**
- Evaluate the single and multiple random variable concepts to expectation, variance and moments. **L3**

UNIT – III: Operations on Multiple Random Variables and Jointly Gaussian Random Variables:

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions,

Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables, Transformations of Multiple Random Variables.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply the different operations to multiple random variables **L3**
- Understand the concepts of linear transformation of Gaussian random variables **L2**

UNIT – IV: Random Processes-Temporal Characteristics, Stationary and Independency and Correlation Functions:

Random Processes-Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes.

Stationary and Independency: Distribution and Density Functions. Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity. Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes.

Correlation Functions: Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand and analyze continuous and discrete-time random processes. **L3**
- Analyze the concepts and its properties of auto correlation, cross correlation functions and power spectral density **L3**

UNIT – V: Random Processes-Spectral Characteristics:

The Power Density Spectrum and its Properties: The Power Density Spectrum, properties of the Power Density Spectrum, Bandwidth of the Power Density spectrum, Relationship between Power Spectrum and Autocorrelation Function.

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the concepts and its properties of Power Density Spectrum, Bandwidth of the Power Density spectrum. **L3**
- Analyze the concepts and its properties of Cross-Power Density Spectrum and establish the relationship between Cross-Power Spectrum and Cross-Correlation Function. **L3**

Text Books:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002.

Reference Books:

1. Simon Haykin, "Communication Systems", 3rd Edition, Wiley, 2010.
2. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing," 3rd Edition, Pearson Education, 2002.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis," 3rd Edition, Oxford, 1999.
4. Sp Eugene Xavier, "Statistical Theory of Communication", New Age International, 2008.

Course Outcomes:

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

- Understanding the concepts of Probability, Random Variables, Random Processes and their characteristics **L1**
- Learn how to deal with multiple random variables, conditional Probability, joint distribution and statistical independence. **L2**
- Formulate and solve the engineering problems involving random variables and random Processes. **L3**
- Analyze various probability density functions of random variables. **L4**
- Analyze the concepts and its properties of Power Density Spectrum, Bandwidth of the Power Density spectrum. **L3**

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B.Tech II Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ECE10- ELECTRONIC CIRCUIT ANALYSIS AND DESIGN

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

1. To gain the knowledge of analysis of BJT amplifiers at high frequencies.
2. To study about the multistage amplifiers and their performance characteristics.
3. To understand the effect of negative feedback on amplifier characteristics.
4. To learn the basic principles and working of oscillator circuits.
5. To get a basic idea about large signal amplifiers and tuned amplifiers.

UNIT – I:

Multistage Amplifiers: Classification of Amplifiers- Distortion in amplifiers, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Different Coupling Schemes used in Amplifiers – RC Coupled Amplifier, Direct and Transformer Coupled Amplifiers, Frequency Response of BJT Amplifier, Design of Single stage RC Coupled Amplifier Using BJT, Analysis of Cascaded RC Coupled BJT Amplifiers, Darlington Pair, Cascode Amplifier, Illustrative problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyse the inter-stage coupling and performance parameters of multistage amplifiers. **L4**
- Design multiple stage amplifier circuits **L6**

UNIT – II:

High Frequency Analysis of BJT and FET: Logarithms, Decibels, General Frequency considerations, Analysis of BJT amplifiers at High Frequencies, Effect of Coupling and bypass Capacitors, The Hybrid-pi (π)- Common Emitter Transistor Model, CE short Circuit Current gain, Current gain with Resistive Load, Single Stage CE Transistor Amplifier response, Gain-Bandwidth Product, FET model at high frequency, Common drain amplifier at high frequencies, Illustrative design problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts and equivalent circuit models of BJT at high frequencies **L2**
- Analyze high frequency models and performance parameters of BJT amplifier circuits **L4**

UNIT – III:

Feedback Amplifiers: Concepts of Feedback, Classification of Feedback Amplifiers, General Characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative design Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of feedback and determine its on amplifier characteristics **L2**
- Analyse the characteristics of various types of feedback configurations **L4**

UNIT – IV:

Oscillators: Conditions for Oscillations, RC and LC type Oscillators, RC-Phase shift and Wien-Bridge Oscillators, Generalized Analysis of LC Oscillators, Hartley and Colpitts Oscillators, Crystal Oscillators, Frequency and Amplitude Stability of Oscillators, Illustrative design problems.

Regulators: Emitter follower type regulator, Transistorized series and shunt regulator, IC Voltage regulator

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic working principle of oscillator. **L2**
- Analyse different types of oscillators circuits **L4**

UNIT – V:

Power Amplifiers: Classification, Series fed Class A Power Amplifier, Transformer Coupled Class A Amplifier, Efficiency, Push Pull Amplifier- Complementary Symmetry Class-B Power Amplifier, Amplifier Distortion, Power Transistor Heat sinking, Class C and Class D Power amplifiers, Illustrative design problems.

Introduction to Tuned amplifiers: Q-Factor, Single tuned, double tuned and stagger tuned amplifiers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about common classes of power amplifier and their basic characteristics . **L1**
- Evaluate the resonant frequency and analyse the characteristics of tuned amplifiers. **L5**

Text Books:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, 2nd Edition, Mc Graw Hill, 2002.
2. Electronic Devices and Circuit Theory, Robert L.Boylestad, Louis Nashelsky, 9th Edition, Pearson, 2008.

Reference Books:

1. Electronic Circuit Analysis, K.Lal Kishore, 2nd Edition, BSP, 2004.
2. Electronic Circuits Analysis and Design, Donald A Neamen, 3rd Edition, Tata McGraw-Hill, 2009.
3. Microelectronic circuits, Sedra, Kenneth, Smith, 5th Edition, Oxford University Press, 2011.
4. Electronic Circuit and Applications, Mohammad H. Rashid, 3rd Edition, CENGAGE Learning, 2009.
5. Introductory Electronic Devices and Circuits, Robert T. Paynter, 7th edition, PEI, 2009.

Course Outcomes:

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

1. Summarize the high frequencies analysis of BJT amplifiers. **L2**
2. Analyse the performance characteristics of multistage amplifiers. **L4**
3. Understand the effect of negative feedback on amplifier characteristics. **L2**
4. Correlate the basic principles and working of oscillator circuits **L4**
5. Compare different types of power amplifiers and tuned amplifiers **L2**

B.Tech II Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ECE12 - EM WAVES AND TRANSMISSION LINES

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

1. To understand and analyze different laws and theorems of electrostatic fields.
2. To study and analyze different laws and theorems of magneto static fields.
3. To analyze Maxwell's equations in different forms.
4. To learn the concepts of wave theory and its propagation through various mediums.
5. To get an exposure to the properties of transmission lines.

UNIT – I:

Electrostatics: Review of Vector algebra, Co-ordinate systems & transformation, Vector calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Electric dipole, Energy Density, Convection and Conduction Currents, Dielectric Constant, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand vector algebra, vector calculus and concepts related to electrostatic Fields. **L2**
- Analyze and solve the problems related to electrostatic fields. **L4**

UNIT – II:

Magneto statics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic torque and moment, Magnetic dipole, Inductances and Magnetic Energy, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Comprehend the laws, concepts and proofs related to Magnetostatic Fields. **L2**
- Analyze and solve the problems related to magnetic fields. **L4**

UNIT – III:

Maxwell's Equations : Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the significance and utility of Maxwell's Equations. **L2**

Appreciate the importance of boundary conditions in electromagnetics. **L3**

UNIT – IV:

EM Wave Characteristics : Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves ,All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Wave Propagation in Good Conductors and Good Dielectrics, Skin depth, physical significance of Skin Depth, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem – Applications, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the characteristics of Uniform Plane Waves (UPW). **L1**
- Understand the propagation of electromagnetic waves in different media. **L2**

UNIT – V:

Transmission Lines: Types, Transmission line parameters (Primary and Secondary), Transmission line equations, Input impedance, Standing wave ratio & power, Smith chart & its applications, Applications of transmission lines of various lengths, Basics of waveguides. Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Determine the basic transmission line equations and their characteristics **L3**
- Understand the smith chart and its applications. **L2**

Text Books:

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

Reference Books:

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

Course Outcomes:

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

1. Analyze and apply the laws & theorems of electrostatic fields to solve the related problems. **L4**
2. Gain proficiency in the analysis and application of magneto static laws and theorems. **L4**
3. Analyze Maxwell's equations in different forms. **L4**
4. Learn the concepts of wave theory and its propagation through various mediums. **L1**
5. Understand the properties of transmission lines and their applications. **L2**

B.Tech II Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ECE13 - ANALOG COMMUNICATIONS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

1. To gain an understanding of basics of analog communication systems, various amplitude modulation and demodulation techniques
2. To study different types of angle modulation and demodulation schemes.
3. To learn and analyze the effects of noise for different modulation techniques.
4. To understand different pulse modulation schemes, radio transmitters and receivers
5. To acquire the knowledge about information theory and channel coding.

UNIT – I:

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation : Baseband and carrier communication, Amplitude Modulation (AM), Side band and carrier power of AM, Generation of amplitude modulated wave-square law Modulator, switching Modulator, Demodulation of AM Waves- Envelope detector, Rectifier detector, Suppressed carrier Modulation, Double sideband suppressed carrier (DSB-SC) Modulation, Generation of DSB-SC signals- Balanced Modulator, Ring Modulator, Demodulation of DSB-SC signals- Synchronous detector, Quadrature amplitude modulation (QAM), Single side band suppressed carrier (SSB-SC) Modulation, Generation of SSB-SC signals-Frequency & Phase discrimination methods, Demodulation of SSB-SC signals- Synchronous detector, Vestigial sideband (VSB) modulation & demodulation, Frequency mixer.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic concepts of the analog communication systems **L2**
- Appreciate the uses and applications of different amplitude modulation and demodulation techniques. **L3**

UNIT – II:

Angle Modulation & Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Features of angle modulation, Generation of FM waves – Indirect method, Direct generation; Demodulation of FM, Band pass limiter, Practical frequency demodulators, Power Spectral density, Pre-emphasis & De-emphasis filters, FM receiver, FM Capture Effect, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the concepts of frequency modulation and phase modulation. **L1**
- Compare NBFM and WBFM, analyze FM and PM. **L2**

UNIT – III:

Noise in Communication Systems: Thermal noise, Properties of Thermal Noise, Time domain representation of narrowband noise, Filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about different types of noise and their effects **L1**
- Analyze the performance of different modulation methods in the presence of noise **L4**

UNIT – IV:

Analog pulse modulation schemes: Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, Illustrative Problems.

Radio Transmitters and Receivers: AM Transmitter, FM Transmitter, Super-heterodyne AM and FM receiver, Sensitivity, Selectivity, Image rejection ratio and fidelity.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different types of analog pulse modulation methods. **L2**
- Gain knowledge on radio transmitters and receivers. **L1**

UNIT – V:

Information Theory & Channel Coding: Introduction, Information content of message, Entropy, Entropy of symbols in long independent and dependent sequences, Entropy and information rate of Mark off sources, Shannon's encoding algorithm, Huffman coding, Discrete communication channels, Rate of information over a discrete channel, Capacity of discrete memory less channels, Discrete channels with memory, Shannon – Hartley theorem and its implications, Illustrative problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of information theory and coding techniques. **L2**
- Derive the channel capacity and design the channel performance. **L3**

Text Books:

1. Simon Haykin, "Communication Systems", 3rd edition, Wiley-India edition, 2010.
2. B. P. Lathi, "Modern Digital and Analog Communication Systems," 3rd Edition, Oxford Univ. press, 2006.
3. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", 5th Edition, McGraw-Hill International Edition, 2010.

Reference Books:

1. Herbert Taub, Donald L Schilling, "Principles of Communication Systems", 3rd Edition, Tata McGraw-Hill, 2009.
2. George Kennedy, Bernard Davis, "Electronics & Communication System", 3rd Edition, Tata McGraw Hill, 2004.

Course Outcomes:

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

1. Understand the basics of analog communication systems, various amplitude modulation and demodulation techniques. **L2**
2. Compare different types of angle modulation and demodulation schemes **L2**
3. Analyze the effects of noise for different modulation techniques **L4**
4. Summarize different pulse modulation schemes, radio transmitters and receivers **L5**
5. Understand the concepts of information theory and channel coding . **L2**

B.Tech II Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ECE15 - LINEAR AND DIGITAL INTEGRATED CIRCUITS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

1. To study differential amplifiers and their characteristics, characteristics of Op-amp and its applications.
2. To understand the operation of op-amp with negative feedback and its frequency response.
3. To design and analyze amplifiers, filters and converters
4. To develop oscillators and Multivibrators using Linear IC's.
5. To learn about various techniques to design A/D and D/A convertors.

UNIT – I:

Operational Amplifiers: Introduction to IC Technology, Basic BJT Differential Amplifiers and its qualitative description, Differential amplifier configurations , Ideal Op-Amp, Equivalent circuit, Voltage Transfer curve, open loop op-amp configurations, Introduction to dual OP-AMP TL082 as a general purpose JFET-input Operational Amplifier. Closed loop op-amp configurations: Inverting, non-inverting and differential amplifiers, properties of Practical op-amp.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the differential amplifiers and their characteristics **L2**
- Analyze the linear and non-linear applications of operational amplifiers **L4**

UNIT – II:

Frequency Response of Op-Amp: Introduction, compensating networks, frequency response of internally compensated op-amps and non-compensated op-amps, High frequency op-amp equivalent circuit, open loop vs close loop frequency response, circuit stability, slew rate.

OP-AMP Applications-1: Summing, scaling and averaging amplifiers, voltage to current converter, current to voltage converter, integrator, differentiator, active filters, First and Second order Butterworth filter and its frequency response

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the feedback configurations of OP-AMP **L1**
- Explain the frequency response of op-amp circuits **L3**

UNIT – III:

OP-AMP Applications-2 : Phase shift and Wien bridge oscillators, square, triangular and sawtooth wave generators, comparators, Zero crossing detector.

Specialized IC Applications: IC555 Timer Block Schematic, Functional Diagram, applications of IC555 Timer - Monostable and Astable Operations, VCO - 566, PLL - 565.

Analog to Digital and Digital to Analog Converters: D/A Converters - R-2R ladder type, Voltage Mode and Current Mode R-2R ladder types, High speed sample and hold circuits, A/D Converters - Flash type, Successive Approximation type, Single slope type, Dual slope type, A/D Converter using Voltage to Time Conversion.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design and analyze different amplifiers using op-amp **L6**
- Understand the working of converters and filters using op-amp **L2**

UNIT – IV:

Combinational Logic Design: Decoders (74x138), Dual Decoder (74x139), 8 to 3 Encoders, Priority Encoder (74x148), three state devices, multiplexers (74x151) and de-multiplexers (74x155), Code Converters, EX-OR gates and parity circuits, comparators (74x85), adders & subtractors, ALUs, Combinational multipliers, Design considerations of the above-mentioned combinational logic digital IC's, VHDL models for the above ICs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design oscillators using op-amps **L6**
- Analyze the design and working of Multivibrators and PLL's using timer IC **L4**

UNIT – V:

Sequential logic Design: Latches & flip flops, counters (74x163), shift register (74x164 and 74x166) and PLDs. Design considerations of the above-mentioned sequential logic digital IC's, VHDL models for the above ICs. Design process of FSM: Moore and Mealy machines and their VHDL models, Synchronous design methodology and it's impediments.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the techniques for designing Digital to Analog Converters **L1**
- Implement Analog to Digital Converters in different methods **L5**

Text Books:

1. D. Roy Chowdhury, "Linear integrated circuits", 2nd Edition, New Age International (P) Ltd, 2003.
2. Ramakanth A.Gayakwad,"Op-amps and Linear ICs", 4th Edition, PHI, 1987.
3. TL082 Data sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf
4. John F. Wakerly, "Digital Design Principles & Practices," 3rd Edition, PHI/ Pearson Education Asia, 2005.

Reference Books:

1. R.F.Coughlin and Fredrick Driscoll, "Op-amps and Linear ICs", 6th Edition, PHI.
2. David A.Bell, "Op-amps and Linear ICs", 2nd Edition, Oxford University press, 2010.
3. J. Bhasker, "A VHDL Primer," 3rd Edition, Pearson Education/ PHI.

Course Outcomes:

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

1. Relate the characteristics of differential amplifiers, Op-amp's and their applications. **L4**
2. Understand the operation of op-amp with negative feedback and its frequency response. **L2**
3. Design and analyze amplifiers, filters and converters **L6**
4. Develop oscillators and Multivibrators using Linear IC's **L6**
5. Describe various techniques used in designing A/D and D/A convertors **L1**

B.Tech II Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ECE11 - ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

1. To design, simulate and test single and multistage amplifiers.
2. To verify the effect of feedback on amplifier parameters.
3. To understand the functioning of oscillator circuits
4. To design and analyse power amplifiers and tuned amplifiers.

List of Experiments (Any 12 experiments to be done)

I) Design and Simulation in Simulation Laboratory using any Simulation Software. (Minimum of 6 Experiments):

1. Common Emitter Amplifier
2. Common Source Amplifier
3. A Two Stage RC Coupled Amplifier.
4. Current shunt and Voltage Series Feedback Amplifier
5. Cascade Amplifier
6. Wien Bridge Oscillator using Transistors
7. RC Phase Shift Oscillator using Transistors
8. Class A Power Amplifier (Transformer less)
9. Class B Complementary Symmetry Amplifier
10. High Frequency Common base (BJT) / Common drain (JFET) Amplifier.

II) Testing in the Hardware Laboratory (6 Experiments)

Any Three circuits simulated in Simulation laboratory

1. Class A Power Amplifier (with transformer load)
2. Class C Power Amplifier
3. Single Tuned Voltage Amplifier
4. Hartley & Colpitt's Oscillators.
5. Darlington Pair.
6. MOSFET Amplifier

Course Outcomes:

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

a. Design, simulate and test single and multistage amplifiers **L6**
b. Verify the effect of feedback on amplifier parameters **L5**
c. Learn the functioning of oscillator circuits **L1**

B.Tech II Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ECE14- ANALOG COMMUNICATIONS LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

1. To gain an understanding on analog modulation and demodulation techniques.
2. To recognize the importance of pre-emphasis and de-emphasis.
3. To know the need for diode detector, and AGC.
4. To understand different pulse modulation and demodulation techniques.
5. To perform radio receiver measurements like sensitivity, selectivity and fidelity.

List of Experiments: (Any 10 Experiments are to be conducted)

1. Amplitude Modulation & Demodulation.
2. AM - DSB SC - Modulation & Demodulation.
3. Diode Detector.
4. Characteristics of Mixer
5. Pre-emphasis & De-emphasis.
6. Frequency Modulation & Demodulation.
7. AM / FM Transmitter & Receiver.
8. Verification of Sampling Theorem.
9. Pulse Amplitude Modulation & Demodulation.
10. Pulse Width Modulation & Demodulation.
11. Pulse Position Modulation & Demodulation.
12. Phased Locked Loop.
13. Spectral analysis of modulated signals using Spectrum Analyzer.
14. Radio receiver measurements – sensitivity, selectivity and fidelity.

Course Outcomes:

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

1. Gain an understanding on analog modulation and demodulation techniques **L2**
2. Recognize the importance of pre-emphasis and de-emphasis **L1**
3. Demonstrate the need for diode detector, and AGC **L5**
4. Understand different pulse modulation and demodulation techniques **L2**
5. Measure radio receiver characteristics like sensitivity, selectivity and fidelity **L5**

B.Tech II Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ECE16 - LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

1. To design and analyze various applications of op-amp and waveform generation circuits.
2. To get exposure to design and analysis of multivibrators and filters.
3. To get the knowledge about functionality of A/D and D/A converters.
4. To use computer-aided design tools for development of complex digital logic circuits
5. To understand the functionality of various Digital ICs.

Part A: Linear IC Applications

List of Experiments: (any seven using Hardware)

1. Op-Amp applications-Adder, subtractor, comparator
2. Study the characteristics Integrator, differentiator
3. Study the characteristics of negative feedback amplifier
4. Monostable and Astable multivibrator using IC 555 Timer
5. LPF and HPF (First order)
6. Design of Analog filters (2^{nd} order bandpass filter and Notch filter)
7. D/A Converters (R-2R Ladder)
8. A/D Converters (Successive Approximation)
9. Design of a function generator
10. Design of a Voltage Controlled Oscillator (VCO)
11. Design of a Phase Locked Loop (PLL)

Part-B: Digital IC Applications

List of Experiments: (any six using Software)

1. 4 to 8 Decoder- 74138.
2. 8 x 1 Multiplexer-74151 and 2 x 4 De-multiplexer-74155.
3. 4-Bit Comparator-7485.
4. D Flip-Flop-7474.
5. Decade counter-7490.
6. Shift registers-7495 and Universal shift register – 74194/74195
7. Priority encoder- 74LS148

Course Outcomes:

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

1. Design and analyze various applications of op-amps and waveform generation circuits **L6**
2. Analyze the design of Multivibrators and filters **L4**
3. Understand the functionality of A/D and D/A converters **L2**
4. Use computer-aided design tools for development of digital logic circuits . **L3**
5. Learn the functionality of various Digital ICs **L1**

Course Code		ADVANCED DIGITAL SYSTEMS DESIGN	L	T	P	C
Semester	IV		1	0	3	

Prerequisites: Digital Circuits and Systems

Course Objectives:

- To understand the basic concepts of Verilog HDL
- To classify the different modeling techniques
- To familiarize the HDL simulator / synthesis tool
- To design given combinational and sequential circuits

Course Outcomes (CO): Student will be able to

- Understand the basic concepts of Verilog HDL
- Classify the different modeling techniques
- Familiarize the HDL simulator / synthesis tool
- Design given combinational and sequential circuits

Theory:

Module I: Introduction to Verilog HDL and Basic Concepts

- Emergence of HDL, typical design flow, trends in HDL, Modelling concept
- Design methodologies, modules, instances, simulation, design block
- Lexical conventions, Number Specification, Data Types.
- Modules and Ports

Module II: Gate-Level Modelling and Dataflow Modelling

- Gate Types. Gate Delays, Continuous Assignments. Delays. Expressions, Operators, and Operands. Operator Types.
- Examples for combinational and sequential circuit using Gate level and Data-flow modelling.

Module III: Behavioural modelling

- Structured Procedures, Procedural Assignments, Timing Controls, Conditional Statements. Multiway Branching. Loops.

Module IV: Tasks and Functions and Useful modelling Techniques

- Difference between Tasks and Functions, Tasks, Functions.
- Procedural Continuous Assignments.

List of Experiments:

Student must implement any twelve experiments using Vivado Xilinx Design Suite Simulator.

1. Realization of all the Logic Gates.
2. Implementation of 4-bit Adder.
3. Implementation of 4-bit Subtractor.
4. Compute the output for arithmetic expression. y=(a+b*c)/(a+c).
5. Compute the output for Logical expression y= (A & B) | (B & C).
6. Implementation of 2-bit ALU with any 2 arithmetic and logical operations.
7. Implementation of 4-bit Carry Look Ahead Adder.
8. Implementation of 2-to-4 Decoder.
9. Implementation of 8-to-3 Encoder.
10. Implementation of 8-to-1 Multiplexer.
11. Implementation of 1-to-4 De-multiplexer.
12. Implementation of a 4-bit Comparator.
13. Implementation of 4-bit Binary to Gray Code Converter.
14. Implementation of BCD to seven segment decoder using case statement.
15. Implementation of D - Flip Flop and T – Flip Flop.
16. Implementation of 4-bit binary counters (Up and Down Counter).

17. Implementation of a 4- bit Register of Serial- in Serial –out, Serial-in parallel-out, Parallel-in Serial-out and Parallel-in Parallel-Out.

Software Requirements: Vivado Xilinx Design Suite

Textbooks & References:

1. Samir Palnitkar, "Verilog HDL", Pearson Education (2nd edition).
2. Donald Thomas, Philip moorby, "The Verilog hardware Description language" 5th Edition, Kluwer Academic publishers
3. J. Bhasker, Verilog HDL Synthesis: A Practical Primer,1998

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA

B.Tech – IV / V Sem (R20)

L	T	P	C
3	0	0	0

APTITUDE AND REASONING SKILLS

(Common to CIVIL ,ME, EEE, ECE & CSE)

Course Objectives

- To equip students with aptitude and reasoning skills in order to help them succeed in competitive exams.
- To help students improve their knowledge of quantitative and reasoning skills, which in turn helps them comprehend and solve various mathematical problems in professional life.

UNIT 1: Quantitative Aptitude 1:

Number Systems - HCF and LCM - Square Roots and Cube Roots – Averages - Problems on ages – Allegations – Percentages - Profit and loss - Logarithms – Progressions - Decimal Fractions - Simplification.

UNIT 2: Reasoning 1:

Directions - Blood Relations - Series and Sequences - Odd man out.

UNIT 3: Quantitative Aptitude 2:

Permutation and Combination - Ratio and Proportion and variation –Inequalities - Time and Work - Time and Distance - Pipes and Cisterns - Simple interest and Compound interest – Calendar - Clocks.

UNIT 4: Quantitative Aptitude 3:

Mensuration : Area, Volume and Surface Areas
Data Interpretation : Tabulation, Line Graphs, Bar Graphs, Pie charts.

UNIT 5: Reasoning 2:

Coding and Decoding - Data sufficiency-Logical deductions.

Text Books:

1. Quantitative Aptitude, R.S. Agarwal, S. Chand Publishers, New Delhi, 2012.
2. Verbal and Non-Verbal Reasoning, R.S.Agarwal, S.Chand Publishers, New Delhi, 2012.

Reference Books:

1. How to Prepare for Quantitative Aptitude, Arun Sharma, TMH Publishers, New Delhi, 2003.
2. IrnK.Wolf, Barron's GRE, Sharon Weiner-Green, Galgotia Publications, New Delhi, 2006.
3. More Puzzles, Shakuntala Devi, OPB, New Delhi, 2006.
4. Brain Teasers, Ravi Narula,Jaico Publishing House, New Delhi, 2005.
5. Puzzles and Teasers, George J Summers, Jaico Publishing House, Mumbai, 2005
6. Puzzles to Puzzle you, Shakuntala Devi , Orient Paper Backs Publishers(OPB), New Delhi, 2005.

Course Outcomes:

The student will be able to

- apply the knowledge of general mathematical models discussed to solve a variety of problems.
- read between the lines and understand various mathematical and reasoning concepts.
- demonstrate various principles involved in solving mathematical problems pertain to Quantitative functions.
- crack puzzles, decode information from charts and interpret their logical thinking in the aspects.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

PERFORMANCE OF SYNCHRONOUS AND SPECIAL MACHINES

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the Synchronous Machine Model
- To understand the performance of Synchronous Machine
- To understand the Special Machines
- To understand the design of Synchronous machines

UNIT – I: PRINCIPLES OF SYNCHRONOUS MACHINES **10 Hrs**

Introduction - Basic Synchronous Machine Model - Circuit Model of Synchronous Machine - Determination of the Synchronous Reactance - MMF Method - Determination of Armature Reaction Ampere-Turns and Leakage Reactance of a Synchronous Machine - Potier Method - ASA (American Standards Association) Method (Latest) - Nature of Armature Reaction - Synchronizing to Infinite Bus-Bars - Operating Characteristics– Numerical Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the fundamentals of synchronous Machine **L1**
- Learn about the construction & working of synchronous machine **L1**
- Learn about the applications of the models of synchronous machine **L2**
- Learn about the voltage regulation & its methods **L4**
- Learn about the analyzing and solving numerical problems on voltage regulation **L5**

UNIT – II: PERFORMANCE OF SYNCHRONOUS MACHINES **10 Hrs**

Efficiency of Synchronous Machines - Power Flow (Transfer) Equations - Capability Curve of Synchronous Generator - Salient-Pole Synchronous Machine Two-Reaction Model – Numerical Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the performance of synchronous machine **L1**
- Learn about the analyzing the power flows in the synchronous machine **L2**
- Learn about the capabilities of individual synchronous machines **L3**
- Learn about the air gap behavior within the machines **L4**
- Learn about the analyzing and solving numerical problems on the machine performance **L5**

UNIT – III: SYNCHRONOUS MACHINES **10 Hrs**

Synchronization– The Synchronizing Power (Torque) - Determination of XD And XQ —Slip Test - Parallel Operation of Synchronous Generators - Hunting in Synchronous Machines - Starting of Synchronous Motors - Short-Circuit Transient in Synchronous Machine – Numerical Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the concept of synchronization of alternator to the live system **L1**
- Learn about the analyzing of direct and quadrature axes of the synchronous machines **L2**
- Learn about the loading concept on the parallel operation of alternators **L3**
- Learn about the causes for hunting **L4**
- Learn about the starting of synchronous motors **L5**

UNIT – IV: SPECIAL MACHINES **10 Hrs**

Brushless DC Motors (Advantages, Schematic, operation and Circuit model) - Single-Phase Induction Motors (rotating fields, Torque speed relationship, performance analysis) - Single-Phase Synchronous Motors (reluctance motor, hysteresis motor)- Balanced 2-Phase Motor Fed from Unbalanced Supply - 2 phase servo motor – AC Tachometer - Stepper Motors (Elementary diagram, torque angle characteristics) - Series Motor—Universal Motor – Numerical Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the construction and working of various special machines **L1**
- Learn about the applications of each special machine **L2**
- Learn about the domestic and industrial usage of these special machines **L3**
- Learn about the performance difference between ac and dc machines **L4**
- Learn about the analyzing and solving numerical problems on the special machines **L5**

UNIT – V: SYNCHRONOUS MACHINES – DESIGN **10 Hrs**

Output equation, Main dimensions for cylindrical and salient pole machines, Choice of specific magnetic and electric loadings, Effect of SCR on machine performance, Length of air gap, Selection of stator slots, and mitigation of harmonics -Numerical examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the design concept on two machines **L1**
- Learn about the impact of SCR on the synchronous machines **L2**
- Learn about the slots selection for these machines and its impact on stability **L3**
- Learn about the harmonics in these machines and its mitigation design concept **L4**
- Learn about the analyzing and solving numerical problems on design based concepts **L5**

Text Books:

1. Electrical Machines by I.J. Nagrath& D.P. Kothari, Tata Mc Graw – Hill Publishers, 3 rd Edition, 2004.
2. Electrical Machines – P.S. Bimbra., Khanna Publishers, 2011.
3. A course on Electrical Machine Design, 6th edition, Dhanpat Rai & Co Pvt. Ltd., 2014.

Reference Books:

1. Performance and Design of AC Machines – by M G Say, CBS Publishers, 2002
2. Electrical Machines – S.K. Bhattacharya, TMH Edn. Pvt. Ltd., 3rd Edition, 2009
3. Electric Machinery – A.E. Fitzerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5th Edition, 2003
4. Electrical Machines – M.V Deshpande, Wheeler Publishing, 2004
5. Electromechanics – I- Kamakshaiah S., Overseas Publishers Pvt. Ltd, 3rd Edition, 2004.

Course Outcomes:

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

- Understand the basics of ac machine windings, construction, principle of working, equivalent circuit of induction and synchronous machines.
- Analyze the phasor diagrams of induction and synchronous machine, parallel operation of alternators, synchronization and load division of synchronous generators.
- Apply the concepts to determine V and inverted V curves and power circles of synchronous motor.
- Analyze the various methods of starting in both induction and synchronous machines.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

ELECTRICAL POWER TRANSMISSION AND UTILIZATION

L	T	P	C
3	0	0	3

Course Objectives:

- To calculation transmission line parameters and to find the performance of transmission line.
- To understand the mechanical design of transmission line.
- To study underground cables and power system transients.
- To understand different lighting design schemes for various applications and also about different types of heating and welding techniques.
- Learn basic principles of traction system & speed time curves for different traction system

UNIT – I: TRANSMISSION LINE PARAMETERS 10 Hrs

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configurations with and without transposition. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Determine resistance , inductance and Capacitance of transmission line **L1**
- Learn about concept of GMR & GMD and effect of ground on capacitance **L2**

UNIT – II: TRANSMISSION LINE PERFORMANCE 10 Hrs

Classification of Transmission Lines - Short, medium and long lines and their models - representations - Nominal-T, Nominal-π and A, B, C, D Constants. Mathematical Solutions to estimate regulation and efficiency of all types of lines. Long Transmission Line-Rigorous Solution, Interpretation of the Long Line Equations – Representation of Long lines – Exact T and π, Numerical Problems. Surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation – Ferranti effect, Charging current.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about classification of transmission lines and their modeling. **L1**
- Learn about concept of Impedance and surge Impedance loading **L2**

UNIT – III: MECHANICAL DESIGN OF TRANSMISSION LINES 10 Hrs

Overhead Line Insulators: Types of Insulators, String Efficiency and Methods for Improvement, Numerical Problems - Voltage Distribution, Calculation of String Efficiency, Capacitance Grading and Static Shielding. Corona: Corona - Description of the Phenomenon, Factors Affecting Corona, Critical Voltages and Power Loss, Radio Interference. Sag and Tension Calculations: Sag and Tension Calculations with Equal and Unequal Heights of Towers, Effect of Wind and Ice on Weight of Conductor, Numerical Problems - Stringing Chart and Sag Template and Its Applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Determine String Efficiency of Insulator and Corona Phenomenon **L1**
- To calculate Sag and Tension with Equal and Unequal Heights of Towers **L2**

UNIT – IV: CABLES and POWER SYSTEM TRANSIENTS **10 Hrs**

Underground Cables: Types of Cables, Construction, Types of Insulating Materials, Calculations of Insulation Resistance and Stress in Insulation, Numerical Problems. Capacitance of Single and 3-Core Belted Cables, Numerical Problems. Grading of Cables - Capacitance Grading, Numerical Problems, Description of Inter-Sheath Grading. Power System Transients: Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of Lines with Different Types of Conditions - Open Circuited Line, Short Circuited Line, TJunction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Types, Construction of Underground Cables and find the Capacitance **L1**
- To Understand Types of System Transients and Bewley's Lattice Diagrams **L2**

UNIT – V: ELECTRIC TRACTION **10 Hrs**

Introduction – Systems of Electric Traction. Comparison Between A. C and D. C Traction – Special Features of Traction Motors - Methods of Electric Braking – Plugging, Rheostatic and Regenerative Types. Mechanics of Train Movement. Speed-Time Curves of Different Services – Trapezoidal and Quadrilateral, Speed-Time Curves – Numerical Problems. Calculations of Tractive Effort, Power, Specific Energy Consumption - Effect of Varying Acceleration and Braking Retardation, Adhesive Weight and Coefficient of Adhesion – Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Features of Traction Motors and Methods of Electric Braking **L1**
- To Calculate Tractive Effort and Effect of Varying Acceleration and Braking **L2**

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd. 2.
2. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers,1998.
3. Utilization of Electric Energy – by E. Openshaw Taylor and V. V. L. Rao, Universities Press.
4. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Co

Reference Books:

1. Power system Analysis-by John J Grainger, William D Stevenson, TMC Companies, 4th edition
2. Modern Power System Analysis by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition.
3. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
4. Utilization of Electrical Power – by R. K. Rajput, Laxmi Publications.

Course Outcomes:

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

- Analyze the transmission lines and obtain the transmission line parameters and constants. **L1**
- To determine String Efficiency of Insulator and calculate sag and tension. **L2**
- To determine Capacitance and Single and 3-Core Belted Cables **L3**
- Identify the effects of power system transients **L4**
- To draw speed time curves and find the mechanics of Train Movement **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

POWER ELECTRONICS

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the operation, characteristics and usage of basic Power Semiconductor devices.
- Analyze controlled rectifier circuits.
- Analyze the operation of DC-DC choppers.
- Analyze the operation of voltage source inverters.
- To Understand the concept of AC voltage controllers and cycloconverters

UNIT – I: POWER SWITCHING DEVICES **10 Hrs**

Diode, Thyristor, Triac, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET and IGBT, Simple forced commutation circuits, Numerical Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic power semiconductor devices **L1**
- Understand in detail about SCR, MOSFET and IGBT **L2**

UNIT – II: THYRISTOR RECTIFIERS **10 Hrs**

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor-Numerical problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the concepts of single phase control converters. **L1**
- Learn about the concepts of three phase control converters. **L2**

UNIT – III: DC- DC CONVERTERS **10 Hrs**

power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage - Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage - Power circuit of the converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage - Numerical problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the concepts of Buck DC-DC converter **L1**
- Learn the concepts of Boost and Buck-boost DC-DC converters **L2**

UNIT – IV: INVERTERS **10 Hrs**

Single phase Voltage Source inverters –operating principle- steady state analysis, McMurray and McMurray Bedford inverters, Voltage control techniques for inverters and Pulse width modulation techniques, single phase current source inverter with ideal switches, basic series inverter, single phase parallel inverter – basic principle of operation only, Three phase bridge inverters (VSI) – 180 degree mode–120 degree mode of operation, Sine triangle PWM, Numerical problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the working of single phase inverters **L1**
- Learn about the working of three phase inverters **L2**

UNIT – V: AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS **10 Hrs**

AC voltage controllers – Principle of phase control, Principle of integral cycle control – With R and RL loads, Numerical problems. Cyclo converters - Midpoint and Bridge connections - Single phase to single phase step-up and step-down cyclo converters with Resistive and inductive load, Principle of operation, Waveforms, output voltage equation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the concept of AC voltage controllers **L1**
- Learn the concept of Cyclo Converters **L2**

Text Books:

1. Power Electronics: Circuits, Devices and Applications by M.H.Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics by P.S.Bimbhra, Khanna Publishers, 4th Edition, 2010.
3. Power Electronics by M.D.Singh&K.B.Kanchandhani, Tata McGraw Hill Publishing Company, 1998.

Reference Books:

1. Power Electronics, A first Course by Ned Mohan, Wiley, 2011.
2. Fundamentals of Power Electronics by Robert W. Erickson and Dragan Maksimovic, Kluwer Academic Publishers, 2nd Edition, 2004.
3. Power Electronics by V.R.Murthy, OXFORD University Press, 1st Edition, 2005.
4. Power Electronics by VedamSubramanyam, New Age International(P) Limited, 1996.
5. Power Electronics by P.C.Sen, Tata McGraw Hill Education, 1987.

Course Outcomes:

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

- Understand the operation, characteristics and usage of basic Power Semiconductor Devices. **L1**
- Understand different types of Rectifier circuits with different operating conditions **L2**
- Understand DC-DC converters operation and analysis of their characteristics. **L3**
- Understand the construction and operation of voltage source inverters, Voltage Controllers and CycloConverters. **L4**
- Understand the construction and operation of Voltage Controllers and CycloConverters. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

SYSTEM RELIABILITY CONCEPTS

((Professional Elective-I))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- The Basic concepts, rules for combining probabilities of events, failure density and distribution functions.
- Evaluation of network Reliability / Unreliability and types of redundancies.
- Evaluation of network Reliability / Unreliability using conditional probability method.
- Expected value and standard deviation of Exponential distribution and Measures of reliability.
- Evaluation of Limiting State Probabilities of one, two component repairable models.

UNIT – I: Basics of Probability Theory, Distribution & Network Modeling **09 Hrs**

Basic concepts – Rules for combining Probabilities of events – Failure Density and Distribution functions – Bernoulli's trials – Binomial distribution – Expected value and standard deviation for binomial distribution – Examples - Analysis of Series – Parallel – Series - Parallel Networks – Complex Networks – Decomposition Method..

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic rules for probabilities of events and Get detailed information about Probability of failure density and distribution Functions and obtain the expected value and standard deviation for binomial distribution. **L1**
- How to find the Probability of success and failures of network using different approaches for series-parallel configurations. **L2**

UNIT – II: Reliability Functions **09 Hrs**

Basic concepts – Reliability functions f(t), Q(t), R(t), h(t) – Relationship between these functions – Bath tub curve – Expected value and standard deviation of Exponential distribution – Measures of reliability – MTTF, MTTR, MTBF – Evaluation of network reliability / Unreliability of simple Series, Parallel, Series-Parallel systems - Partially redundant systems - Evaluation of reliability measure – MTTF for series and parallel systems – Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of reliability functions and relationship between them. and obtain the expected value and standard deviation for exponential distribution. **L1**
- To obtain probabilistic measures for fully redundant and partially redundant configurations **L2**

UNIT – III: Markov Modeling And Frequency & Duration Techniques **09 Hrs**

Markov Chains – Concept of Stochastic Transitional Probability Matrix, Evaluation of Limiting State Probabilities –Markov Processes One Component Repairable System – Time Dependent Probability Evaluation Using Laplace Transform Approach – Evaluation of Limiting State Probabilities Using STPM – Two Component Repairable Models. Frequency and Duration Concept – Evaluation of Frequency of Encountering State, Mean Cycle time, For One, Two Component Repairable Models – Evaluation of Cumulative Probability and Cumulative Frequency of Encountering of Merged States.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of Stochastic Transitional Probability Matrix, Limiting State Probability **L1**
- Understand the concept of Frequency balance approach. And To distinguish between Markov chains and Markov processes **L2**

UNIT – IV: Applications To Power Systems -I **09 Hrs**

Generation System Reliability Analysis: Reliability Model of a Generation System– Recursive Relation for Unit Addition and Removal – Load Modeling - Merging of Generation Load Model- Evaluation of Transition Rates for Merged State Model – Cumulative Probability, Cumulative Frequency of Failure Evaluation – LOLP, LOLE, LOEE.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of recursive relation for evaluation of equivalent transitional rates. **L1**
- Understand the concept of loss of load expectation and loss of expected energy. **L2**

UNIT – V: Applications To Power Systems - II **09 Hrs**

Basic Techniques - Radial Networks – Evaluation of Basic Reliability Indices, Performance Indices – Customer Oriented, Loss and Energy Oriented Indices – Load Point and System Reliability Indices Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of the reliability distribution systems for finding reliability indices. **L1**
- To know about computation of load point and system reliability indices. **L2**

Text Books:

1. Reliability Evaluation of Engineering Systems by Roy Billinton and Ronald N. Allan, Reprinted in India B. S. Publications, 2007.
2. Reliability Engineering by E. Balagurusamy, Tata McGraw Hill, 2003.

Reference Books:

1. Introduction to Reliability Engineering by E. E. Lewis by Wiley Publications.
2. Reliability and Maintainability Engineering by Charles E. Ebeling, Tata McGraw Hill, 2000.
3. Reliability and Safety Engineering by Ajit Kumar Verma, SrividyaAjit and Durga Rao Karanki, Springer, Second Edition, 2016. System Reliability Theory Marvin Rausand and ArnljotHoyland, Wiley Publictions.

Course Outcomes:

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

- Understand the concepts for combining Probabilities of events, Bernoulli's trial, and Binomial distribution. **L1**
- Understanding Reliability functions and to develop relationship between these functions, expected value and standard deviation of Exponential distribution and measures of reliabilities. **L2**
- Understanding Reliability functions and to develop relationship between these functions, expected value and standard deviation of Exponential distribution and measures of reliabilities. **L3**
- Recursive relation for evaluation of equivalent transitional rates, cumulative probability and cumulative frequency and 'n' component repairable model. **L4**
- `Understand the concept of the reliability distribution systems for finding reliability indices. **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

ANALYSIS OF LINEAR SYSTEMS

(Professional Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- To develop skills to analyze linear dynamic systems in both continuous and discrete time
- To find the system response in both time and frequency domains and examine system stability
- To understand the use of the Fourier, Laplace, and Z transforms in analysis of signals and systems
- To know the applications of Fourier series to electrical circuits excited by non sinusoidal Sources
- Study of different types of sampling methods

UNIT – 1: SIGNAL ANALYSIS **10 Hrs**

Analogy between vectors and signals, Orthogonal signal space, Signal approximation usi orthogonal functions, Mean square error, Closed or complete set of orthogonal functio Orthogonality in complex functions, Exponential and sinusoidal signals, Concepts of Impu function Unit step function, Signum function.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about different types of signals L1
- Learn about similarities between vectors and signals and analysis L2

UNIT – II:FOURIER SERIES AND FOURIER TRANSFORM REPRESENTATION **10 Hrs**

Introduction, Trigonometric form of Fourier series, Exponential form of Fourier series, Wave symmetry ,Fourier integrals and transforms, Fourier transform of a periodic function ,Properties of Fourier Transform , Parseval's theorem, Fourier transform of some common signals ,Effects of harmonics, Application in Circuit Analysis, Circuit Analysis using Fourier Series

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concepts of different forms of fourier series and transformation methods **L1**
- Application of circuit analysis using fourier series **L2**

UNIT – III: LAPLACE TRANSFORM APPLICATIONS **10 Hrs**

Applications of Laplace transform Methods of Analysis, Response of RL,RC,RLC Networks to Step, Ramp, and impulse functions, Shifting Theorem, Convolution integral, Applications

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Laplace transformation method of analysis **L1**
- Distinguish between different types of input signals applied to RLC elements **L2**

UNIT – IV: SAMPLING **10 Hrs**

Sampling theorem – Graphical and Analytical proof for Band Limited Signal, impulse sampling, natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under

sampling – Aliasing, introduction to Band Pass sampling, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and Energy / Power spectral density function

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the sampling methods and types and reconstruction techniques **L1**
- Distinguish between Energy and power spectral density function **L2**

UNIT – V: Z-TRANSFORMS **10 Hrs**

Fundamental difference between continuous and discrete time signals, discrete time complex, exponential and sinusoidal signals, periodicity of discrete time complex exponential, concept of Z – Transform of a discrete sequence. Distinction between Laplace, Fourier and Z – Transforms, Region of convergence in Z – Transforms, constraints on ROC for various classes of signals, Inverse Z – Transforms, properties of Z – Transforms

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the applications of Z transform to discrete time signals **L1**
- Distinction between Laplace, Fourier and Z transformation methods **L2**

Text Books:

1. Signals, Systems and Communications by B.P.Lathi, BS publication 2003.
2. Network Analysis and Synthesis by Umeshsinha- Satyaprakashan publication
3. Signals and Systems by A.Anand Kumar 2 edition PHI learning pvt ltd

Reference Books:

1. Linear System Analysis-A N Tripathi,New Age International.
2. Network and Systems D Roy Chowdary,New Age International
3. Engineering Network Analysis and Filter Design-Gopal G Bhisk&Umesh
4. Linear system analysis by A. Cheng,Oxford Publishers

Course Outcomes:

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

- An ability to recognize, use, and analyze signals coming from diverse disciplines and represent them in terms of elementary signals **L1**
- Understand the basic signals operations such as convolution, correlation and understanding linear system dynamics **L2**
- Knowledge of methods for finding the system transient and steady state response **L3**
- Knowledge of main properties of linear feedback systems□ **L4**
- `understanding of Fourier, Laplace, and Z- transforms in the design of electrical systems **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

AI TECHNIQUES IN ELECTRICAL ENGINEERING

(Professional Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- To get exposed to a few Intelligent Control Techniques
- To learn about Artificial Neural Network based Estimators
- To learn about Fuzzy Logic Control System as one of the ICT
- To learn about a few evolutionary algorithms
- To implement the various ICTs for linear and non

UNIT – I: Fundamentals of AI **10 Hrs**

AI trend in Engineering applications, Need for AI, Approaches to intelligent control; Architectures for intelligent control; Symbolic reasoning system; rule-based systems; Knowledge representation; Expert systems.

Learning Outcomes:

At the end of this unit, the student will be able to

- To get exposed to fundamentals of AI **L1**
- To understand about architecture of Intelligent Control **L2**

UNIT – II: ANN based Controllers and Estimators **10 Hrs**

Concept of Artificial Neural Networks and its basic mathematical model; McCulloch-Pitts neuron model; simple perceptron; Adaline and Madaline; Feed-forward Multilayer Perceptron – Back Propagation algorithm; Training the neural network- Supervised and unsupervised learning concepts; Hopfield network; Self- organizing map (SOM), Neural Network based controllers and estimators design

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn about basic concepts of ANN **L1**
- To develop mathematical models for various controllers of single and multilayer Perceptrons **L2**

UNIT – III: Fuzzy Logic Control System **10 Hrs**

Motivation and basic definitions; Crisp sets, Fuzzy sets, difference between crisp and fuzzy sets, Fuzzy properties, operations and relations; Fuzzy logic system and its components; Membership functions and methods for assignment of membership function values, Fuzzy knowledge and rule bases; defuzzification, Fuzzy modelling and control schemes for linear and nonlinear systems; Fuzzy estimators.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn about fundamentals of Fuzzy Logic Control systems **L1**
- To be able to understand knowledge and rule bases in Fuzzy Logic Systems **L2**

UNIT – IV: Evolutionary Algorithms **10 Hrs**

Genetic Algorithm: Introduction - basic concepts, application, Adaptive Neuro-fuzzy Inference System (ANFIS). Ant colony optimization, Particle swarm optimization (PSO) – basic concepts and design procedures

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn about basic concepts of evolutionary algorithms **L1**
- To learn about ANFIS **L2**

UNIT – V Case Studies **10 Hrs**

ANN Applications to Load Flow Studies, Applications of Fuzzy Controller for Load Frequency Control – Single Area System , Applications of ANFIS Controller for Water Tank Control, Applications of Evolutionary Algorithms for Economic Load Dispatch.

Learning Outcomes:

At the end of this unit, the student will be able to

- To identify case studies related to linear and non-linear dynamic systems **L1**
- To be able to implement control strategies with Neural Networks for the identified **L2**

Text Books:

1. Padhy.N.P.; "Artificial Intelligence and Intelligent Systems"; Oxford University Press, 2005
2. Jacek. M. Zurada; "Introduction to Artificial Neural Systems", JaicoPublishing House, 1 st Edition, 1994
3. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3 rd Edition, WILEY Publications, 2011
4. S.N. Sivanandam and S.N. Deepa, Introduction to Genetic Algorithms, Springer Publications, 2008

Reference Books:

1. J.S.R. Jang, C.T.Sun and E. Mizutami, "Neuro-Fuzzy & Soft Computing", Pearson India Education Services Pvt. Ltd.
2. LaurereFauselt, "Fundamentals of Neural Networks", Pearson India Education Services Pvt. Ltd..

Course Outcomes:

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

- To get familiarity of various Intelligent Control Techniques **L1**
- To be able to design the controllers and estimators using ANN **L2**
- To be able to model and develop control schemes with Fuzzy Logic rule bases **L3**
- To be able to implement an evolutionary algorithm suitable to optimize and design a given system specifications **L4**
- To be able to use MATLAB tool boxes for implementation of various ICTs for system modeling, control schemes and to design estimators **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Skill Course – III : DESIGN OF ELECTRICAL LAYOUT FOR BUILDINGS

L	T	P	C
1	0	2	2

Course Objectives: The objectives of the course are to make the students learn about

- To understand Electrical Design.
- To calculate the Electrical Projects Cost
- To design Buildings and industrial Projects with the help of CAD Software.
- To design Buildings and Estimate the Cost of the Electrical Products

UNIT – I:Basics of Electrical Drawing **10 Hrs**

Need of Drawings, Electrical Drawings, Circuit Diagram, Wiring Diagram, Wiring Schedule, Block Diagram, Parts list, Symbols in Electrical Drawings, Conductors, Connectors and terminals, Inductors and transformers, Resistors,Capacitors, Fuses, Switch contacts, Switch types, Diodes and rectifiers, Earthing, Wire and specifications, Types of wires, Wire specifications, Labeling. Openmarket survey with report.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic concepts of Electrical Drawings **L1**
- Understand the need for design of layout of buildings. **L1**

UNIT – II: Project Management **10 Hrs**

Workflow in AutoCAD , Electrical Initializing ,Project Project ,Properties Project , Settings tabComponents , Tab Wire Numbers tab, Cross-References Tab, Styles tab, Drawing , Format tab , Opening a Project , FileNew Drawing in a Project, RefreshProject Task , ListProject Wide Update or Retag, Drawing List Display Configuration, Plotting and PublishingPlot , ProjectPublish to WEBPublish to DWF/PDF/DWFxZip , Project Removing, Replacing, and Renaming Drawings in a ProjectLocations View in Project Manager , Filter by Installation and Location , Search box, Details and Connections tabs, Inserting. Report on Project Management Creation of a Customer.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn how to Create Projects and Planning **L1**
- Learn about Project Creation and File Management **L1**

UNIT – III: COMPONENTS DESIGN & PROJECT ESTIMATION **10 Hrs**

Electrical Components , Inserting Component Using Icon Menu, Component Tag area, Catalog Data area,Description AreaCross-Reference , AreaInstallation Code and Location Code, Pins areaCatalog BrowserUser Defined , ListEquipment , ListPanel , ListPneumatic , Components Hydraulic Components, P&ID Components , Symbol BuilderAdding New Symbol in Icon Menu, SummaryWires, Circuits,and Ladders. Report on Creation of layout of a Client requirement.

Learning Outcomes:

At the end of this unit, the student will be able to

- To design Panel Boards **L5**
- To perform various Various Symbols in electrical Engineering and there Importance **L4**

UNIT – IV: Introduction to Wires **10 Hrs**

Wire22.5 Degree, 45 Degree, and 67.5, DegreeInterconnect Components , GapMultiple Bus, Creating of Multiple Buses with various radio button, Ladders , Insert Ladder, XY Grid Setup , X Zones Setup, Wire Numbering, Wire Numbers, 3 PhasePLC, I/OWire Number Leaders and Labels, Wire Number Leader, Wire Color/Gauge Labels, In-Line Wire Labels, MarkersCable , MarkersMultiple Cable Markers, Insert Dot Tee Markers , Insert Angled Tee , MarkersCircuit Builder, Starting a New drawing, Editing Title Block, Creating Wires , Assigning Numbers and Labels to Wires, Inserting 3 Phase Motor , Adding Ground symbol , Adding symbols for various components, Editing Wires, Components, and Circuits. Final design and load estimation.

Learning Outcomes:
At the end of this unit, the student will be able to

- Learn the Wires, PLC Units Wires with Components **L2**
- Learn the design and Farming the Components in CAD Software **L5**

UNIT – V:Reports Generation & Project **10 Hrs**

Bill of Materials reports , Component report , Wire From/To report, Component Wire List report, Connector Plug report, PLC I/O Address and Description report, PLC I/O Component Connection report, PLC Modules Used So Far report, Terminal Numbers report, Terminal Plan report, Connector Summary report, Connector Details report, Cable Summary report, Cable From/To report, Wire Label report, Missing Catalog Data, Electrical AuditDrawing , AuditDynamic Editing of Reports in Drawing , Modifying Tables, Modifying Rows, Modifying Columns, Merge Cells, Match Cells, Table Cell StylesEdit BordersText Alignment, LockingData FormatBlock, FieldFormulaManage Cell ContentLink CellDownload from source. Error Identification and Rectification Report.

Learning Outcomes:
At the end of this unit, the student will be able to

- Able to Design Building Design . **L4**
- Able to measure the Project Estimation and Cost Analysis **L3**

Text Books:

1. AutoCAD Electrical 2022 Black Book by Gaurav Verma and Matt Weber, Cadcamcae Works
2. Get started with AutoCAD Electrical by James Richardson, Musselburgh Press, 2020.

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

- To design a layout for a given building. **L5**
- To calculate the Electrical Projects Cost **L2**
- To carry out Buildings and industrial Projects **L4**
- To Estimate the Cost of the Electrical Products **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

AC MACHINES LAB

L	T	P	C
0	0	3	1.5

Course Objectives:

- To prepare the students to have a basic knowledge of transformers.
- To prepare the students to have a basic knowledge of induction motors.
- To prepare the students to have a basic knowledge of alternators.
- To design a practical transformer.
- To know about an induction generator

The following list all the ten experiments are required to be conducted as compulsory experiments:

1. No-load & Blocked-rotor tests on Squirrel cage Induction motor
2. Load test on three phase slip ring Induction motor.
3. Speed control of three phase induction motor
4. Rotor resistance starting for slip ring induction motor
5. Load test on single phase induction motor
6. Determination of Equivalent circuit of a single phase induction motor.
7. Predetermination of Regulation of a three phase alternator by synchronous impedance & m.m.f methods.
8. Predetermination of Regulation of three-phase alternator by Z.P.F. method.
9. Determination of Xd and Xq of a salient pole synchronous machine.
10. V and inverted V curves of a 3-phase synchronous motor.

Text Books:

1. Laboratory Manual for Electrical Machines by D. P.Kothari and B. S. Umre, I.KInternational Publishing House Pvt. Ltd, 2017.
2. A Laboratory Course in Electrical Machines by D.R. Kohli and S.K. Jain, NEM Chand &Bros.
3. Virtual Labs (vlab.co.in)

Reference Books:

1. J.S.R. Jang, C.T.Sun and E. Mizutami, "Neuro-Fuzzy & Soft Computing", Pearson India Education Services Pvt. Ltd.
2. LaurereFauselt, "Fundamentals of Neural Networks", Pearson India Education Services Pvt. Ltd..

Course Outcomes:

After the completion of the course the student should be able to:

- Able to conduct open circuit/ short circuit test on transformer **L1**
- Ability to conduct experiments on Ac Machines to find the characteristics **L2**
- Able to calculate torque and speed of given Machine. **L3**
- Ability to perform test on synchronous Machine to find Direct and quadrature axis reactance. **L4**
- Ability to conduct No Load and Full load tests on transformers/Induction Motor. **L5**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

ELECTRICAL AND ELECTRONICS ENGINEERING

III B.TECH I SEM

L	T	P	C
0	0	3	1.5

Renewable Energy Lab

Fromthefollowinglistallthetenexperimentsarerequiredtobeconductedascompulsoryexperiments:

1. Simulation study on Solar PV Energy System.
2. Experiment on "VI-Characteristics and Efficiency of 1kWp Solar PV System".
3. Experiment on "Shadowing effect & diode based solution in1kWp Solar PV System".
4. Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
5. Simulation study on Wind Energy Generator.
6. Experiment on Performance assessment of micro Wind Energy Generator.
7. Simulation study on Hybrid (Solar-Wind) Power System.
8. Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
9. Simulation study on Hydel Power.
10. Experiment on Performance Assessment of 100W Fuel Cell.
11. Simulation study on Intelligent Controllers for Hybrid Systems

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
College of Engineering (Autonomous), Pulivendula - 516390, A.P, INDIA.

L	T	P	C
3	0	0	0

Constitution of India

Course Objectives:

1. To enable the student to understand the importance of constitution.
2. To understand philosophy of fundamental rights and duties.
3. To understand the structure of executive, legislature and judiciary.
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative.

UNIT-I

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

Learning Outcomes:

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

1. Understand the concept of Indian constitution.
2. Apply the knowledge on directive principle of state policy.
3. Analyze the History, features of Indian constitution.
4. Evaluate Preamble Fundamental Rights and Duties.

UNIT-II

Democratic forms of Constitution, Union Government and its Administration Structure of the Indian Union: Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning Outcomes:

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

1. Understand the structure of Indian government.
2. Differentiate between the state and central government.
3. Explain the role of President and Prime Minister.
4. Know the Structure of supreme court and High court.

UNIT-III

Federalism, Political relations, Financial relations of State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions.

Learning Outcomes:

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

1. Understand the structure of state government.
2. Analyze the role Governor and Chief Minister.
3. Explain the role of state Secretariat.
4. Differentiate between structure and functions of state secrateriate.

UNIT-IV

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

Learning Outcomes:

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

1. Understand the local Administration.
2. Compare and contrast district administration role and importance.
3. Analyze the role of Myer and elected representatives of Municipalities.
4. Evaluate Zilla panchayat block level Organisation.

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate , State Election Commission, Supreme Court, High Court.

Learning Outcomes:

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

1. Know the role of Election Commission apply knowledge.
2. Contrast and compare the role of Chief Election commissioner and Commissiononerate.
3. Analyze role of state election commission.
4. Evaluate various commissions of viz SC/ST/OBC and women.

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi.
2. Subash Kashyap, Indian Constitution, National Book Trust.
3. J.A. Siwach, Dynamics of Indian Government & Politics.
4. D.C. Gupta, Indian Government and Politics.
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication.
6. J.C. Johari, Indian Government and Politics Hans.

Course Outcomes:

1. Understand historical background of the constitution making and its importance for building a democratic India.
2. Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
3. Understand the value of the fundamental rights and duties for becoming good citizen of India.
4. Analyze the decentralization of power between central, state and local self-government.
5. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
6. Know the sources, features and principles of Indian Constitution.
7. Learn about Union Government, State government and its administration.
8. Get acquainted with Local administration and Pachayati Raj.
9. Be aware of basic concepts and developments of Human Rights.
10. Gain knowledge on roles and functioning of Election Commission.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech. V-Sem (R20)

FUZZY SET THEORY, ARITHMETIC AND LOGIC

(Open Elective -I)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing

- the basic knowledge to understand Fuzzy set theory and Arithmetic. and
- Logic, related to a real word problems of engineering, Science etc.

UNIT – 1: Classical (Crisp) Sets To Fuzzy Sets & Fuzzy Sets Versus Crisp Sets: **9 Hrs**

Classical (Crisp) Sets To Fuzzy Sets:

Introduction: Crisp Sets: An Overview, Fuzzy Sets: Basic Types, Fuzzy Sets: Basic Concepts.

Fuzzy Sets Versus Crisp Sets:

Alpha -Cuts :Additional Properties of alpha -Cuts, Representations of Fuzzy Sets, Extension Principle for Fuzzy Sets.

Learning Outcomes:

At the end of this unit, the student will be able to

• The basic concepts of Sets and Fuzzy sets	L2
• Analyze the Fuzzy Sets Versus Crisp Sets	L3

UNIT – II: Operations On Fuzzy Sets:

Types of Operations, Fuzzy Complements, Fuzzy Intersections: t-Norms.

Fuzzy Unions: t-Conorms ,Combinations of Operations, Aggregation Operations.

Learning Outcomes:

At the end of this unit, the student will be able to

• Do some operations on Fuzzy sets	L2
• Assess t-Norms Fuzzy Unions	L3

UNIT – III: Fuzzy Arithmetic & Fuzzy Relations :

Fuzzy Arithmetic :

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals, Arithmetic Operations on Fuzzy Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Fuzzy Relations:

Crisp versus Fuzzy Relations, Projections and Cylindric Extensions, Binary Fuzzy Relations,

Binary Relations on a Single Set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relations, Fuzzy Ordering Relations.

Learning Outcomes:

At the end of this unit, the student will be able to

• Perform arithmetic operations on Fuzzy numbers and equations.	L2
• Analyze Fuzzy Relations, Projections and Cylindric Extensions etc.	L3

UNIT – IV: Fuzzy Relation Equations & Possibility Theory:

Fuzzy Relation Equations:

General Discussion ,Problem Partitioning ,Solution Method.

Possibility Theory:

Fuzzy Measures, Evidence Theory, Possibility Theory, Fuzzy Sets and Possibilty Theory, Possibility Theory versus Probability Theory.

Learning Outcomes:

At the end of this unit, the student will be able to

• Solve Fuzzy relation equations.	L3
• Analyze Possibility Theory.	L4

UNIT – V: Fuzzy logic:

Classical Logic: An Overview, Multi-valued Logics, Fuzzy Propositions, Fuzzy Quantifiers, Linguistic Hedges, Inference from Conditional Fuzzy Propositions, Inference from Conditional and Qualified Propositions, Inference from Quantified Propositions.

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand the Fuzzy logic.	L1
• Analyze the Inferences from Conditional, Qualified, and Quantified Propositions.	L4

Text Books:

1. Fuzzy Sets and Fuzzy Logic, Geoge J. Klir and Bo Yuan

Reference Books:

1. Fuzzy Mathematical Models in Engineering and Management Science, A. Kaufmann and M.M. Gupta
2. Fuzzy Logic, Timothy J. Ross
3. Fuzzy Set Theory, H.J. Zimmermann
4. Introduction to Fuzzy Logic and Fuzzy Sets, J.J. Buckley and E. Eslami

Course Outcomes:

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

• Understand the basic concepts of Fuzzy sets and logic.	**L1**
• Do some operations of Fuzzy sets.	**L2**
• Solve Fuzzy relation equations.	**L3**
• Analyze the Inferences from Conditional, Qualified, and Quantified Propositions.	**L4**
• analyze the real word problem through the technique of Fuzzy set theory and logic to have better insight of the real word problems.	**L5**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF PHYSICS
III B.TECH – I SEMESTER-R20 (Open elective-Interdisciplinary) –OE-ID.1(THEORY)

FUNCTIONAL NANOMATERIALS FOR ENGINEERS
(Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- Be able to describe the terminology and basics of smart materials and smart systems
- Be able to understand the classification and applications of smart materials.
- Be able to understand the use of appropriate materials for energy applications.
- Be able to identify appropriate techniques for understanding the mechanisms of nanosensors
- Be able to explain the concepts of self-assembling monolayers and their applications

UNIT-I: INTRODUCTION TO FUNCTIONAL /SMART NANOMATERIALS — 9 Hrs

Introduction:-Nanomaterials and their importance (in brief), Functional/ Smart Nanomaterials, – (Hydrogels, Carbon nanotubes) and their Functionalization techniques, Properties of Smart materials (Sensing materials, Actuation materials, Self-detection, Self-corrective, self-healing, Shock Absorbers)- Components of smart systems (Sensor :- Data Acquisition, Data Transmission; Command and control unit, Actuator:- Data Instructions, Action Devices)

Learning Outcomes:

At the end of this unit, the student will be able to

• **Understand** the basic properties and functionalization of smart nanomaterials	**L1**
• **Explain** the need of functional/smart nanomaterials for advanced tecghnology	**L2**
• **Identify** engineering applications of sensors	**L3**
• **Analyze** the sensing, control and detection mechanism in smart nanomaterials	**L4**
• **Illustrate** the components of smart systems	**L2**

UNIT-II: CLASSIFICATION AND APPLICATIONS — 9 Hrs

Introduction, Classification of smart materials (piezoelectric, electrostrictive, Magnetostrictive, Thermoresponsive and Electrochromic), Shape Memory Alloys and their working principle, Applications of smart materials in Aircrafts, Medicine, Robotics,Smart fabrics, Sporting goods and smart glass, Merits and de-merits of smart materials.

Learning Outcomes:

At the end of this unit, the student will be able to

• **Classify** smart materials based on electrical, magnetic and thermal characteristics	**L1**
• **Understand** the basic concepts and working principle of memory alloys	**L2**
• **Identifies** the Engineering applications of smart materials	**L2**
• **Apply** the concepts to Aircrafts, Medicine and Robotic fields	**L3**
• **Identify** the Merits and demerits of smart materials in engineering field	**L2**

Unit-III NANOSENSORS — 9 Hrs

Introduction, Principle of nanosensors, Types of nanosensors (Physicalnanosensors – *Pressure, Force, Mass, Displacement*, Optical nanosensors – *Proximity, Ambient light*, Chemical nanosensors- *Chemical composition, Molecular concentration*).Applications of nanosensors (Medicine, Aerospace, Communication, Structural Engineering).

Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the working principle and concept of nanosensors	L1
• **Classify** the nanosensors based on their working principle and application	L2
• **Summarize** various types of nanosensors	L2
• **Explain** the applications of nanosensors in various fields	L2
• **Apply** the concept of nanosensors in Medicine, Aerospace, Communication, Structural Engineering fields	L3

UNIT-IV: SELF-ASSEMBLING MONO LAYERS **9Hrs**

Introduction, principles of self-assembly, monolayers, Characteristics of Self assembled monolayers (SAMs), Types of SAMs, Factors influencing Monolayer order, Methods of preparation of SAMs(Langmuir- Boldgett film :Mechanism, Experimental arrangement, Assembly, Advantages and disadvantages of LB films) patterning of SAMs (Locally attract, Locally remove, Modify tail group).Applications (Self-cleaning and moisture repellent).

Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the concept of self-assembling	L1
• **Understand** the significance of molecular layers	L2
• **Explain** the concept of Langmuir- Boldgett film preparation	L2
• **Explain** the important factors influencing Monolayer order	L2
• **Classify** the materials based on patterning of SAMs	L2
• **Apply** the concept of Self-cleaning and moisture repellent	L3

UNIT-V: NANOMATERIALS FOR ENERGY APPLICATIONS **9Hrs**

Introduction, **Solar Cells** (Silicon Solar Cells, Thin film Solar Cells, Organic Solar Cells, Polymer solar cells) Working Principle, Efficiency estimation and advantages. **HydrogenFuel Cells** – Working Principle, Configuration, Assembly of fuel cell, Water **splitting** – H_2 Production, Photocatalytic process.

Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the concept of solar cell	L1
• **Classify** the solar cells based on manufacturing material	L2
• **Explain** the construction and working principle of solar cell	L2
• **Interpret** the efficiency and advantages in various solar cells	L2
• **Explain** the construction and working principle of hydrogen cells	L2
• **Identify** applications of water splitting for H_2 production	L2
• **Explain** the photocatalytic process	L2

Text Books:

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2012
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

Reference Books:

1. Gauenzi,P.,Smart Structures, Wiley, 2009.
2. MahmoodAliofkhazraei, Handbook of functional nanomaterials,-Vol (1&2), Nova Publishers, 2014.

Course Outcomes:	
At the end of this Course the student will be able to	
• **Identify** the various functional/smart nanomaterials materials	**L1**
• **Classify** the smart nanomaterials based their applications and properties	**L2**
• **Apply** the various functional nanomaterials in various applications	**L3**
• **Classify** the solar cells based on manufacturing material	**L4**
• **Interpret** the efficiency and advantages in various solar cells	**L5**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA				
B.Tech – III-I-Sem	L	T	P	C
	3	0	0	3
Chemistry of Energy Materials (OE.1) (common to all branches)				

Course Objectives:

- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquefaction method.
- Necessity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To understand and apply the basics of calculations related to material and energy flow in the processes.

UNIT-I: **Electrochemical Systems**	9 Hrs

a) Introduction to Energy- Materials, Chemistry, Engineering and Technology.
b) Electrochemical Systems: Galvanic cell, standard electrode potential, application of EMF, Electrode mechanism, Batteries-Lead-acid and Lithium ion batteries.

Learning Outcomes:
At the end of this unit, the student will be able to:

- Solve the problems based on electrode potential (L3)
- Describe the Galvanic Cell (L2)
- Differentiate between Lead acid and Lithium ion batteries(L2)
- Illustrate the electrical double layer(L2)

UNIT-II:**Fuel Cells**	7 Hrs

Basic design of fuel cell, Fuel cell working principle, Fuel cell efficiency Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), and their applications

Learning Outcomes:
At the end of this unit, the student will be able to:

- Classify the fuel cell(L2)
- Describe the working Principle of Fuel cell(L2)
- Explain the efficiency of the fuel cell (L2)
- Discuss about the Basic design of fuel cells(L3)

UNIT-III: **Hydrogen Storage**	9 Hrs
Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF) zinc-(3-aminotriazolato)-oxalate; MOF-74 (Zn_2 -(2,5-dihydroxy-1,4-benzenedicarboxylate), Carbon structures (Carbon nano tubes, fullerenes), metal oxide porous structures, hydrogen storage by high pressure methods-liquefaction method	
Learning Outcomes: After completing the course, the student will be able to: • Differentiate Chemical and Physical methods of hydrogen storage (L2) • Discuss the metal organic frame work(L3) • Illustrate the carbon and metal oxide porous structures (L2) • Describe the liquification methods(L2)	
UNIT-IV: **Solar Energy**	8 Hrs
Solar energy introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar Fuels – Hydrogen: Ammonia& Hydrazine, Solar cells (Si-Te& Cd-Te), advantages and disadvantages	
Learning Outcomes: After completing the course, the student will be able to: • Apply the photo voltaic technology (L3) • Demonstrate about solar energy and prospects(L2) • Illustrate the Solar cells (L2). • Discuss about concentrated solar power(L3)	
UNIT-V: **Photochemical and Photo electrochemical Conversions**	7 Hrs
Photochemical cells and applications of photochemical reactions, photo electrochemical cell, advantages of photoelectro catalytic conversions.	
Learning Outcomes: • After completing the course, the student will be able to: • Differentiate between Photo and Photo electrochemical Conversions(L2) • Illustrate the photochemical cells(L2) • Identify the applications of photochemical reactions(L3) • Interpret advantages of photoelectron catalytic conversion(2)	
Text Books:	
1. Bahl and Bahl and Tuli, Essentials of Physical Chemistry, S. Chand Publications, New Delhi, 28th Edition, 2020. 2. US Department of Energy (EG&G technical services and corporation), Fuel Cell Hand Book 7th Edition, 2004.	
Reference Books:	
1. Ira N. Levine, Physical chemistry 6th Edition, McGraw Hills Education, New Delhi, 2009. 2. Silver and Atkins, Inorganic Chemistry, , 7th Edition, Oxford University Press, 2018 3. Michael Hirscher, Hand book of Hydrogen Storage: New materials for future energy, storage, Wiley-VCH Verlag GmbH & Co. KGaA, 2010	

4. Klaus Jagar et.al., Solar energy fundamental, technology and systems, UIT-Cambridge publishers, 2016

Course Outcomes:

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

- Understand to perform simultaneous material and energy balances(L1)
- Lists about various electrochemical and energy systems(L1)
- Classify solid, liquid and gaseous fuels(L3)
- Analyze the energy demand of world, nation and available resources to fulfill the demand(L3)
- Evaluate the conventional energy resources and their effective utilization(L3)
- To be able to understand and perform the various characterization techniques of fuels(L1)
- Explain knowledge of modern energy conversion technologies(L2)
- To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively(L1)

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE55A- BASICS OF CIVIL ENGINEERING

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- To study the basic concept of Civil Engineering and instruction buildings.
- To understand the concept of planning of buildings and drawing of single stored building.
- To study the Basic principles of surveying and instruments used.
- To study about the various materials used for the construction of Buildings.
- To understand the construction of Structural Elements in buildings.

UNIT-I:

Introduction to Civil Engineering Building planning : Introduction to types of buildings as per NBC; Selection of site for buildings. Components of a residential building and their functions. Introduction to industrial buildings – office / factory / software development office / power house /electronic equipment service centre

UNIT-II:

Site plan, Orientation of a building, Open space requirements, Position of doorsand windows, Size of rooms; Preparation of a scaled sketch of the plan of asingle storeyed residential building in a given site plan. Introduction to the various building area terms - Computation of plinth area/ built up area, Floor area / carpet area - for a simple single storeyed building; Setting out of a building.

UNIT-III

Surveying - Principles and objectives of surveying; Horizontal measurements – instruments used – tape, types of tapes; Ranging(direct ranging only) Theodolite and Total station-Principles

UNIT-IV:

Building materials

Bricks, cement blocks - Properties and specifications.

Cement – OPC, properties, grades; other types of cement and its uses (inbrief).

Cement mortar – constituents, preparation.

Concrete – PCC and RCC – grades.

Steel - Use of steel in building construction, types and market forms.

UNIT-V:

Building construction – Foundations; Bearing capacity of soil (definitiononly); Functions of foundations, Types - shallow and deep (sketches only).

Brick masonry – header and stretcher bond, English bonds – Elevation and plan (one brick thick walls only).

Roofs – functions, types, roofing materials (brief discussion only).

Floors – functions, types; flooring materials (brief discussion only).

Decorative finishes – Plastering – Purpose, procedure.

Paints and Painting – Purpose, types, preparation of surfaces for painting (brief discussion only).

Text Books:

- Rangwala, S. C., Essentials of Civil Engineering, Charotar Publishing House
- Rangwala, S. C. and Dalal, K. B., Engineering Materials, Charotar Publishing house
- Rangwala, S. C. and Dalal, K. B., Building Construction, Charotar Publishing house
- Dr. K. R. Arora, "Surveying Volume-1", Standard book house, New Delhi, 13th Edition, 2012. 2. S. K.
- Duggal, "SurveyingVolume-2", Tata McGraw-Hill Education Private Limited, India,New Delhi, 3rd Edition, 2009.

Course Outcomes:

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

- To learn the types of buildings and components of building.
- To get the knowledge of planning of single stored buildings.
- To understand Basic concepts of surveying and Basic uses of instruments in surveying.
- To know the materials used for the construction of Buildings.
- To get the knowledge about the construction methods of Buildings.

Annexure-I *R20*

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

BASICS OF NON-CONVENTIONAL ENERGY SOURCES

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Identify various sources of Energy and the need of Renewable Energy Systems
- Understand the concepts of Solar Radiation, Wind energy and its applications
- Distinguish between solar thermal and solar PV systems
- Interpret the concept of geo thermal energy and its applications
- Understand the use of biomass energy and the concept of Ocean energy and fuel cells.

UNIT – I: Solar Energy **10 Hrs**

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy thermal storage.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand about solar thermal parameters
- To distinguish between flat plate and concentrated solar collectors
- To know about thermal storage requirements
- To know about measurement of solar radiation

UNIT – II: PV Energy Systems **10 Hrs**

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems..

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of PV effect in crystalline silicon and their characteristics
- Understand other PV technologies
- To know about electrical characteristics of PV cells & modules
- To know about grid connected PV systems

UNIT – III: Wind Energy **10 Hrs**

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand basics of wind energy conversion and system
- To distinguish between VAWT and HAWT systems
- To understand about design considerations
- To know about site selection considerations of WECS

UNIT – IV: Geothermal Energy **10 Hrs**

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India..

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Geothermal energy and its mechanism of production and its Applications
- Analyze the concept of producing Geothermal energies
- To learn about disadvantages and advantages of Geo Thermal Energy Systems
- To know about various applications of GTES

UNIT – V: Miscellaneous Energy Technologies **10 Hrs**

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.

Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the operation of tidal energy
- Analyze the operation of wave energy
- Analyze the operation of bio mass energy
- Understand the principle, working and performance of fuel cell technology
- Apply these technologies to generate power for usage at remote centres

Text Books:

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.

Reference Books:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd,2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Course Outcomes:

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

- To distinguish between various alternate sources of energy for different suitable application requirements
- To differentiate between solar thermal and PV system energy generation strategies
- To understand about wind energy system
- To get exposed to the basics of Geo Thermal Energy Systems
- To know about various diversified energy scenarios of ocean, biomass and fuel cells

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME55a-3D PRINTING

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize of additive manufacturing / rapid prototyping and its applications in various fields.
- Impart reverse engineering techniques.
- Explain different processes available in additive manufacturing.
- Bring awareness on mechanical properties of materials and geometric issues related to additive manufacturing applications.

UNIT – I: Introduction to 3D PRINTING Systems: **10 Hrs**

History and Development of 3D printing, Need of 3D Printing, Difference between 3D Printing and CNC, Classification of 3D Printing Processes: Based on Layering Techniques, Raw Materials and Energy Sources, 3D Printing Process Chain, Benefits and Applications of 3D Printing, Representation of 3D model in STL format, RP data formats: SLC, CLI, RPI, LEAF, IGES, CT, STEP, HP/GL.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the applications for additive manufacturing processes. **L3**
- Explain the process of additive manufacturing. **L2**
- Represent a 3D model in STL format and other RP data formats to store and retrieve the geometric data of the object. **L3**

UNIT – II: CAD & Reverse Engineering: **8 Hrs**

Basic Concept, Digitization techniques, Model Reconstruction, Data Processing for Additive Manufacturing Technology: CAD model preparation, Part Orientation and support generation, Model Slicing, Tool path Generation, Software's for Additive Manufacturing Technology: MIMICS, MAGICS. Reverse Engineering (RE) –Meaning, Use, RE – The Generic Process, Phase of RE Scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply various digitalization techniques. **L3**
- Explain the concept of reverse engineering and scanning tools. **L2**

UNIT – III: Solid and Liquid Based AM Systems: **8 Hrs**

Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, Applications.

Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications.

Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications.

Stereo lithography Apparatus (SLA): Principle, Process, Materials, Advantages, Limitations and Applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the principles, advantages, limitations and applications of solid and liquid based AM systems. **L2**
- Identify the materials for solid and liquid based AM systems. **L3**

UNIT – IV: Powder Based AM Systems: **8 Hrs**

Principle and Process of Selective Laser Sintering (SLS), Advantages, Limitations and Applications of SLS, Principle and Process of Laser Engineered Net Shaping (LENS), Advantages, Limitations and Applications of LENS, Principle and Process of Electron Beam Melting (EBM), Advantages, Limitations and Applications of EBM.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the principles, advantages, limitations and applications of powder based AM systems. **L2**
- Apply SLS, LENS and EBM 3D printing methods. **L3**

UNIT – V: Other Additive Manufacturing Systems: **8 Hrs**

Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballistic Particle Manufacturing (BPM): Principle, Process, Advantages, Limitations, Applications. Shape Deposition Manufacturing (SDM): Principle, Process, Advantages, Limitations, Applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain principles and limitation of 3D printing using BPM and SDM. **L2**
- Use BPM and SDM 3D printing methods. **L3**

Text Books:

1. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1/e Springer, 2010.
2. Chua C.K., Leong K.F. and Lim C.S., Rapid Prototyping: Principles and Applications, 2/e World Scientific Publishers, 2003.
3. Liou W. Liou, Frank W., Liou, Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development, CRC Press, 2007.

Reference Books:

1. Pham D.T. and Dimov S.S., Rapid Manufacturing; The Technologies and Application of RPT and Rapid Tooling, Springer, London 2001.
2. Gebhardt A., Rapid prototyping, Hanser Gardener Publications, 2003.
3. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC Press, 2005.
4. Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006.

Course Outcomes:

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

- Demonstrate various additive manufacturing and rapid prototyping techniques applications. **L4**
- Describe different additive manufacturing processes. **L3**
- Apply methods in rapid prototyping. **L2**
- Use powder based AM system. **L3**
- Model 3D printing using SDM and BPM methods. **L6**

Online Learning Resources:

- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4

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Mechanical Engineering Department,
JNTUA College of Engineering,

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME55b-SMART MATERIALS

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize the smart materials and its role in developing intelligent systems.
- Introduce the students with HBLS and LBHS smart materials.
- Expose the students in smart systems development and uses.
- Understand the working principle of smart actuators and smart sensors.

UNIT – I: Introduction to Smart Materials: **10 Hrs**

Introduction to Smart Materials: What is Intelligence? Artificial intelligence Vs. embedded Intelligence, Definition of smart material, need for smart materials, classifications of smart systems, components of a smart systems, smart system applications, the role of Smart Materials in developing Intelligent Systems and Adaptive Structures.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall what intelligence is. **L1**
- Define smart materials. **L1**
- Describe the role of smart materials in development of intelligent systems and adaptive structures. **L2**
- Illustrate the applications of smart systems. **L2**

UNIT – II: High bandwidth - Low strain generating (HBLS) Smart Materials: **8 Hrs**

High bandwidth - Low strain generating (HBLS) Smart Materials:

Piezoelectric Materials – constitutive relationship, electromechanical coupling coefficients, piezoelectric constants, piezoceramic materials, variation of coupling coefficients in hard and soft piezoceramics, polycrystalline vs single crystal piezoelectric materials, polyvinyldene fluoride, piezoelectric composites.

Magnetostrictive Materials – constitutive relationship, magneto-mechanical coupling coefficients, Joule Effect, Villari Effect, Matteuci Effect, Wiedemann effect, Giant magnetostriction in Terfenol-D, Terfenol-D particulate composites, Galfenol and Metglas materials.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the constitutive relationship of piezoelectric materials. **L2**
- Compare polycrystalline and single crystal piezeoelectric materials. **L2**
- Explain concepts of Joule effect, Villari effect, Matteuci effect, Wiedemann effect. **L2**
- Discus Galfenol and Metglas materials. **L6**

UNIT – III: Low bandwidth - High strain generating (LBHS) materials: **8 Hrs**

Low bandwidth - High strain generating (LBHS) materials: Shape Memory Alloys (SMA) – Introduction, Phenomenology, Influence of stress on characteristic temperatures, Modelling of shape memory effect. Vibration control through shape memory alloys. Design considerations, multiplexing embedded NiTiNOL actuators. Electro-active Polymers (EAP)- Introduction, Phenomenology, Influence of stress on characteristic temperatures.

Learning Outcomes:

At the end of this unit, the student will be able to

- List various types of LBHS smart materials. **L2**
- Identify the influence of stress on characteristic temperatures in SMA and EAP. **L3**
- Explain the concept of vibration control through shape memory alloys. **L2**
- Discus design considerations of shape memory alloy. **L6**

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UNIT – IV: Smart actuator: **8 Hrs**

Smart actuators:

Based on HBLS smart materials: Piezoelectric Actuators – Induced Strain actuation model, Unimorph and Bimorph Actuators, Actuators embedded in composite laminate, Impedance matching in actuator design, Feedback Control, Pulse Drive, Resonance Drive. Magnetostrictive Actuators – Magnetostrictive Mini Actuators, Thermal instabilities, Discretely distributed actuation, Manetostrictive Composites.

Based on LBHS Smart Materials - Shape Memory Alloy based actuators for Shape Control, Electro-active Polymers for Work-Volume Generation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall working principle of actuators. **L1**
- Explain impedance matching in actuator design, feedback control, pulse drive and resonance. **L2**
- Describe the working principle of Piezoelectric Actuators & Magnetostrictive Actuators. **L2**
- Discus the concepts of actuators based on HBLS and LBHS. **L6**

UNIT – V: Smart sensors: **8 Hrs**

Smart sensors:

Sensors based on HBLS Smart Materials - Piezoelectric Sensors, Magnetostrictive Sensors, Techniques of Self Sensing MEMS Sensors.

Sensors based on LBHS Smart Materials - EAP based sensors, SMA based encoders, Optical Fibre based Sensing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Select the type of sensor required for smart systems. **L1**
- Explain techniques of self sensing MEMS sensors. **L2**
- discus EPA based and SMA based sensors. **L6**
- Explain optical based sensing system. **L2**

Text Books:

1. M.V. Gandhi, B.D. Thompson" Smart Materials and Structures" Springer Science & Business Media, 31.
2. A.V. Srinivasan, Smart Structures; Analysis and Design, Cambridge University Press, Cambridge; New York, 2001
3. K.Uchino, Kluwer, Piezoelectric Actuators and ultrasonic Motors Academic Publishers, Boston, 1997.

Reference Books:

1. Brian Culshaw, Smart Structures and Materials, Artech House, Boston,2000.
2. Gauenzi, P., Smart Structures, Wiley, 2009.
3. Cady, W. G., Piezoelectricity, Dover Publication.
4. A.J. Moulson and J.M-Herbert, Electro ceramics: Materials, Properties/ / Wiley/ 2/e.

Course Outcomes:

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

- Describe the role of smart materials in development of intelligent systems and adaptive structures. **L2**
- Compare polycrystalline and single crystal piezeoelectric materials. **L2**
- Identify the influence of stress on characteristic temperatures in SMA and EAP. **L3**
- Explain techniques of self sensing MEMS sensors. **L2**

Online Learning Resources:

- https://nptel.ac.in/courses/112104251
- http://wwwcourses.sens.buffalo.edu/mae538/LecNotes.html
- http://ssdl.iitd.ac.in/vssdl/smart.pdf
- https://www.stem.org.uk/resources/elibrary/resource/33044/smart-materials-1

Head
Mechanical Engineering Department,
JNTUA College of Engineering,

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC55a- FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING

(Open Elective-I)

L–T – P - C
3 – 0 – 0 – 3

Course Objectives:

- To study the basic principle, construction and operation of semiconductor devices.
- To learn the real time applications of semiconductor devices.
- To introduce binary number systems, logic gates and digital logic circuits.
- To get an idea about the basic principles of communication systems and their applications.
- To learn the measurement of physical parameters using Sensors and Transducers.

UNIT I

Introduction to Electronics Engineering: Overview, scope and objective of studying Electronics Engineering. Introduction to semiconductor devices: Bond structure of semiconductors, intrinsic and extrinsic semiconductors; Basic principle and operation of semiconductor devices – diode, bipolar junction transistor, field effect transistors; Introduction to VLSI.

Learning Outcomes:

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

- Understand the basic principle, construction and operation of semiconductor devices.(L2)
- Learn about the diode, bipolar junction transistor and field effect transistors.(L1)

UNIT II

Applications of semiconductor devices: Basic concepts of rectifiers, voltage regulators, amplifiers and oscillators; Basic concepts of operational amplifier and their applications.

Learning Outcomes:

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

- To learn the real time applications of semiconductor devices.(L1)
- To understand the basic concepts of operational amplifier and their applications.(L2)

UNIT III

Introduction to digital systems: Binary number system, Boolean algebra, Logic gates, adders, one-bit memory, flip-flops (SR, JK), shift registers, Asynchronous counter.

Learning Outcomes:

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

- Understand the binary number systems, Boolean algebra and working of logic gates.(L2)
- Know the working and applications of digital logic circuits.(L1)

UNIT IV

Introduction to Communication Systems: Elements of a communication system – transmitter and receiver; Signal types in communication; FDM and TDM; Processing of signals for transmission – basic concepts of amplitude and frequency modulation; Examples of telecommunication systems – telephone, radio, television, mobile communication and satellite communication.

Learning Outcomes:

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

- Identify the basic elements of a communication system.(L2)
- Understand various examples of telecommunication systems.(L2)

UNIT V

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Learning Outcomes:

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

- Understand the basic working principle and applications of different sensors and transducers.(L2)
- Measure physical parameters using different types of sensors and transducers.(L3)

TEXT BOOKS

1. Millman J, Halkias C.C andJit S, "Electronic Devices and Circuits", Tata McGraw-Hill, 2nd 2007 Edition.
2. Mano M.M., "Digital Design", Prentice-Hall, 3rd Edition. 2002
3. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation",DhanpatRai& Co. 3rd edition Delhi, 2010.
4. Kennedy G. and Davis B., "Electronic Communication Systems", Tata McGraw-Hill, 4th 2008 Edition.

REFERENCE BOOKS

1. Tomasi W., "Advanced Electronic Communication Systems", Pearson/Prentice-Hall, 6th 2004 Edition.
2. Boylstead R.L. andNashelsky L., "Electronic Devices and Circuit Theory", Pearson, 10th 2009 Edition.

Course outcomes:

At the end of this course, the students will be able to

- Understand the basic principle, construction and operation of semiconductor devices.(L2)
- Learn the real time applications of semiconductor devices.(L1)
- Comprehend the binary number systems, logic gates and digital logic circuits.(L1)
- Understand the basic principles of communication systems and their applications.(L2)
- Measure the physical parameters using Sensors and Transducers.(L3)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC55b- TRANSDUCERS AND SENSORS

(Open Elective-I)

L – T – P - C
3 – 0 – 0 – 3

Course Objectives:

- To study about the characteristics of instrumentation system and transducers.
- To know the operation of different types of Temperature Transducers.
- To learn the operation of different types of Flow Transducers.
- To understand the working and operation of different types of Pressure Transducers.
- To gain the knowledge on working of Force and Sound Transducers.

UNIT I

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

Learning Outcomes:

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

- Learn the characteristics of instrumentation system and transducers.(L1)
- Measure motion using different motion transducers.(L3)

UNIT II

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics.

Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

Learning Outcomes:

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

- Understand the working principle of temperature transducers.(L2)
- Study about different types of bio sensors and smart sensors.(L1)

UNIT III

Flow Transducers: Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

Learning Outcomes:

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

- Understand the Bernoulli's principle and continuity.(L2)
- Learn how to measure flow using different types of flow meters.(L1)

UNIT IV

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.

Learning Outcomes:

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

- Work with different types of manometers.(L3)
- Use different types of pressure transducersto measure pressure.(L3)

UNIT V

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone.

Learning Outcomes:

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

- Learn how to measure force using force transducers.(L1)
- Understand the working and operation of sound transducers.(L2)

TEXT BOOKS

1. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", DhanpatRai& Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, "Instrumentation Devices and Systems", TATA McGraw Hill publications, 2007.

REFERENCE BOOKS

1. Doebelin. E.O, "Measurement Systems Application and Design", McGraw Hill International, New York, 2004.
2. Nakra B.CandChaudharyK.K , "Instrumentation Measurement and Analysis", Second Edition, Tata McGraw-Hill Publication Ltd.2006.

Course outcomes:

At the end of this course, the students will be able to

- Understand the characteristics of instrumentation system and transducers.(L2)
- Know the operation of different types of Temperature Transducers.(L1)
- Compare the operation of different types of Flow Transducers.(L2)
- Correlate the working and operation of different types of Pressure Transducers.(L4)
- Gain the knowledge on working of Force and Sound Transducers.(L1)

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS55A- Fundamentals of Internet of Things

(Open Elective-I)

L	T	P	C
3	0	0	3

Course objectives:

- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario.

UNIT I : Fundamentals of IoT

Introduction – Characteristics-Physical Design – IoT Protocols – Logical Design – Enabling technologies – IoT Levels – Six Levels of IoT - Domain Specific IoTs.

Learning Outcome:

At the end of this unit, students will able to

- Describe the IoT devices physical design and able to design IoT devices in various levels of IoT L1
- Explain the technologies enabling related to industry. L2

UNIT II: IOT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP, NETOPEER.

Learning Outcome:

At the end of this unit, students will able to

- Describe the Software defined networks and Network function virtualization with respect to the IoT systems. L2
- Explain the NETCONF protocol with YANG modeling language. L2

UNIT III: IoT Design Methodology

IoT Systems Management – IoT Design Methodology – Specifications Integration and Application Development.

Learning Outcome:

At the end of this unit, students will able to

- Describe the IoT devices complete design methodology with all spectifications. L2
- Explain the system Integration and application development and deployment.L3 L3

UNIT IV: Sensors and Connectivity

Sensors- Types of sensor nodes, Internet communications, IP addresses, MAC Address, TCP and UDP Ports, Application layer protocols

Learning Outcome:

At the end of this unit, students will able to

- Describe various sensors usage with respect to the IoT systems and differentiation between IP address and MAC address L3
- Explain the benefits of application layer protocols. L4

UNIT V: IOT Industry Applications

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plant wide Ethernet Model (CPwE) – Power Utility Industry – Grid Blocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

Learning Outcome:

At the end of this unit, students will able to

- Describe the industry oriented IoT devices and its applications. L4

TEXT BOOKS:

2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A Hands-on Approach", Universities Press, 2015.
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCES:

4. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.
5. Marco Schwartz, "Internet of Things with the Arduino Yun", Pack Publishing, 2014.
6. *Simon Monk, "Programming the Raspberry Pi: Getting Started with Python"*, McGraw-Hill, *2013.*
7. CharalamposDoukas,"Building Internet of Things With the Arduino", Second Edition, 2012.
8. Dr.John Bates, "Thingalytics: Smart Big Data Analytics for the Internet of Things", Software AG Publisher, 2015.

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models. L2
- Appraise the role of IoT protocols for efficient network communication. L3
- Illustrate different sensor technologies for sensing real world entities and identify the

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS55B-E-Marketing
(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about
I. Understand the legal and ethical issues in e-marketing.

II. Analyze online marketing and supply chain management.

III. Provides extensive theoretical and practical knowledge of online marketing.

IV. Develop marketing skills required for a continuously growing international business environment.

UNIT – I: E-BUSINESS OVERVIEW :
Traditional commerce vs. e-commerce, e-commerce and e-business categories of e-commerce development and growth of e-commerce advantages and disadvantages of e-commerce international nature of e-commerce..

Learning Outcomes:
At the end of this unit, the student will be able to
To realize basics of E-Marketing. **L1**

To introduce different E-Business Models . **L2**

UNIT – II: E-BUSINESS INFRASTRUCTURE :

E Commerce architectural framework, the internet and www-internet protocols, internet, intranet and extranets, internet connection options, security issues in e commerce environment, encryption techniques payment systems types of payments legal, ethical and tax issues in e-commerce.

Learning Outcomes:
At the end of this unit, the student will be able to
To understand the E-Marketing Plan. **L2**

To know about Online Expression . **L3**

UNIT – III: ONLINE MARKETING AND SUPPLY CHAIN MANAGEMENT
Online marketing, business models of e marketing, online advertisement, advertisement methods and strategies online retailing e-auctions.Supply chain management-procurement process and the supply chain types of procurement, multi-tier supply chains and trends in supply chain management.

Learning Outcomes:
At the end of this unit, the student will be able to
To know about the Data Drive Strategy . **L6**

Gain knowledge on Consumer Behavior Online **L3**

UNIT – IV: ONLINE SERVICES :

Online financial services, online banking and brokerage, online insurance services, online real estate services, travel services online, hospitality services online, recruitment services online, publishing services online entertainment, e-learning.

Learning Outcomes:

At the end of this unit, the student will be able to

To know about Pricing Strategies L4

To know about Channel Management and Power. L6

UNIT – V: MOBILE COMMERCE :

Definition of mobile commerce, mobile commerce framework, growth of mobile commerce benefits and limitations of mobile commerce mobile network infrastructure, information distribution for mobile networks multimedia content, publishing, mobile payment models, mobile commerce applications.

Learning Outcomes:

At the end of this unit, the student will be able to

To know how Browsing Behavior Model L4

To know about Ten rules for CRM Success. L2

Text Books:

1. Gary P. Schneider, "Ecommerce-Strategy, Technology and Implementation", Cengage Learning, India Edition

2. Kenneth C. Laudon, Carol GuercioTraver, "E-commerce–Business", Technology, Pearson, Low Price Edition.

3. Bharat Bhasker, "Electronic Commerce Framework, Technologies and Applications", 3rdn Edition.Tata McGraw, Hill.

Reference Books:

1. Efraim Turban, Tae Lee, David King and H. Micheal Chung, "Electronic Commerce, Managerial Perspective", Pearson Education Asia.
2. CSV Murthy, "E-commerce-Concepts, Models and Strategies", HPH.
3. . J. Christopher Westland and Theodore H K Clark, "Global Electronic Commerce ,Theory and Case Studies", Oxford Universities Press.

Course Outcomes:

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

- Analyse the confluence of marketing, operations, and human resources in real-time delivery. L3
- Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks. L3
- Investigate and evaluate issues in adapting to globalised markets that are constantly changing and increasingly networked. L5
- Investigate and evaluate issues in adapting to globalised markets that are constantly changing and increasingly networked. L2
- Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities. L3

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS55C-Computer Architecture and Organization

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To impart basic concepts of computer architecture and organization.
- To explain key skills of constructing cost-effective computer systems.
- To familiarize the basic CPU organization.
- To help students in understanding various memory devices.

UNIT – I: STRUCTURE OF COMPUTERS:

Computer types, Functional units, Basic operational concepts, VonNeumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data representation, Fixed and Floating point, Error detection and correction codes.

COMPUTER ARITHMETIC: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations.

Learning Outcomes:

At the end of this unit, the student will be able to

To realize basics of computer structure. L1

To know about the arithmetic operations. L2

UNIT – II: BASIC COMPUTER ORGANIZATION AND DESIGN:

Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC.

Learning Outcomes:

At the end of this unit, the student will be able to

To understand the organization of computer. L2

To know about design of the computer. L3

UNIT – III:REGISTER TRANSFER AND MICRO-OPERATIONS

REGISTER TRANSFER AND MICRO-OPERATIONS: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit.

MICRO-PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.

Learning Outcomes:
At the end of this unit, the student will be able to
To know about the registers and its operations. **L6**

Gain knowledge on Micro operations. **L3**

UNIT – IV:MEMORY SYSTEM

MEMORY SYSTEM: Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging, Secondary Storage, RAID.

Learning Outcomes:
At the end of this unit, the student will be able to
To know about Semiconductor Memories **L4**

To know about the Cache Memory **L6**

UNIT – V: INPUT OUTPUT

INPUT OUTPUT: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA.
MULTIPROCESSORS: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.

Learning Outcomes:
At the end of this unit, the student will be able to
To know about the Input/Output operations **L4**

To know about the multiprocessors. **L2**

Text Books:

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.

Reference Books:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.

2.William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy

3.Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,

4.John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill

Course Outcomes:

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

- Identify various components of computer and their interconnection. **L3**
- Identify basic components and design of the CPU: the ALU and control unit. **L3**
- Compare and select various Memory devices as per requirement. **L5**
- Compare various types of IO mapping techniques. **L2**
- Critique the performance issues of cache memory and virtual memory. **L3**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

POWER SYSTEM OPERATION AND CONTROL

L	T	P	C
3	0	0	3

Course Objectives:

- To determine the mathematical model of Power System and find the load flow of a given power system
- To perform fault analysis and determine the stability of the system.
- To understand about optimal power flow problems and solving using specified method
- To understand about Automatic Generation Control problems and solutions in Power Systems
- To understand necessity of reactive power control, compensation under no load and load operation of transmission systems.

UNIT – I: LOAD FLOW STUDIES — 10 Hrs

Representation of Power System Elements, Ybus - Formation by Inspection Method, Modelling of Transformer (Off nominal turns ratio), Necessity of Power Flow Studies – Data for Power Flow Studies, Static Load Flow Equations – Load Flow Solutions using Gauss Seidel Method: Acceleration Factor, with P-V Buses, Algorithm and Flowchart, Newton Raphson Method in Polar Co-ordinates Form: with PV Buses, Jacobian Elements, Algorithm and Flowchart, Decoupled and Fast Decoupled Methods, Comparison of Different Methods, Numerical Problems .

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about representation of power system components. **L1**
- Learn about formation of Y bus. **L2**
- Learn about necessity of studyof load flows and various methods. **L3**

UNIT – II: SHORT CIRCUIT ANALYSIS — 10 Hrs

Per-Unit System of Representation. Per-Unit Equivalent Reactance Network of a Three Phase Power System, Numerical Problems. Fault Analysis: Short Circuit Current and MVA Calculations, Fault Levels, Application of Series Reactors, Numerical Problems. Symmetrical Component Transformation, Positive, Negative and Zero Sequence Components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without Fault Impedance, Numerical Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand regarding the per unit system. **L1**
- Understand regarding Short ckt analysis and MVA calculations. **L2**
- Learn about Sequence networks. **L3**

UNIT – III: POWER SYSTEM STABILITY ANALYSIS — 10 Hrs

Elementary Concepts of Steady State, Dynamic and Transient Stabilities. Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to Improve Steady State Stability.

Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Solution of Swing Equation by 4th Order Range – Kutta Method (up to 2 iterations) - Methods to improve Stability.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about various stabilities and definitions involved in stability. **L1**
- Learn about how to calculate steady state stability and methods to improve it. **L2**

- Learn about the concept of equal area ,Swing equation solution by various methods

UNIT – IV: ECONOMIC OPERATION OF POWER SYSTEMS **10 Hrs**

Optimal Operation of Generators in Thermal Power Stations, - Heat Rate Curve – Cost Curve – Incremental Fuel and Production Costs, Input-Output Characteristics, Optimum Generation Allocation with Line Losses Neglected. Optimum Generation Allocation Including the Effect of Transmission Line Losses – Loss Coefficients, General Transmission Line Loss Formula. First Order Turbine Model, Block Diagram Representation of Steam Turbines and Approximate Linear Models. Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of Small Signal Transfer Function – Block Diagram.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about economic operation of power systems. **L1**
- Learn about B.D representation and Modelling of various components in P.S. **L2**

UNIT – V: LOAD FREQUENCY CONTROL and REACTIVE POWER CONTROL **10 Hrs**

Necessity of Keeping Frequency Constant. Definitions of Control Area – Single Area Control – Block Diagram Representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Uncontrolled Case and PI Controlled Case. Load Frequency Control of 2-Area System – Tie-Line Bias Control , Uncontrolled Case and PI Controlled Case. Steady State Response – Load Frequency Control and Economic Dispatch Control (AGC). Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the necessity of keeping the frequency constant. **L1**
- Learn about calc. of steady state and Dynamic response of controlled and uncontrolled cases. **L2**
- Learn about power system compensation. **L3**

Text Books:

1. Power System Analysis Operation and Control-A.Chakravarthi and S.Halder,3rd Edition,PHI.
2. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata M Graw – Hill Publishing Company Ltd, 2nd edition.

Reference Books:

1. An Introduction to: Reactive Power Control and Voltage Stability in Power Transmission Systems by AbhijitChakrabarti, D. P. Kothari
2. A. K. Mukhopadhyay and Abhinandan De, Eastern Economy Edition, 2010..
3. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., THOMPSON, 3rd Edition
4. Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH

Course Outcomes:

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

- To form Y Bus and perform load flow and short circuit analysis **L1**
- To determine the transient and steady state stability of a given power system **L2**
- To be able to Understand to deal with AGC problems in Power System **L3**
- To understand the f control& complexity of reactive power control problems. **L4**
- To understand how the cost of generation per unit can be minimized **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

ELECTRICAL AND ELECTRONIC MEASUREMENTS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- The basic principles of different types of electrical instruments for the measurement of voltage, current, power factor, power and energy.
- The measurements of RLC parameters using Bridges.
- The principles of magnetic measurements.
- The principle of working of CRO and its applications.
- Extending the range of an Instrument.

UNIT – I: MEASURING INSTRUMENTS **10 Hrs**

Classification – Ammeters and Voltmeters – PMMC, Dynamometer, Moving Iron Types – Expression for the Deflecting Torque and Control Torque – Errors and their Compensation, Extension of range–Numerical examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the operation of different instruments. **L1**
- Know the different types of errors and their compensation **L2**

UNIT – II: MEASUREMENT OF POWER, POWER FACTOR AND ENERGY **10 Hrs**

Single Phase Dynamometer Wattmeter, LPF and UPF, Double Element and Three Elements, Expression for Deflecting and Control Torques; P.F.Meters: Dynamometer and Moving Iron Type–1-ph and 3-ph Power factor Meters. Single Phase Induction Type Energy Meter –Driving and Braking Torques–Errors and their Compensation, Three Phase Energy Meter-Numerical examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the working principles and construction of different types of Energy meters **L1**
- Distinguish between low and high power factor ranges in watt meters **L2**

UNIT – III: INSTRUMENTTRANSFORMERS,POTENTIOMETERS,ANDMAGNETICMEASUREMENTS **10 Hrs**

Current Transformers and Potential Transformers – Ratio and Phase Angle Errors –Methods for Reduction of Errors-Design Considerations. DC Potentiometers: Principle and Operation of D.C. Crompton's Potentiometer –Standardization – Measurement of unknown Resistance, Currents and Voltages. A.C. Potentiometers: Polar and Coordinate types-Standardization – Applications. Determination of B-H Loop Methods of Reversals – Six Point magnetic measurement Method– A.C. Testing– Iron Loss of Bar Samples –Numerical Examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Distinguish between CTs and PTs **L1**
- Understand the principles and working of various measuring instruments used to detect electrical circuit parameters R,L,C **L2**

UNIT – IV: D.C&A.C BRIDGES **10 Hrs**

Method of Measuring Low, Medium and High Resistances – Sensitivity of Wheat stone's Bridge – Kelvin's Double Bridge for Measuring Low Resistance, Measurement of High Resistance –Loss of Charge Method. Measurement of Inductance-Maxwell's Bridge, Anderson's Bridge. Measurement of Capacitance and Loss Angle – DeSauty Bridge. Wien's Bridge –Schering Bridge– Numerical Examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the bridge configurations and their applications for various ranges of resistance measurement **L1**
- Compute the unknown parameters of Inductance and Capacitance using the bridges **L2**

UNIT – V: CROAND DIGITAL METERS **10 Hrs**

Cathode Ray Oscilloscope- Cathode Ray Tube-Time Base Generator-Horizontal and Vertical Amplifiers– Applications of CRO–Measurement of Phase, Frequency, Current and Voltage-Lissajous Patterns. Digital Voltmeters- Successive Approximation, Ramp, and Integrating Type – Digital Frequency Meter-Digital Multi meter - Digital Tachometer.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the operation of CRO and its parts **L1**
- Know about Digital voltmeters and Distinguish between analog and digital meters **L2**

Text Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co.Publications, 2007.
2. Electrical Measurements and measuring Instruments–by E.W.Goldingand F.C.Widdis, 5thEdition, Reem Publications, 2011.

Reference Books:

1. Electrical &Electronic Measurement & Instruments by A.K. Sawhney Dhanpat Rai & Co. Publications, 2007.
2. Electrical Measurements: Fundamentals, Concepts, Applications–by Reissl and, M.U,New Age International (P)Limited,2010.
3. Electrical &Electronic Measurement &InstrumentationbyR.K.Rajput,2nd Edition, S.Chand &Co., 2ndEdition,2013.

Course Outcomes:

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

- Understand the working of various instruments and equipments used for the measurement of various electrical engineering parameters like voltage, current, power, phase etc in industry as well as in power generation, transmission and distribution sectors **L1**
- Analyze and solve the varieties of problems and issues coming up in the vast field of electrical measurements. **L2**
- Analyze the different operation of extension range ammeters and voltmeters, **L3**
- Design and development of various voltage and current measuring meters. **L4**
- Analyze DC and AC bridges for measurement of parameters and different characteristics of periodic and a periodic signals using CRO. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

SWITCHGEAR AND PROTECTION

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- The technical aspects involved in the operation of circuit breaker
- The different types of electromagnetic relays and microprocessor based relays
- The protection of Generators
- The protection of Transformers
- The protection of feeders and lines
- Generation of over voltages and protection from them

UNIT – I: FUSES AND CIRCUIT BREAKERS — 10 Hrs

Fuses: Definitions, characteristics, types, HRC fuses.

Circuit Breakers: Elementary Principles of Arc Interruption, Re-striking Voltage and Recovery Voltage – Re-striking Phenomenon, Average and Max. RRRV, Current Chopping and Resistance Switching - CB Ratings and Specifications: Types and Numerical Problems. – Auto Re-closures. Minimum Oil Circuit Breakers, Air Blast Circuit Breakers, Vacuum and SF6 Circuit Breakers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about different types of fuses and circuit breakers — **L1**
- Learn about arc ionization and deionization — **L2**

UNIT – II: RELAYS — 10 Hrs

Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT. Static Relays – Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays and Their Flow Charts. Basics of Digital / Numerical Relays.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about basic principle of relay operation — **L1**
- Learn about all types of relays — **L2**

UNIT – III: PROTECTION OF GENERATORS & TRANSFORMERS — 10 Hrs

Protection of Generators against Stator Faults, Rotor Faults and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection – calculation of percentage winding unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problems on Design of CT Ratio, Buchholz Relay Protection, Numerical Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about total protection of generator and transformer — **L1**
- learn about concepts of protection with numerical analysis — **L2**

UNIT – IV: PROTECTION OF FEEDERS & LINES — 10 Hrs

Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection. Protection of Bus Bars.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about total protection of FEEDERS & LINES **L1**
- learn about concepts of protection with numerical analysis **L2**

UNIT – V: OVER VOLTAGES IN POWER SYSTEMS **10 Hrs**

Generation of Over Voltages in Power Systems-Protection against Lightning over Voltages - Valve Type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the generation of over voltages in power system and its protection **L1**
- Understand the basic insulation coordination **L2**

Text Books:

1. Power System Protection and Switchgear, Badri Ram, D.N Viswakarma, TMH Publications, 2011.
2. Switchgear and Protection, Sunil S Rao, Khanna Publishers, 1992.

Reference Books:

1. Electrical Power Systems, C.L.Wadhwa, New Age international (P) Limited, Publishers, 2012.
2. Transmission network Protection, Y.G. Paithankar ,Taylor and Francis,2009
3. Power system protection and switch gear, BhuvaneshOza, TMH, 2010.

Course Outcomes:

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

- Solve numerical problems for arc interruption and recovery in circuit breakers **L1**
- Distinguish between the principles of operation of electromagnetic relays, static relays and microprocessor based relays **L2**
- Determine the unprotected percentage of generator and transformer winding under fault occurrence **L3**
- Identify various types of the relays in protecting feeders, lines and bus bars **L4**
- Demonstrate the protection of a power system from over voltages **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

POWER ELECTRONICS LAB

L	T	P	C
0	0	3	1.5

Course Objectives:

- Understand and analyze various characteristics of power electronic devices with gate firing circuits and forced commutation techniques.
- Analyze the operation of single-phase half & fully-controlled converters and inverters with different types of loads
- Analyze the operation of DC-DC converters, single-phase AC Voltage controllers, cyclo converters with different loads
- Create and analyze various power electronic converters using PSPICE software.

Any Eight of the following Experiments are to be conducted

1. Study of Characteristics of SCR, Triac, MOSFET & IGBT
2. Gate firing circuits for SCR's: (a) R triggering (b) R-C triggering
3. Gate driver Circuits for MOSFET and IGBT
4. Single Phase AC Voltage Controller with R and RL Loads
5. Single Phase fully controlled bridge converter with R and RL loads
6. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
7. DC Jones chopper with R and RL Loads
8. Single Phase Parallel, inverter with R and RL loads
9. Single Phase Cycloconverter with R and RL loads
10. Single Phase Half controlled converter with R load
11. Three Phase half controlled bridge converter with R-load
12. Single Phase series inverter with R and RL loads
13. Single Phase Bridge converter with R and RL loads
14. Single Phase dual converter with RL loads.

Any two simulation experiments with PSPICE /PSIM / MATLAB

15. PSPICE / MATLAB / PSIM simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads
16. PSPICE/ MATLAB/ PSIM simulation of resonant pulse commutation circuit and Buck converters and chopper.
17. PSPICE / MATLAB/ PSIM simulation of single phase Inverter with PWM control.

Reference Books:

1. Power Electronics Laboratory: Theory, Practice and Organization (Narosa series in Power and Energy Systems) by O.P. Arora, Alpha Science International Ltd., 2007.
2. Simulation of Electric and Electronic circuits using PSPICE – by M.H.Rashid, M/s PHI Publications.
3. PSPICE A/D user's manual – Microsim, USA.
4. PSPICE reference guide – Microsim, USA.
5. MATLAB and its Tool Books user's manual and – Mathworks, USA.

Course Outcomes:

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

- Design a Commutation circuit of a thyristor, control a supply voltage using converters. **L1**
- Select a suitable power electronic device for different applications. **L2**
- Use PSPICE software for determining the performance of given power electronic Converters. **L3**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

ELECTRICAL MEASUREMENTS LAB

L	T	P	C
0	0	3	1.5

Course Objectives:

- Calibration of various electrical measuring instruments
- Accurate determination of inductance and capacitance using AC Bridges
- Measurement of coefficient of coupling between two coupled coils
- Measurement of resistance for different range of resistors using bridges
- Measurement of power using Watt meters by different methods

Thefollowingexperimentsarerequiredtobeconductedascompulsoryexperiments:

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. CromptonD.C.Potentiometer–CalibrationofPMMCammeterandPMMCvoltmeter
4. Kelvin's double Bridge–Measurement of low resistance–Determination of Tolerance
5. Determination of Coefficient of coupling between two mutually coupled coils.
6. Schering Bridge
7. Measurementof3-phasereactivepowerwithsingle-phasewattmeter
8. Anderson bridge

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

9. Maxwell's bridge and DeSauty bridge
10. Calibration of LPF wattmeter–by Phantom loading
11. Wheatstone bridge–measurement of medium resistances
12. LVDT and capacitance pickup–characteristics and Calibration
13. Resistance strain gauge–strain measurement and Calibration
14. Transformer turns ratio measurement using AC Bridge
15. AC Potentiometer –Calibration of AC Voltmeter, Parameters of Choke coil

Reference Books:

1. Electrical & Electronic Measurement &Instruments by A.K.Sawhney DhanpatRai & Co. Publications, 2007.
2. Electrical Measurements and measuring Instruments– by E.W.Goldingand F.C.Widdis, 5th Edition, Reem Publications, 2011.

Course Outcomes:

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

- Accurately determine the values of inductance and capacitance using AC bridges **L1**
- Compute the coefficient of coupling between two coupled coils **L2**
- Accurately determine the values of very low resistances **L1**
- Determine power of the Three phase AC circuits **L2**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

POWER SYSTEMS LAB

L	T	P	C
0	0	3	1.5

Course Objectives:

- Understand the Relay Operating Characteristics
- Todotheexperiments(inmachineslab)onvariouspowersystemconceptslikedeterminati on of sequence impedance, fault analysis, finding of sub transientreactances.
- Todrawtheequivalentcircuitofthreewindingtransformerbyconductingasuitableexperi ment.
- TodeveloptheMATLABprogramforformationofYandZbuses.TodeveloptheMATLA BprogramsforGauss-Seidelandfastdecoupledloadflowstudies.
- To develop the SIMULINK model for single are a load frequency problem

Conductany10experimentsfromthefollowing:

1. Operating Characteristics of Over Current-Relay and Differential Relay
2. Operating Characteristics of phase sequence Relay and microprocessor based Over Voltage Relay
3. Simulation of Y-Bus Using MATLAB
4. Simulation of Z-Bus Using MATLAB
5. Simulation of Power Flow Using Gauss-Seidel Method for the 3-BusSystem
6. Economic Load Dispatch for Thermal Plant Simulation
7. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine
8. LG Fault Analysis on an unloaded alternator, LL Fault Analysis on conventional phases
9. LLG Fault Analysis and LLLG Fault Analysis
10. Determination of Sub-transient reactance of salient pole synchronous machine
11. Equivalent circuit of three winding transformer.
12. Develop a Simulinkmodel for a single area load frequency problem and simulate the same

Reference Books:

1. Modern Power System Analysis–by I.J.Nagrath & D.P.KothariTata MGraw–Hill Publishing Company Ltd ,2nd edition..
2. Power System Analysis – by HadiSaadat Mc Graw-Hill Publishing Company Ltd, Published in April 2009..

Course Outcomes:

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

- Get the practical knowledge on calculation of sequence impedance, fault currents, voltages and sub-transient reactance's. **L1**
- Write a program to determine Y Bus and Z Bus for the given transmission system. **L2**
- Get the knowledge on development of MATLAB program for formation of Y and Z buses, Gauss-Seidel and Fast Decouple Load Flow studies **L3**
- Get the knowledge on development of SIMULINK model for single area load frequency problem. **L4**
- Get the practical knowledge on calculation of sequence impedance, fault currents, **L5**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

SOFT SKILLS

(Common to all branches)

L	T	P	C
1	0	2	2

Course Objectives:

- To prepare to face global competition for employment and excellence in profession.
- To help the students understand and build interpersonal and interpersonal skills that will enable them to lead meaningful professional life.

UNIT – 1: SOFT SKILLS: INTRODUCTIUON

Soft Skills: Definition-Meaning--Importance- Why skill gap -Analysis--Personality Development vs. Soft Skills- Learning Methods.

Learning Outcomes:

At the end of this unit, the student will be able to

• Developing self-motivation, raised aspirations and belief in one's own abilities, defining and committing to achieving one's goals.	**L1**
• Learning to keep going when things don't go according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict	**L2**

UNIT – II: PERSONAL SKILLS

Intra-Personal: Definition-Meaning-Importance-SWOT analysis- Goal Setting- Emotional Intelligence- Right thinking- Problem Solving-Time management.

Inter-Personal: Definition-Meaning-Importance-Communications skills- Team Work-Negotiation Skills-Leadership skills.

Learning Outcomes:

At the end of this unit, the student will be able to

• A commitment to ethics and integrity in academic and professional relationships, within the community and the environment.	**L1**
• Describe how good communication with other can influence our working relationships	**L2**

UNIT – III: VERBAL AND NON VERBAL SKILLS

Verbal Skills: Definition and Meaning-Importance-Improving Tips for Listening, Speaking, Reading- Writing Skills.

Non Verbal Skills: Definition and Meaning-Importance- Dress Code- Facial Expressions- Eye Contact- Proxemics- Haptics -Posture -Kinetics- Para Language.

Learning Outcomes:

At the end of this unit, the student will be able to

• Compares verbal and nonverbal communication	**L1**
• Understand the functions of nonverbal communication	**L2**

UNIT – IV: FINISHING SCHOOL

Before Interview: Bridging between Campus and Corporate- Preparation of Resume-Cover Letter- Statement of Purpose-E-mail writing-Corporate Etiquettes.

Learning Outcomes:	
At the end of this unit, the student will be able to	
• Learner will be able to prepare his/ her own Resume and Cover letter.	L1
• Learner will understand the importance of etiquettes and learn the nuances of expected behaviour within a group, a social class and society at general	L2

UNIT – V: DURING INTERVIEW

Interview Skills: Importance-Purpose- Types of interviews –Preparation for interviews - Top Questions- Body Language in Interview Room-Do's and Don'ts s of interview.

Learning Outcomes:	
At the end of this unit, the student will be able to	
• Learner will be able to face interview questions and effectively present his /her. skills	L1
• Learner will manage how to plan and organize personal and professional life.	L2

Reference Books:

1. Sherfield, M. Robert at al ***Cornerstone Developing Soft Skills***, 4th ed. Pearson Publication, New Delhi, 2014.
2. Alka Wadkar, ***Life Skills for Success***, Sage Publications India Private Limited; First edition (1 May 2016)
3. Sambaiah.M. ***Technical English***, Wiley publishers India. New Delhi. 2014.
4. Gangadhar Joshi, ***From Campus to Corporate***, *Sage Text.*
5. Alex.K, ***Soft Skills***, 3rd ed. S. Chand Publication, New Delhi, 2014.
6. Meenakshi Raman and Sangita Sharma, ***Technical Communication: Principle and Practice***, Oxford University Press. 2009.
7. Shalini Varma, ***Body Language for Your Success Mantra***, 4th ed, S. Chand Publication, New Delhi, 2014.
8. Stephen Covey, ***Seven Habits of Highly Effective People***, JMD Book, 2013.

Course Outcomes:	
At the end of this Course the student will be able to	
• The students will be able to assimilate and understood the meaning and importance of soft skills and learn how to develop them.	L1
• The students will understand the significance of soft skills in the working environment for professional excellence.	L2
• The students will be prepared to undergo the placement process with confidence and clarity.	L3
• The students will be ready to face any situation in life and equip themselves to handle them effectively.	L4
• The students will understand and learn the importance of etiquettes in both professional and personal life	L5

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

DESIGN THINKING FOR INNOVATION

L	T	P	C
3	0	0	3

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

UNIT – I: Introduction to Design Thinking **10 Hrs**

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about elements of design **L1**
- Learn about New materials in Industry. **L2**

UNIT – II: Design Thinking Process **10 Hrs**

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

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about design thinking in social innovations **L1**
- Learn about product development **L2**

UNIT – III: Innovation **10 Hrs**

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about role of creativity and innovation in organizations **L1**
- learn about Measurment the impact and value of creativity **L2**

UNIT – IV: Product Design **10 Hrs**

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

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about Product strategies **L1**
- learn about concepts of Product planning **L2**

UNIT – V: Design Thinking in Business Processes **10 Hrs**

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Design Thinking principles **L1**
- Understand to Develop & test prototypes **L2**

Text Books:

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

Reference Books:

1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.

Course Outcomes:

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

- Define the concepts related to design thinking. **L1**
- Explain the fundamentals of Design Thinking and innovation **L2**
- Apply the design thinking techniques for solving problems in various sectors **L3**
- Analyse to work in a multidisciplinary environment **L4**
- Formulate specific problem statements of real time issues **L5**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech. VI /VII-Sem (R20)

NUMERICAL TECHNIQUES

(Open Elective -II)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing the student

- With the concepts and several methods of Numerical methods.
- To explore the solutions of ordinary differential equations, partial differential equations and integral equations.

UNIT – 1: Solution to System of Nonlinear Equations and Spline Functions: **9 Hrs**

Method of Iteration- Newton-Raphson method. Linear splines - Quadratic splines – Cubic splines: Minimizing property of Cubic splines – Error in the Cubic Spline ad its derivatives – Surface fitting by cubic splines. – Cubic B-Splines: Representation of B- Splines – Least squares solution – Applications of B-Splines.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve the algebraic and transcendental equations. L2
- Solve the system of nonlinear equations and spline functions. L4

UNIT – II: Numerical Linear Algebra:

Triangular matrices – LU decomposition of a matrix – vector and matrix norms. – Solutions of linear systems –Direct methods: Gauss elimination – necessary for pivoting – Gauss-Jordan method – modification of the Gauss method to compute the inverse – number of arithmetic operations – LU decomposition method – computational procedure for LU decomposition method – LU decomposition from Gauss elimination – solution of tridiagonal systems – III conditioned linear systems – Method for III- conditioned systems. – Solution of linear systems –Iterative methods.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of numerical linear algebra. **L1**
- Apply the concepts of numerical linear algebra. **L3**

UNIT – III: Initial and Boundary value problems:

Predictor-Corrector methods: Adams-Moulton method – Milne's method. – Cubic Spline method – Simultaneous and higher order equations. – Boundary value problems: Finite difference method – Cubic Spline method – Galerkin's method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve first order initial value problems. L3
- Solve ssimultaneous and higher order equations and boundary value problems. L4

UNIT – IV: Numerical solution of Laplace's equation and Poisson's equation:

Laplace's equation and Poisson's equation – Finite difference approximations to derivatives – solution of Laplace's equation and Poisson's equation: Jacobi's method – Gauss-Seidel method – Successive over

relaxation method – ADI method.	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• Solve Laplace's equation using finite difference technique.	L3
• Solve Poisson's equation through iterative methods.	L4
UNIT – V: One dimensional Heat equation & Wave equation:	
Heat equation in one dimension: Finite difference approximations-Bender-Schmidt recurrence formula-Crank-Nicolson formula ; Iterative methods for the solution of equations - Gauss-Seidel iteration formula and One dimensional Wave equation.	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• Apply numerical methods for solving one dimensional heat equation.	L3
• Apply numerical methods for solving one dimensional wave equation.	L4
Text Books:	
1. S. S. Sastry, Introductory Methods of Numerical Analysis(Fifth Edition 2012), PHI Learning Private Limited, New Delhi.	
Reference Books:	
1. M.K.Jain,S.R.K.Iyengar, R.K.Jain, Numerical Methods for Scientific and Engineering Computation (sixth edition),Nee Age International(P) Limited, Publishers, New Delhi.	
2. K.E. Atkinson, An Introduction to Numerical Analysis, Wiley, 1989.S.D. Conte and C. De Boor, Elementary Numerical Analysis 302226 An Algorithmic Approach, McGraw-Hill, 1981.	
3. K. Eriksson, D. Estep, P. Hansbo and C. Johnson, Computational Differential Equations, Cambridge Univ. Press, Cambridge, 1996.	
4. G.H. Golub and J.M. Ortega, Scientific Computing and Differential Equations: An Introduction to Numerical Methods, Academic Press, 1992.	
5. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd ed., Texts in Applied Mathematics, Vol. 12, Springer Verlag, New York, 1993.	
Course Outcomes:	
At the end of this Course the student will be able to	
• Understand the need of numerical methods in solving engineering problems of various fields.	**L1**
• Learn various numerical techniques to solve initial and boundary value problems.	**L2**
• Apply various methods in solving Laplace's equation.	**L3**
• Emphasizes the numerical solutions of one dimensional heat and wave equations .	**L4**
• Analyze the problems in engineering and technology using various techniques of Numerical methods.`	**L5**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF PHYSICS
III B.TECH – II SEMESTER-R20 (Open elective-Interdisciplinary) –OE-ID.1(THEORY

MATERIALS CHARACTERIZATION TECHNIQUES

(Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- The latest analysis techniques and material structure and property correlation
- The most advanced imaging instruments for investigating the modern materials at the highest topographic resolution
- The commonly used analytical tools for characterizing modern materials at highest sensitivity
- The latest advancement in spectroscopy for getting structural and elemental analysis of Materials

UNIT – 1: Structure analysis by Powder X-Ray Diffraction **9 Hrs**

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams –factors affecting Diffraction Intensities - structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer equation, Small angle X-ray scattering (SAXS) (in brief).

Learning Outcomes:

At the end of this unit, the student will be able to

• **Understand** the diffraction phenomenon in crystals	**L1**
• **Identify** the factors affecting diffraction pattern intensities	**L2**
• **Explain** the polycrystalline nature of the material	**L3**
• **Analyze** the crystal structure and crystallite size by various methods	**L4**
• **Illustrate** the Small angle X-ray scattering (SAXS)	**L2**

UNIT – II: Microscopy technique -1 –Scanning Electron Microscopy (SEM) **9 Hrs**

Introduction, Principle, Construction and working principle of Scanning Electron Microscope, Specimen preparation, Different types of modes used (Secondary Electron and Back scattered Electron), Energy Dispersive X-ray Analyzer (to provide elemental identification and quantitative compositional information), Advantages and limitations of SEM.

Learning Outcomes:

At the end of this unit, the student will be able to

• **Explain** the basic concepts and working principle of Scanning Electron Microscope	**L1**
• **Classify** the different types of Scanning Electron Microscope modes used	**L2**
• **Identifies** the specimen preparation for Scanning Electron Microscope	**L2**
• **Analyze** the morphology of the sample by using Scanning Electron Microscope	**L4**
• **Understand** the advantages and limitations of Scanning Electron Microscope	**L2**

UNIT – III: Microscopy Technique -2 - Transmission Electron Microscopy (TEM) **9Hrs**

Principle, Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy,Difference between SEM and TEM, Advantages and Limitations of Transmission Electron Microscopy.

Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the basic principle and working principle of Transmission Electron Microscope	**L1**
• **Classify** the different types of Transmission Electron Microscope modes used	**L2**
• **Identifies** the specimen preparation for Transmission Electron Microscope	**L2**
• **Analyze** the morphology and crystal structure of the sample by using Transmission Electron Microscope	**L2**
• **Understand** the advantages and limitations of Transmission Electron Microscope	**L3**

UNIT – IV: Spectroscopy techniques	**9 Hrs**
Principle, Experimental arrangement, Analysis and Advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy – quantitative analysis of elements and organic compounds, energy band gap determination – wood and Tauc and KubelkaMunk functions (ii) Raman Spectroscopy – Molecular analysis using vibrational modes (iv) X-ray photoelectron spectroscopy (XPS) for surface materials characterization and chemical analysis.	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the principle and experimental arrangement of spectrometers	**L1**
• **Understand** the analysis and advantages of the spectroscopic techniques	**L2**
• **Explain** the concept of UV-Visible spectroscopy	**L2**
• **Explain** the principle and experimental arrangement of Raman Spectroscopy	**L2**
• **Explain** the principle and experimental arrangement of X-ray photoelectron spectroscopy (XPS)	**L2**

UNIT – V: Electrical & Magnetic Characterization techniques	
Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method,Vibrating sample Magnetometer (VSM) and SQUID (Superconducting Quantum Interference Device)	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the various types of electrical properties analysis techniques	**L1**
• **Explain** the effect of magnetic field on the electrical properties	**L2**
• **Analyze** the magnetization by using induction method	**L2**
• **Explain** the construction and working principle of VSM	**L2**
• **Explain** the construction and working principle of SQUID	**L2**

Text Books:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008.

Reference Books:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M. McCash, Tata McGraw-Hill, 2008.

2. Elements of X-ray diffraction – Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall , 2001 – Science.

Course Outcomes:	
At the end of this Course the student will be able to	
• **Identify** the various characterization techniques	**L1**
• **Classify** the characterization techniques based on their applications and properties	**L2**
• Ilustates the various characterization techniques for materials characterization.	**L3**
• **Apply** suitability in Engineering Applications	**L4**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech – IV-I-Sem	L	T	P	C
	3	0	0	3

Polymers and their applications (OE.2)
(common to all branches)

Course Objectives:

- To understand the basic principles of polymers
- To synthesize the different polymeric materials and their characterization by various instrumental methods.
- To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
- To enumerate the applications of polymers in engineering

UNIT-I: **Polymers-Basics and Characterization**	9 Hrs

Basic concepts: monomers, repeat units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization mechanisms: condensation, addition.Molecularweight concepts: determination bynumber, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers, Characterization of polymers by XRD, DSC.

Learning Outcomes:
At the end of this unit, the student will be able to:

- Classify the polymers (L3)
- Explain polymerization mechanism (L2)
- Differentiate addition, condensation polymerizations(L2)
- Describe measurement of molecular weight of polymer(L2)

UNIT-II: **Synthetic Polymers**	8 Hrs

Polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization.Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol - formaldehyde and melamine Epoxy and Ion exchange resins.

Learning Outcomes:
At the end of this unit, the student will be able to:

- Differentiate Bulk, solution, Suspension and emulsion polymerization(L2)
- Describe fibers and elastomers (L2)
- Identify the thermosetting and thermo polymers(L3)

UNIT-III: Natural Polymers & Modified cellulosics	8 Hrs

Natural Polymers: Chemical & Physical structure, properties, source, important chemical

modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

Learning Outcomes:

After completing the course, the student will be able to:

- Describe the properties and applications of polymers(L2)
- Interpret the properties of cellulose, lignin, starch, rosin, latex (L2)
- Discuss the special plastics of PES, PAES, PEEK (L3)
- Explain modified cellulosics(L2)

UNIT-IV: Hydrogels of Polymer networks and Drug delivery	8 Hrs

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, **Applications** of hydrogels in drug delivery.Introduction to drug systems including regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

Learning Outcomes:

After completing the course, the student will be able to:

- Identify types of polymer networks(L3)
- Describe methods involve in hydrogel preparation(L2)
- Explain applications of hydrogels in drug delivery(L2)
- Demonstrate the advanced drug delivery systems and controlled release(L2)

UNIT-V: **Advanced Polymers for engineering applications**	7Hrs

Importance of advance polymers examples-polymers in sensors,conducting and synthetic metals, photonics, thermoplastics. Applications of Biodegradable polymers, Bio-PET, BIO-PEP, Polylactides

Learning Outcomes:

After completing the course, the student will be able to:

- Demonstrate conducting polymers (L3)
- Explain Biodegradable polymers (L2)
- Discuss applications of Biodegradable polymers, Bio-PET, BIO-PEP, Polylactides (L3)

Text Books:

1. Fred W.Billmayer, A Text book of Polymer science, 3rd Edition, Wiley India, 2007
2. K.J.Saunders, Organic polymer Chemistry, Chapman and Hall, 1973.

Reference Books:

1. B.Miller, Advanced Organic Chemistry, Prentice Hall, 2nd Edn, 2003
2. Ambikanandan Misra, Aliasgar Shahiwala, Applications of polymers in Drug delivery system, Elsevier Pub., 2020.
3. Gowarikar, Polymer Chemistry –New Age International Publications, 2019
4. Physical Chemistry , Samel Galsstone, Lan Caster Press, 1970.

Course Outcomes:

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

- Understand the state of art synthesis of Polymeric materials(L1)
- Understand the hydro gels preparation, properties and applications in drug delivery system (L2).
- Explain biodegradable polymers(L2)
- Discuss applications of Biodegradable polymers (L3)

B.Tech III Year II Sem & IV Year I Sem

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE65A- ENVIRONMENTAL IMPACT ASSESSMENT

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- This course is aimed at exposing the student to the concept of environmental impact assessment and methodologies used for the same.
- The student will also be imparted the knowledge about the various laws related to EIA and also methods of EIA audit.

UNIT-I:

INTRODUCTION:-

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT-II:

EIA METHODOLOGIES:-

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

UNIT-III

IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE:-

Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT-IV:

ASSEMENT OF IMPACT ON VEGETATION AND WILDLIFE :

Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

ENVIRONEMNTAL AUDIT :

Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT-V:

ENVIRONEMENTAL ACTS (PROTECTION AND PREVENTION)

Post Audit activities, The Environmental protection Act, The water preventation Act, The Air (Prevention & Control of pollution Act.), Wild life Act.Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

- Environmental Impact Assessment Methodologies, byY. Anjaneyulu, B.S. Publication, Sultan Bazar,Hyderabad.
- Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice HallPublishers

Reference Books:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katari& Sons Publication., NewDelhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

Course Outcomes:

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

1. Understand the concept of Environmental impact
2. Understand the methodologies related to EIA
3. Appreciate various laws related to environmental protection
4. Prepare the environmental impact assessment statement and to evaluateit.

Annexure-II *R20*

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

ENERGY CONSERVATION & MANAGEMENT

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation Techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient Technologies.

UNIT – I: **09 Hrs**

Basic Principles of Energy Audit and management Energy audit – Definitions – Concept– Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various types of Energy Audit **L1**
- To know about various types of Energy conservation schemes and Energy Manager functions **L2**

UNIT – II: **09 Hrs**

Lighting Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam – Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various Lighting systems and types of lamps. **L1**
- To evaluate illumination level Illumination of inclined surface to beam and Design of Energy efficient lighting systems. **L2**

UNIT – III: **09 Hrs**

Power Factor and energy instruments Power factor – Methods of improvement – Location of capacitors – Power factor with non linear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various Methods of Power Factor improvement **L1**
- To know about various Energy Instruments **L3**

UNIT – IV: **09 Hrs**

Space Heating and Ventilation Ventilation – Air–Conditioning (HVAC) and Water Heating: Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning – Insulation–Cooling load – Electric water heating systems – Energy conservation methods

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about analysis of Heating and HVAC **L1**
- To know about Energy conservation methods **L2**

UNIT – V: **09 Hrs**

Economic Aspects and Analysis : Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts).Computation of Economic Aspects Calculation of simple payback method – Net present worth method – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic concept of Analysis of Economics and different methods **L1**
- To know about Computation of Economic Aspects Calculation **L2**

Text Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy efficient electric motors by John.C.Andreas, Marcel Dekker Inc Ltd-2nd edition,1995.

Reference Books:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1stedition, 1998.
3. Energy management hand book by W.C.Turner, John wiley and sons.
4. Energy management and conservation –k v Sharma and pvenkata seshaiah-I K International Publishing House pvt.ltd, 2011.
5. http://www.energymanagertraining.com/download/Gazette_of_IndiaP art IISecI-37_25-08-2010.pdf

Course Outcomes:

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

- Explain energy efficiency, conservation and various technologies. **L1**
- Design energy efficient lighting systems. **L2**
- Calculate power factor of systems and propose suitable compensation techniques. **L3**
- Explain energy conservation in HVAC systems. **L4**
- Determination of the economic analysis **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME65a-PROGRAMMING OF ROBOTS AND CONTROL

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Learn the fundamental concepts of industrial robotic technology.
- Apply the basic mathematics to calculate kinematic and dynamic forces in robot manipulator.
- Understand the robot controlling and programming methods.
- Describe concept of robot vision system.

UNIT – I: Fundamentals of Robots: **10 Hrs**

Introduction, definition, classification and history of robotics, robot characteristics and precision of motion, advantages, disadvantages and applications of robots.

Learning Outcomes:

At the end of this unit, the student will be able to

- outline the advantages, disadvantages and applications of robot. **L2**
- compare the types of robot manipulators based on applications. **L2**

UNIT – II: Robot Actuators And Feedback Components: **8 Hrs**

Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compare the types of actuators used in robot manipulator. **L2**
- List out the various types of robots and feedback components. **L1**

UNIT – III: Robot Programming: **8 Hrs**

Methods of programming - requirements and features of programming languages, software packages, problems with programming languages - VAL, RAIL, AML, C, C++.

Learning Outcomes:

At the end of this unit, the student will be able to

- List out the various methods of robot programming **L1**
- Explain the requirements and features of programming **L2**

UNIT – IV: Control of Manipulators **8 Hrs**

Open-loop and close-loop control, the manipulator control problem, linear control schemes, characteristics of second-order linear systems, linear second-order SISO model of a manipulator joint, joint actuators, partitioned PD control scheme, PID control Scheme, computer Torque control, force control of robotic manipulators, description of force-control tasks, force control strategies, hybrid position/force control, impedance force/torque control.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the basic concepts of robot controlling systems. **L2**
- Outline PD and PID control schemes. **L3**
- Use the force control strategies to determine the forces in robot. **L2**
- Explain the force control and torque control techniques. **L2**

UNIT – V: Robot Vision: **8 Hrs**

Introduction, architecture of robotic vision system, image processing, image acquisition camera, image enhancement, image segmentation, imaging transformation, Camera transformation and calibrations, industrial applications of robot vision.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the components of robot vision system. **L3**
- Explain the concept of image enhancement, segmentation and transformation. **L2**

- List the various components of robot vision system. **L1**
- Illustrate the industrial applications of robot vision system. **L2**

Text Books:

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , Industrial Robotics — McGraw Hill, 1986.
2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003.
3. S.R.DEB

Reference Books:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2/e, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1/e, Wiley- Inter science, 1986.
3. Robert J. Schillin, Fundamentals of Robotics: Analysis and control, Prentice-Hall Of India Pvt. Limited, 1996.
4. Mohsen shahinpoor, A robot Engineering text book, Harper & Row Publishers,1987.
5. John.J.Craig Addison, Introduction to Robotics: Mechanics and Control, Wesley, 1999.
6. K.S. FU, R.C. Gonzalez and C.S.G Lee, Robotics: Control, sensing, vision, and intelligence. Mc Graw Hill, 1987.
7. Richard D. Klafter, Thomas Robotic Engineering an integrated approach, PHI publications 1988.

Course Outcomes:

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

- Explain fundamentals of Robots. **L2**
- Apply kinematics and differential motions and velocities. **L3**
- Demonstrate control of manipulators. **L2**
- Understand robot vision. **L2**
- Develop robot cell design and programming. **L3**

Online Learning Resources:

- https://nptel.ac.in/courses/112105249
- https://onlinecourses.nptel.ac.in/noc20_de11/preview
- https://nptel.ac.in/courses/112104308
- https://nptel.ac.in/courses/112104288
- https://nptel.ac.in/courses/112101099
- https://www.iare.ac.in/sites/default/files/lecture_notes/ROBOTICS_LECURE_NOTES.pdf

Head
Mechanical Engineering Department.
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B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME65b-NON-CONVENTIONAL SOURCES OF ENERGY

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize with concept of various forms of renewable energy.
- Understand division aspects and utilization of renewable energy sources for both domestics and industrial applications.
- Expose the students in an environmental and cost economics of using renewable energy sources compared to fossil fuels.

UNIT – I: Introduction **10 Hrs**

Introduction to energy resources: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the basic concepts of solar radiation and solar collectors **L2**
- develop sun path diagrams **L3**
- Explain environmental impact of solar power. **L2**
- Discuss the instruments for measuring solar radiation and sun shine. **L6**

UNIT – II: Solar Energy Collection & Storage **8 Hrs**

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Solar Energy Storage and Applications :

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar heating technique, solar distillation and drying, photovoltaic energy conversion.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify solar energy collectors. **L1**
- Describe orientation and thermal analysis of solar energy collectors. **L2**
- Explain photovoltaic energy conversion. **L2**
- Illustrate the various solar energy applications. **L2**

UNIT – III: Wind Energy & Bio-Mass **8 Hrs**

Wind Energy : Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compare vertical axis and horizontal axis windmills. **L3**
- Illustrate the performance characteristics of vertical axis and horizontal axis windmills. **L2**
- Discus the principles of Bio-conversion. **L6**
- Explain combustion characterises of bio-gas. **L2**

UNIT – IV: Geothermal Energy & Ocean Energy **8 Hrs**

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. **Tidal and wave energy:** Potential and conversion techniques, mini-hydel power plants, and their economics.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of geothermal and ocean energy. **L2**
- Discus OTEC and principles utilization. **L6**
- Explain mini-hydel power plants and their economics. **L2**

UNIT – V: Direct Energy Conversion **8 Hrs**

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the working principle of MHD engine. **L2**
- Explain constructional details of various thermo-electric generators. **L2**
- Identify the various economic, thermodynamic aspects of electron gas dynamic conversion system. **L3**

Text Books:

1. Tiwari and Ghosal, Renewable energy resources, Narosa Publishing House-2004.
2. G.D. Rai, Non-Conventional Energy Sources, Khanna Publications-1988.

Reference Books:

1. Twidell & Weir, Renewable Energy Sources, Routledge; 3/e, 2015.
2. Sukhatme S.P., Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
3. Sathyajith Mathew, Wind Energy Fundamentals, Resource Analysis and Economics, Springer Publications, 2006.
4. Wei Tong, Wind Power Generation and Wind Turbine Design, WIT Press, 2010.
5. Wind Power, Revised Edition: Renewable Energy for Home, Farm, and Business, Paul Gipe, Chelsea Green Publishing, 2004.
6. S.S. Rao, B.B. Parulekar, Energy Technology (Non Conventional, Renewable and Conventional), Khanna publications, 1994.

Course Outcomes:

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

- Outline the various economic, thermodynamic aspects of electron gas dynamic conversion system. **L3**
- Explain the basic concepts of solar radiation and solar collectors **L2**
- Discus OTEC and principles utilization. **L6**
- Describe orientation and thermal analysis of solar energy collectors. **L2**

Online Learning Resources:

- https://nptel.ac.in/courses/103103206
- https://nptel.ac.in/courses/108108078
- https://onlinecourses.nptel.ac.in/noc21_ph33/preview
- https://nptel.ac.in/courses/121106014
- https://mrcet.com/downloads/digital_notes/EEE/31082020/IV-I%20SOLAR%20&%20WIND%20ELECTRICAL%20SYSTEMS%20DIGITAL%20NOTES%201.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf

Head
Mechanical Engineering Department
MRCUA College of Engineering,

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC65a- INTRODUCTION TO MICROCONTROLLER AND APPLICATIONS

(Open Elective-II)

L–T – P - C
3 – 0 – 0 – 3

Course Objective:

- To understand the basic concepts and architecture of 8051.
- To learn various instructions and addressing modes used in 8051
- To be able to program 8051 Timers and implement serial communication for a given application.
- To learn interfacing of memory, I/O devices and the usage of Interrupts.
- To know the basic architecture and interfacing of ARM microcontroller.

UNIT I

Architecture of 8051: Introduction, Block diagram of 8051 Microcontroller, Functions of each block, Pin details of 8051, ALU,ROM, RAM, Memory Organization of 8051, Special function registers, Program Counter, PSW register, Stack, I/O Ports, Timer, Interrupt, Serial Port, Oscillator and Clock, Clock Cycle, Machine Cycle, Instruction cycle, Reset, Power on Reset.

Learning Outcomes:

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

- Understand the architecture of 8051 microcontroller.(L2)
- Learn the functions of each block of 8051 microcontroller.(L1)

UNIT II

Instruction Set of 8051: Instruction set of 8051, Classification of 8051 Instructions, Data transfer instructions, Arithmetic Instructions, Logical instructions, Branching instructions, Bit Manipulation Instructions

Assembler and Addressing Modes: Assembling and running an 8051 program, Structure of Assembly Language, Assembler directives, Different addressing modes of 8051. **I/O:** Bit addresses for I/O and RAM, I/O programming, I/O bit manipulation programming.

Learning Outcomes:

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

- Know different instructions available in the Instruction set of 8051.(L1)
- Learn and use different types of addressing modes of 8051 microcontroller.(L1)

UNIT III

Timer: Programming 8051 Timers, Timer registers, Different modes of Timer, Programming timer in different modes, Counter programming, Different modes of Counter, Sample programs.

Serial Communication: Basics of Serial communication, UART, RS 232 Protocol, 8051 interface to RS 232, 8051 UART Programming, SPI and I^2C implementation on 8051.

Learning Outcomes:

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

- Write programs to use the 8051 Timers for a given application.(L6)
- Use different types of serial communication devices based on the application.(L3)

UNIT IV

Interrupt: 8051 Interrupts, Programming Timer Interrupts, Programming external hardware interrupts, Programming the serial communication interrupt, Interrupt priority in 8051.**IC 8255:** IC 8255, Block Diagram, Modes of 8255, Interfacing with 8051.

Interfacing Techniques: Interfacing external memory to 8051, Sensor interfacing, ADC interfacing, DAC interfacing, Keyboard interfacing, Seven segment LED Display Interfacing, Stepper Motor interfacing.

Learning Outcomes:

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

- Interface memory and I/O devices for specific applications.(L4)
- Learn and apply Interrupts based on the application and usage.(L3)

UNIT V

ARM Cortex-M Microcontrollers: A Memory-centric System Model. Basics of Chip Design. The Arm Cortex-M Processor Architecture, Interconnects, The Advanced Microcontroller Bus Architecture (AMBA), Interfacing with the External World, Peripherals, Memory System, FPGA SoC Architecture.

Learning Outcomes:

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

- Learn about the ARM based processor and its architecture.(L3)
- Interface ARM controllers for practical applications.(L3)

TEXT BOOKS

1. Muhammed Ali Mazidi, Janice GillispieMazidi andRolin D McKinlay, "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd Edition, Pearson Education, 2008.
2. Ajit pal, "Microcontrollers, Principles and Applications", – PHI Ltd., - 2011.

REFERENCE BOOKS

1. Ajay V Deshmukh, "Microcontrollers: Theory and Applications", TATA McGraw Hill publications, 2007.
2. Krishna Kanth, "Microprocessors and Microcontrollers", PHI Publications, 2010
3. Fundamentals of System-on-Chip Design on Arm Cortex-M Microcontrollers Paperback – 2 Aug. 2021by Rene Beuchat , Andrea Guerrieri , SahandKashani.

Course outcomes:

At the end of this course, the students will be able to

- Understand the basic concepts and architecture of 8051.(L2)
- Know the usage of various instructions and addressing modes in 8051(L1)
- Program 8051 Timers and implement serial communication for a given application.(L6)
- Interface memory, I/O devices and use Interrupts.(L4).
- Learn the basic architecture and interfacing of ARM microcontroller(L3).

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC65b- PRINCIPLES OF DIGITAL SIGNAL PROCESSING

(Open Elective-II)

L–T – P - C
3 – 0 – 0 – 3

Course Objectives:

- To understand the frequency domain analysis of discrete time signals.
- To learn the properties of discrete fourierseries and fourier transforms.
- To design & analyze IIR digital filters from analog filters.
- To know various structures used in implementation of FIR digital filters.
- To grasp the importance and applications of Multirate Digital signal processing.

UNIT I

Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, LTI system Properties. Solution of Linear constant coefficient difference equations, frequency domain representation of discrete time signals and systems. Review of Z-transforms.

Learning Outcomes:

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

- Analyze and process signals in the discrete domain.(L4)
- Determine time domain representations and frequency domain analysis of discrete-time signals and systems (L3)

UNIT II

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

Learning Outcomes:

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

- Understand the pproperties of discrete fourier series.(L2)
- Describe DFT using FFT algorithms.(L1)

UNIT III

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

Learning Outcomes:

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

- Design IIR digital filters from analog filters.(L6)
- Construct IIR digital filters with different realization techniques.(L6)

UNIT IV

Design of FIR Digital Filters and Realizations: Characteristics of FIR Digital Filters, frequency response. Design of FIR digital filters using window techniques and frequency sampling technique, comparison of IIR & FIR filters, basic structures of FIR systems.

Learning Outcomes:

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

- Design FIR digital filters using window techniques.(L6)
- Construct the basic structures of FIR systems.(L6)

UNIT V

DSP Applications: Introduction to programmable DSPs, Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Adaptive filters: Introduction, Basic principles of Forward Linear Predictive filter and applications such as system identification, echo cancellation, equalization of channels, and beam forming using block diagram representation study only.

Learning Outcomes:

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

- Apply Interpolation and Decimation with help of sampling and filtering.(L3)
- Understand the principle and applications of Forward Linear Predictive filter.(L2)

Text Books:

1. John G. Proakis andDimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithmsand Applications", Pearson Education, 2007.
2. A.V.Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing",PHI.
3. B.Venkataramani and M. Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", TATA McGraw Hill, 2002.

References:

1. Andreas Antoniou, "Digital Signal Processing", TATA McGraw Hill, 2006
2. MH Hayes, "Digital Signal Processing", Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling and Sandra L. Harris, "Fundamentals of Digital Signal Processing using Matlab", Thomson, 2007.

Course outcomes:

At the end of this course, the students will be able to

- Articulate the frequency domain analysis of discrete time signals.(L3)
- Understand the properties of discrete fourierseries and fourier transforms.(L2)
- Design& analyze IIR digital filters from analog filters.(L6)
- Design various structures used in implementation of FIR digital filters.(L6)
- Summarize the importance and applications of Multirate Digital signal processing.(L2)

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS65A- MACHINE LEARNING APPLICATIONS

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.

UNIT-I: INTRODUCTION

Introduction: An illustrative learning task, and a few approaches to it. What is known from algorithms? Theory, Experiment. Biology. Psychology. Overview of Machine learning, related areas and applications. Linear Regression, Multiple Regression, Logistic Regression, logistic functions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Argue the importance and role of software architecture in large-scale software systems. **L2**
- Design and motivate software architecture for large-scale software systems. **L3**

UNIT-II: DECISION TREE LEARNING

Decision Tree Learning: - Minimum Description Length Principle. Occam's razor. Learning with active queries Introduction to information theory, Decision Trees, Cross Validation and Over fitting. Neural Network Learning: Perceptions and gradient descent back propagation, multilayer networks and back propagation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design and motivate software architecture for large-scale software systems. **L3**
- Recognize major software architectural styles and frameworks. **L4**

UNIT-III SAMPLE COMPLEXITY AND OVER FITTING

Sample Complexity and Over fitting: Errors in estimating means. Cross Validation and jackknifing VC dimension. Irrelevant features: Multiplicative rules for weight tuning. Support Vector Machines: functional and geometric margins.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recognize major software architectural styles and frameworks. **L3**
- Describe a software architecture using various documentation approaches and architectural description languages. **L4**

UNIT-IV: INSTANCE-BASED TECHNIQUES

Instance-based Techniques: Lazy vs. eager generalization. K nearest neighbor, case- based reasoning. Clustering and Unsupervised Learning: K-means clustering, Gaussian mixture density estimation, model selection

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe a software architecture using various documentation approaches and architectural description languages. **L5**
- Generate architectural alternatives for a problem and selection among them. **L3**

UNIT-V: Genetic Algorithms

Genetic Algorithms: Different search methods for induction - Explanation-based Learning: using prior knowledge to reduce sample complexity. Dimensionality reduction: feature selection, principal component analysis.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use well-understood paradigms for designing new systems. **L3**
- Identify and assess the quality attributes of a system at the architectural level. **L4**

Text Books:

1. Tom Michel, Machine Learning, McGraw Hill, 1997
2. Trevor Has tie, Robert Tibshirani & Jerome Friedman. The Elements of Statically Learning, Springer Verlag, 2001.

Reference Books:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc.,2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.

Course Outcomes:

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

- Student should be able to understand the basic concepts such as decision trees and neural networks.Ability to formulate machine learning techniques to respective problems. **L2**
- Apply machine learning algorithms to solve problems of moderate complexity. **L3**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS65B- OBJECT ORIENTED PROGRAMMING

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- Study the syntax, semantics and features of Java Programming Language
- Study the Object Oriented Programming Concepts of Java Programming language
- Learn the method of creating Multi-threaded programs and handle exceptions
- Learn Java features to create GUI applications & perform event handling

UNIT-I: INTRODUCTION

Introduction to Java: The key attributes of object oriented programming, simple program, The Java keywords, Identifiers, Data types and operators, Program control statements, Arrays, Strings, String Handling

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics of computer graphics, different graphics systems and applications of computer graphics. **L2**
- Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. **L3**

UNIT-II: CLASSES

Classes: Classes, Objects, Methods, Parameters, Constructors, Garbage Collection, Access modifiers, Pass Objects and arguments, Method and Constructor Overloading, Understanding static, Nested and inner classes.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use of geometric transformations on graphics objects and their application in composite form. **L2**
- Extract scene with different clipping methods and its transformation to graphics display device. **L3**

UNIT-III INHERITANCE

Inheritance – Basics, Member Access, Usage of Super, Multi level hierarchy, Method overriding, Abstract class, Final keyword.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explore projections and visible surface detection techniques for display of 3D scene on 2D screen. **L3**
- Render projected objects to naturalize the scene in 2D view and use of illumination models for this **L4**

UNIT-IV: INTERFACES

Interfaces – Creating, Implementing, Using, Extending, and Nesting of interfaces.

Packages – Defining, Finding, Member Access, Importing

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics of Multimedia basics, different graphics systems and applications of computer graphics. **L5**
- Discuss various multimedia datastructures. **L5**

UNIT-V: EXCEPTION HANDLING

Exception handling: Hierarchy, Fundamentals, Multiple catch clauses, subclass exceptions, Nesting

try blocks, Throwing an exception, Using Finally and Throws, Built-in exceptions, User-defined exceptions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics of Multimedia Authoring systems **L4**
- Understand the how videos are placed **L5**

Text Books:

1. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.
2. "Java The Complete Reference" Herbert Schildt, 8th Edition, 2011, Oracle press, TataMcGraw-Hill
3. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.

Reference Books:

1. "Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.
2. "Core Java", Nageswar Rao, Wiley Publishers.
3. "Thinking in Java", Bruce Eckel, Pearson Education.
4. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.
5. "Head First Java", Kathy Sierra, Bert Bates, O'Reilly
6. "SCJP – Sun Certified Programmer for Java Study guide" – Kathy Sierra, Bert Bates, McGrawHill
7. "Java in Nutshell", David Flanagan, O'Reilly
8. "Core Java : Volume I – Fundamentals, Cay S. Horstmann, Gary Cornell, The Sun Micro Systems Press

Course Outcomes:

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

Introduction to computer graphics

- Gain knowledge of client-side scripting, validation of forms and AJAX programming **L3**
- Understand server-side scripting with PHP language **L4**
- Understand what XML is and how to parse and use XML Data with Java **L5**
- To introduce Server-side programming with Java Servlets and JSP **L6**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS65C- WEB DESIGN

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To Learn the basic concepts in HTML, CSS, JavaScript
- To Understand the responsive design and development
- To learn the web project management and maintenance process
- To Design a Website with HTML, JS, CSS / CMS - Word press

UNIT-I: WEB DESIGN - HTML MARKUP FOR STRUCTURE

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5.

Learning Outcomes:

At the end of this unit, the student will be able to

- Argue the importance and role of software architecture in large-scale software systems. **L2**
- Design and motivate software architecture for large-scale software systems. **L3**

UNIT-II: CSS AND JAVASCRIPT

CSS - Formatting text - Colours and Background - Padding, Borders and Margins – Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation – JavaScript - Using Java Script.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design and motivate software architecture for large-scale software systems. **L3**
- Recognize major software architectural styles and frameworks. **L4**

UNIT-III RESPONSIVE WEB DESIGN

Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-First or DesktopFirst - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD - Designing small UIs by Large Finger - Images and Videos in Responsive Web Design - Meaningful Typography for Responsive Web Design.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recognize major software architectural styles and frameworks. **L3**
- Describe a software architecture using various documentation approaches and architectural description languages. **L4**

UNIT-IV: WEB PROJECT MANAGEMENT

Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting - Running the project - Technical Documentation - Development, Communicaton, Documentation - QA and testing -Deployment - Support and operations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe a software architecture using various documentation approaches and architectural description languages. **L5**
- Generate architectural alternatives for a problem and selection among them. **L3**

UNIT-V: PROJECT CASE STUDY

Using HTML, CSS, JS or using Opensource CMS like Word press, design and develop a Website having Aesthetics, Advanced and Minimal UI Transitions based on the project - Host and manage the project live in any public hosting.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use well-understood paradigms for designing new systems. **L3**
- Identify and assess the quality attributes of a system at the architectural level. **L4**

Text Books:

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress,2011

Reference Books:

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
2. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End Web Development", John Wiley and Sons, edition 2014
3. Uttam K. Roy "Web Technologies" Oxford University Press, 13th impression, 2017 4. Word press - http://www.wpbeginner.com/category/wp-tutorials/

Course Outcomes:

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

- Recognize the method of using layered approach for design . **L2**
- Explain the functionality of each layer of a computer network. **L3**
- Apply the knowledge of layered approach for the design of computer network software. **L4**
- Analyze the performance of protocols of a computer network. **L4**
- Recommend the protocols for different applications. **L5**
- Propose new protocols for a computer networks. **L6**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

POWER SEMICONDUCTOR DRIVES

(Professional Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Learn the Control of DC motors by phase controlled converters Analyze controlled rectifier circuits.
- Learn the four Quadrant operation of DC drives
- Learn the control of DC motors by choppers
- Learn the control of Induction motors
- Learn the control of Synchronous motors

UNIT – I: Control of DC Motors By Phase Controlled Converters **10 Hrs**

Introduction to Thyristor Controlled Drives, Single Phase, Three Phase Semi and Fully Controlled Converters Connected to D.C Separately Excited and D.C Series Motors – Continuous Current Operation – Output Voltage and Current Waveforms – Speed and Torque Expressions – Speed – Torque Characteristics-Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Control of DC series motors by phase controlled converters **L1**
- Understand the Control of separately DC motors by phase controlled converters **L2**

UNIT – II: Four Quadrant Operation of DC Drives **10 Hrs**

Introduction to Thyristor Controlled Drives, Single Phase, Three Phase Semi and Fully Controlled Converters Connected to D.C Separately Excited and D.C Series Motors – Continuous Current Operation – Output Voltage and Current Waveforms – Speed and Torque Expressions – Speed – Torque Characteristics-Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the four Quadrant operation of DC series motor drives **L1**
- Learn about the four Quadrant operation of separately excited DC motor drives **L2**

UNIT – III: Control of DC Motors By Choppers **10 Hrs**

Single Quadrant, Two –Quadrant and Four Quadrant Chopper Fed DC Separately Excited and Series Excited Motors – Continuous Current Operation – Output Voltage and Current Wave Forms – Speed Torque Expressions – Speed Torque Characteristics – Problems on Chopper Fed D.C Motors – Closed Loop Operation (Block Diagram Only)

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the control of DC series motors by choppers **L1**
- Learn the control of separately excited DC motors by choppers **L2**

UNIT – IV: Control of Induction Motors **10 Hrs**

Stator Voltage Control - Variable Voltage Characteristics-Control of Induction Motor by AC Voltage Controllers – Waveforms – Speed Torque Characteristics - Stator Frequency Control - Variable Frequency Characteristics-Variable Frequency Control of Induction Motor by Voltage Source and Current Source Inverter and Cyclo converters- PWM Control – Comparison of VSI and CSI Operations – Speed Torque Characteristics – Numerical Problems on Induction Motor Drives – Closed Loop Operation of Induction Motor Drives (Block Diagram Only) - Static Rotor Resistance Control – Slip Power Recovery – Static Scherbius Drive – Static Kramer Drive –Performance and Speed Torque Characteristics – Advantages-Applications – Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the stator control of Induction motors **L1**
- Understand the rotor control of Induction motors **L2**

UNIT – V: Control of Synchronous Motors **10 Hrs**

Separate Control & Self Control of Synchronous Motors – Operation of Synchronous Motors by VSI and CSI Cyclo converters. Load Commutated CSI Fed Synchronous Motor – Operation – Waveforms – Speed Torque Characteristics – Applications – Advantages and Numerical Problems – Closed Loop Control Operation of Synchronous Motor Drives (Block Diagram Only), Variable Frequency Control, Cyclo converter, PWM, VFI, CSI.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the VSI and CSI control of Synchronous motors **L1**
- Understand the Cyclo converter control of Synchronous motors **L2**

Text Books:

1. Power semiconductor controlled drives by G K Dubey Prentice Hall
2. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI.

Reference Books:

1. Power Electronics – MD Singh and K B Khanchandani, Tata – McGraw-Hill Publishing company,1998
2. Modern Power Electronics and AC Drives by B.K.Bose, PHI.
3. Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications.
4. A First course on Electrical Drives – S K Pillai New Age International (P) Ltd. 2nd Editon.

Course Outcomes:

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

- Understand the Control of DC motors by phase controlled converters Analyze controlled rectifier circuits. **L1**
- Understand the four Quadrant operation of DC drives **L2**
- Understand the control of DC motors by choppers **L3**
- Understand the control of Induction motors **L4**
- Understand the control of Synchronous motors **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

ELECTRICAL DISTRIBUTION SYSTEMS

(Professional Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:

- To know about fundamental aspects of distribution system
- To understand principle of distribution substations
- To know about classification of various loads
- To understand difference between conventional load flow studies of power system and distribution system load flow
- To know about evaluation of voltage droop and power loss calculations
- To know about distribution automation and management system, SCADA

UNIT – I: DISTRIBUTION SYSTEM FUNDAMENTALS **9 Hrs**

Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the Primary feeder voltage level, Factors affecting the primary feeder loading.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand various distribution system classifications **L1**
- To know more about primary feeders rating, types , factors effecting the primary feeder loading **L2**

UNIT – II: DISTRIBUTION SYSTEM SUBSTATIONS AND LOADS **9 Hrs**

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation service area, K constant, Radial feeder with uniformly and no uniformly Distributed loading.

Loads: Various types of loads, Definitions of various terms related to system loading, detailed description of distribution transformer loading, feeder loading, Modeling of star and delta connected loads, two-phase and single-phase loads, shunt capacitors.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about uniformly and non-uniform distributed loading in distribution substations **L1**
- To understand about modeling of various types of loads and shunt capacitor **L2**

UNIT – III: DISTRIBUTION SYSTEM LOAD FLOW **9 Hrs**

Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various distribution line models **L1**
- To evaluate distribution load flow pattern using sweeping algorithms **L3**

UNIT – IV: VOLTAGE DROP AND POWER LOSS CALCULATION **9 Hrs**

Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common- neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, types of three-phase capacitor bank connections, Economic justification for capacitors – Numerical problems

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about analysis of various distribution system configurations **L1**
- To know how to calculate percent power loss calculations **L2**

UNIT – V: DISTRIBUTION AUTOMATION **9 Hrs**

Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, outage management, decision support applications, substation automation, control feeder automation, database structures and interfaces.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic concept of automation of distribution systems **L1**
- To know about various distribution management /automation systems and functions **L2**

Text Books:

1. Distribution System Modelling and Analysis, William H. Kersting, CRC Press, Newyork, 2002.
2. Electric Power Distribution System Engineering, TuranGonen, McGraw-Hill Inc., New Delhi,1986.

Reference Books:

1. Control and automation of electrical power distribution systems, James Northcote- Green and Robert Wilson, CRC Press (Taylor & Francis), New York, 2007.

Course Outcomes:

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

- To understand basics of distribution systems and substations **L1**
- To understand about modelling of various loads **L2**
- To perform distribution load flow solutions **L3**
- To evaluate power loss and feeder cost **L4**
- `To know the principles of SCADA, Automation distribution system and management **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

DIGITAL ELECTRONICS AND LOGIC DESIGN

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To teach significance of number systems, conversions, binary codes and functionality of logic gates.
- To discuss different simplification methods for minimizing Boolean functions.
- To impart knowledge on operation, characteristics and various configurations of TTL and CMOS logic families.
- To outline procedures for the analysis and design of combinational and sequential logic circuits.
- To learn about a few applications of Internet of Things

UNIT – I **10 Hrs**

Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess -3 codes, Gray code.

Binary codes Classification, Error detection and correction – Parity generators and checkers – Fixed point and floating-point arithmetic.

Boolean Algebra& Logic Gates: Boolean operations, Boolean functions, Algebraic manipulations, Min-terms and Maxterms, Sum-of-products and Product-of-sum representations, Two-input logic gates, NAND /NOR implementations.

Minimization of Boolean Functions: Karnaughmap, Don't-care conditions, Prime implicants, Minimization of functions using Quine-McClusky method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Summarize advantages of using different number systems. **L1**
- Apply basic laws and De Morgan's theorems to simplify Booleanexpressions. **L2**

UNIT – II: **10 Hrs**

Combinational Circuits: Introduction, Analysis of combinational circuits, Design Procedure– Binary Adder-Subtractor, Decimal Adder, Multiplier, Comparator, Code Converters, Encoders, Decoders, Multiplexers, Demultiplexers, Illustrative examples.

Sequential Circuits-1: Introduction, Latches –RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flip flops, Edge-triggered flip-flops, Flip-flop conversions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze standard combinational circuits such as adders, subtractors, multipliers, comparators etc. **L1**
- Design various Combinational logic circuits. **L2**

UNIT – III: **10 Hrs**

Sequential Circuits-2: Analysis and Design of Synchronous Sequential Circuits: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Synthesis using flip flops, Elements of Design style, Top–down design, Algorithmic state Machines (ASM), ASM chart notations.

Registers and Counters: Registers, shift registers, Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compare Moore and Mealy machine models **L1**
- Design synchronous sequential circuits using flip flops and construct digital systems using components such as registers and counters **L2**

UNIT – IV: **10 Hrs**

Memory and Programmable Logic: RAM, Types of Memories, Memory decoding, ROM, Types of ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL) and Programmable Logic Array (PLA), Design of combinational and sequential circuits using PLDs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe functional differences between different types of RAM & ROM **L1**
- Compare different types of Programmable Logic Devices **L2**

UNIT – V: **10 Hrs**

Digital Logic Families: Unipolar and Bipolar Logic Families, Transistor-Transistor Logic (TTL): Operation of TTL, Current sink logic, TTL with active pull up, TTL with open collector output, Shockley TTL, TTL characteristics, I^2L, ECL logic Families.

CMOS: CMOS Inverter, CMOS characteristics, CMOS configurations - Wired Logic, Open drain outputs, Interfacing: TTL to CMOS and CMOS to TTL, Tristate Logic, Characteristics of Digital ICs: Speed, power dissipation, figure of merit, fan-out, Current and voltage parameters, Noise immunity, operating temperature range, power supply requirements.

Learning Outcomes:

At the end of this unit, the student will be able to

- Summarize significance of various TTL , I^2L, ECL and CMOS subfamilies **L1**
- Compare bipolar and MOS logic families. **L2**

Text Books:

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 4th Edition Pearson Education, 2013.
2. R. P. Jain, "Modern Digital Electronics", 4th edition, McGraw Hill Education , India Private Limited, 2012.
3. Z. Kohavi and N. K. Jha, "Switching and Finite Automata Theory", Third Edition, Tata McGraw Hill, 2010.

Reference Books:

1. J.F Wakerly, "Digital Design: Principles and Practices", 4th Edition, Pearson India, 2008.
2. Charles H Roth (Jr) and Larry L. Kinney, "Fundamentals of Logic Design", 5th Edition Cengage Learning India Edition, , 2010.
3. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.

Course Outcomes:

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

- Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits. **L1**
- Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Also describe the various performance metrics for logic families. **L2**
- Utilize concepts of state and state transition for analysis and design of sequential circuits **L3**
- Design combinational and sequential logic circuits. **L4**
- Compare different types of Programmable logic devices and logic families. **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

POWER QUALITY

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To learn about voltage disturbances and power transients that is occurring in power systems
- To know about voltage sag and transient over voltages for quality of power supply
- To understand about harmonics and their mitigation
- To study about different power quality measuring and monitoring concepts.
- To know about long duration voltage variations

UNIT – I: Power Quality Issues 10 Hrs

Power quality, voltage quality, The power quality Evaluation procedure, Terms and Definitions, Transients, Long-duration voltage variations, short-duration voltage variations, voltage imbalance, wave form distortion, voltage fluctuation, power frequency variations, power quality terms CBEMA and ITI curves.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn about various issues of power quality **L1**
- To know about the evaluation procedure of power quality issues **L2**

UNIT – II: Voltage Sags and Transient Over Voltages 10 Hrs

Sources of sags and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the end-use level, Motor-starting sags and utility system fault-clearing issues, sources of over voltages, principles of over voltage protection, devices for over voltage protection, utility capacitor-switching transients, utility system lightning protection.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand what is meant by voltage sag **L1**
- To know about voltage sag performance estimations **L2**

UNIT – III: Fundamentals of Harmonics 10 Hrs

Harmonic sources from commercial and industrial loads, locating harmonic sources, Power system response characteristics, Harmonics Vs transients, Effect of harmonics, harmonic distortion, voltage and current distortion, harmonic indices, inter harmonics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive and active filters, IEEE and IEC Standards.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand about effects of harmonics **L1**
- To distinguish between voltage and current harmonics **L2**

UNIT – IV: Long-Duration Voltage Variations 10 Hrs

Principles of regulating the voltage, Devices for voltage regulation, utility voltage regulator Application, capacitors for voltage regulation, End user capacitor applications, flicker.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about principles of regulating the voltages **L1**
- To understand about the necessity of power electronic devices for voltage regulation **L2**

UNIT – V: Power Quality Bench Marking and Monitoring **10 Hrs**

Benchmarking process, RMS Voltage variation Indices, Harmonic indices Power Quality Contracts, Monitoring considerations, power quality measurement equipment, Power quality Monitoring standards

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about what is meant by bench marking in power quality issues **L1**
- To identify and able to compute voltage variation indices **L2**

Text Books:

1. Electrical Power Systems Quality by Roger C. Dugan, Mark F.McGranaghan, Surya Santoso, H.WayneBeaty, 2nd Edition, TMH Education Pvt. Ltd, 2012
2. Power quality by C. Sankaran, CRC Press, 2017

Reference Books:

1. Electrical systems quality Assessment by J. Arrillaga, N.R. Watson, S. Chen, John Wiley & Sons, 2000.
2. Understanding Power quality problems by Math H. J. Bollen, Wiley-IEEE Press, 2000

Course Outcomes:

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

- To get knowledge about different power quality issues and to mitigate them **L1**
- Analyze voltage disturbances and power transients that are occurring in power systems. **L2**
- Understand the concept of harmonics in the system and their effect on different power system equipment. **L3**
- Able to understand the principles of regulation of long duration voltage variations **L4**
- To get knowledge about different power quality measuring and monitoring concepts **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

INSTRUMENTATION

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Measuring system, Common errors, Objectives of Measuring systems
- Test signals and modulation phenomenon, Data acquisition system, various telemetry systems and various modulation systems
- Measuring various meters and analyzers
- Basic transducers and their usage in various measurements
- Provides an introduction to the field of instrumentation and covers process variables and the various instruments used to sense, measure, transmit and control these variables.

UNIT – I: Instrument Errors **10 Hrs**

Measuring Systems, Objectives of Measuring Instruments, definition of terms-Spam & Range, Sensitivity, Threshold & Resolution, Accuracy, Precision & Reliability, Performance Characteristics - Static Characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical evaluation of measuring data – Numerical Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of generalized measurement system. **L1**
- Know about the static and dynamic characteristics. **L2**

UNIT – II: Data Transmission and Telemetry **10 Hrs**

Signals and Their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation. Methods of Data Transmission – General Telemetry System. Frequency Modulation System (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Acquisition Systems – Components of Analog DAS – Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing – Digital DAS – Block Diagram — Modern Digital DAS (Block Diagram)

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of different modulations and compare different types of modulations in telemetry system. **L1**
- Know about the various telemetry systems and basic operation of Data acquisition systems **L2**

UNIT – III: Signal Analyzers **10 Hrs**

Wave Analyzers- Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers- Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays, Vector Impedance Meter, Q Meter. Peak Reading and RMS Voltmeters.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the principles of Wave Analyzers. **L1**
- Demonstrate the applications of Wave Analyzers. **L2**

UNIT – IV: Transducers **10 Hrs**

Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle Operation of Resistor, Inductor and Capacitive Transducers; LVDT and its Applications, Strain Gauge and Its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Piezo Electric Transducers, Photo electric Transducers, Hall effect, Photo Diodes.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the working principle, characteristics of various transducers **L1**
- Understand about applications of various transducers **L2**

UNIT – V: Measurement of Non-Electrical Quantities **10 Hrs**

Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow, Liquid level

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about measurement the various non-electrical quantities such as pressure, temperature, displacement, velocity **L1**
- Understand the concepts of measuring of various non-electrical quantities **L2**

Text Books:

1. D.V.S Murthy, "Transducers and Instrumentation Prentice Hall of India", 2004.
2. A.K. Sawhney, "A course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai & Co., 2012.

Reference Books:

1. H.S.Kalsi "Electronic Instrumentation", Tata MCGraw-Hill Edition, 3rd edition. 2010.
2. A.D Helfrick and W.D.Cooper,Modern "Electronic Instrumentation and Measurement techniques" Pearson/Prentice Hall of India., 1990.
3. T. R. Padmanabhan, "Industrial Instrumentation – Principles and Design Springer", 3rd re print, 2009.

Course Outcomes:

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

- Measuring systems, error measurements, test signals, different types of data transmission and modulation techniques **L1**
- Various telemetry systems and basic operation of Data acquisition systems **L2**
- Various measuring meters and signal analyzers **L3**
- Transducers and their measurement of electrical and non-electrical quantities **L4**
- The application of the above as a prerequisite topics to SCADA in power systems, state estimation theory, etc. **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

HVDC AND FLEXIBLE AC TRANSMISSION SYSTEMS

(Professional Elective-V)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- High voltage DC transmission systems
- To familiarize the students with the HVDC converters and their control systems
- To introduce students with the concept of various HVDC links.
- Flexible AC transmission systems
- Various configurations of the above, Principle of operation, Characteristics of various FACTS devices

UNIT – I: Introduction **10 Hrs**

Electrical Transmission Networks, Conventional Control Mechanisms-Automatic Generation Control, Excitation Control, Transformer Tap-Changer Control, Phase-Shifting Transformers; Advances in Power-Electronic Switching Devices, Principles and Applications of Semiconductor Switches; Limitations of Conventional Transmission Systems, Emerging Transmission Networks, HVDC and FACTS.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about difference between HVDC and FACTS **L1**
- Know about limitations of conventional transmission systems **L2**

UNIT – II: High Voltage DC Transmission – I **10 Hrs**

Types of HVDC links - Monopolar, Homopolar, Bipolar and Back-to-Back, Advantages and disadvantages of HVDC Transmission, Analysis of Greatz circuit, Analysis of bridge circuit without overlap, Analysis of bridge with overlap less than 600 , Rectifier and inverter characteristics, complete characteristics of rectifier and inverter, Equivalent circuit of HVDC Link.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn about various HVDC link configurations **L1**
- To develop equivalent circuit of HVDC link **L2**

UNIT – III: High Voltage DC Transmission – II **10 Hrs**

Desired features and means of control control of the direct current transmission link, Constant current control, Constant ignition angle control, Constant extinction angle control, Converter firing-angle control-IPC and EPC, frequency control and Tap changer control, Starting, Stopping and Reversal of power flow in HVDC links.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn about various DC link control techniques **L1**
- To learn about starting, stopping and reversal of power flow in DC links **L2**

UNIT – IV: Flexible AC Transmission Systems-I **10 Hrs**

Types of FACTS Controllers, brief description about various types of FACTS controllers, Operation of 6-pulse converter, Transformer Connections for 12-pulse, 24-pulse and 48-pulse operation, principle of operation of various types of Controllable shunt Var Generation, Principle of switching converter type shunt compensator, principles of operation of various types of Controllable Series Var Generation, Principle of Switching Converter type series compensator.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand principle of working and differences between various pulse configurations of various converters **L1**
- To understand the necessity of compensators **L2**

UNIT – V: Flexible Ac Transmission Systems-II **10 Hrs**

Unified Power Flow Controller (UPFC) – Principle of operation, Transmission Control Capabilities, Independent Real and Reactive Power Flow Control; Interline Power Flow Controller (IPFC) – Principle of operation and Characteristics, UPFC and IPFC control structures (only block diagram description), objectives and approaches of voltage and phase angle regulators

Learning Outcomes:

At the end of this unit, the student will be able to

- To know more about advanced Power flow controllers **L1**
- To analyze the transmission control strategies **L2**

Text Books:

1. Narain G. Hingorani and Laszlo Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2000.
2. E.W. Kimbark, Direct current transmission, Vol. I, Wiley Interscience, New York, 1971.

Reference Books:

1. K R Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International Publishers, New Delhi, 2007.
2. AnriqueAcha, Claudio R. Fuerte-Esquivel, Hugo Ambriz-Pérez and César Angeles Camacho, FACTS: Modelling and Simulation in Power Networks, John Wiley & Sons, West Sussex, 2004.
3. R Mohan Mathur and Rajiv K Varma, Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2002.

Course Outcomes:

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

- The necessity of HVDC systems as emerging transmission networks **L1**
- Apply the knowledge of HVAC and HVDC transmission in power networks. **L2**
- Analyze the different modes of operation for six pulse and twelve pulse converter unit in the contest of HVDC system **L3**
- To obtain equivalent circuits of various HVDC system configurations **L4**
- Power Electronic devices to understand the necessity of reactive power compensation devices **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

SMART GRID TECHNOLOGIES

(Professional Elective-V)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To learn about recent trends in grids as smart grid
- To understand about smart grid architecture and technologies
- To know about smart substations
- To learn about smart transmission systems
- To learn about smart distribution systems

UNIT – I: Introduction to Smart Grid **10 Hrs**

Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions –Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid

Smart Grid Architecture: Components and Architecture of Smart Grid Design – Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs – Transmission Automation – Distribution Automation – Renewable Integration

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand basic definitions and architecture of Smart grid **L1**
- To understand the need for integration of Renewable energy sources **L2**

UNIT – II: Smart grid Technologies **09 Hrs**

Characteristics of Smart grid, Micro grids, Definitions, Drives, benefits, types of Micro grid, building blocks, Renewable energy resources, needs in smart grid, integration impact, integration standards, Load frequency control, reactive power control, case studies and test beds

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic characteristic features of smart grid technologies **L1**
- To know about integration requirements, standards of renewable energy sources in Microgrids **L2**

UNIT – III: Smart Substations **09 Hrs**

Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations in smart grid, Volt/VAR control equipment inside substation

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about protection, monitor and control devices in Smart substations **L1**
- To understand about Volt/VAR control equipment inside substation **L3**

UNIT – IV: Smart Transmission **10 Hrs**

Energy Management systems, History, current technology, EMS for the smart grid, Wide Area Monitoring Systems (WAMS), protection & Control (WAMPC), needs in smart grid, Role of WAMPC smart grid, Drivers and benefits, Role of transmission systems in smart grid, Synchro Phasor Measurement Units (PMUs)

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about Energy Management Systems in smart transmission systems **L1**
- To know about role of transmission systems in Smart grid **L2**

UNIT – V: Smart Distribution Systems **10 Hrs**

DMS, DSCADA, trends in DSCADA and control, current and advanced DMSs, Voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage- VAR control, VAR control equipment on distribution feeders, implementation and optimization, FDIR - Fault Detection Isolation and Service restoration (FDIR),faults, objectives and benefits, equipment, implementation

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about DSCADA in Smart Distribution Systems **L1**
- To understand about VAR control and equipment on distribution feeders **L2**

Text Books:

1. Stuart Borlase, Smart Grids - Infrastructure, Technology and Solutions, CRC Press,1e,2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley–IEEE Press, 2e,2013.

Reference Books:

1. A.G. Phadke and J.S. Thorp, Synchronized Phasor Measurements and their Applications, Springer Edition, 2e, 2017.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2e,2012.

Course Outcomes:

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

- To be able to understand trends in Smart grids **L1**
- To understand the needs and roles of Smart substations **L2**
- To understand the needs and roles of Smart Transmission systems **L3**
- To understand the needs and roles of Smart Distribution systems **L4**
- To distinguish between SCADA and DSCADA systems in practical working environment **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

FUNDAMENTALS OF ELECTRIC VEHICLES

(Professional Elective-V)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Understand working of different configurations of electric vehicles
- Understand hybrid vehicle configuration and its components, performance analysis
- Understand the properties of batteries and its types.
- Understand of electric vehicle drive systems.
- Understand of hybrid electric vehicles.

UNIT – I: Introduction to Electric Vehicles

Sustainable Transportation - EV System - EV Advantages – Vehicle Mechanics - Performance of EVs - Electric Vehicle drive train - EV Transmission Configurations and Components-Tractive Effort in Normal Driving - Energy Consumption - EV Market - Types of Electric Vehicle in Use Today - Electric Vehicles for the Future.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the fundamentals of EV system **L1**
- Learn about the vehicle mechanics and its performance **L1**
- Learn about the advantages over conventional vehicles **L2**
- Learn about the types of Electric Vehicles **L4**
- Learn about the future scope of these vehicles **L5**

UNIT – II: Electric Vehicle Modeling

Rolling Resistance - Transmission Efficiency -Consideration of Vehicle Mass - Tractive Effort - Modeling Vehicle Acceleration - Modeling Electric Vehicle Range -Aerodynamic Considerations - Ideal Gearbox Steady State Model - EV Motor Sizing - General Issues in Design.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the electric vehicle modeling like rolling resistance, efficiency **L1**
- Learn about the tractive effort developed by the EV **L2**
- Learn about the Modeling of Electric Vehicle Range **L3**
- Learn about the considerations of aerodynamic in EV design **L4**
- Learn about the EV motor sizing with general issues considerations **L5**

UNIT – III: Batteries

Introduction to electric vehicle batteries - electric vehicle battery efficiency - electric vehicle battery capacity - electric vehicle battery charging - electric vehicle battery fast charging - electric vehicle battery discharging - electric vehicle battery performance – testing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the introduction of batteries related to the EVs **L1**
- Learn about the EVs battery performance details **L2**
- Learn about the testing of batteries for EVs **L3**

UNIT – IV: Hybrid Electric Vehicles

HEV Fundamentals -Architectures of HEVs- Interdisciplinary Nature of HEVs - State of the Art of HEVs - Advantages and Disadvantages - Challenges and Key Technology of HEVs - Concept of Hybridization of the Automobile-Plug-in Hybrid Electric Vehicles - Design and Control Principles of Plug-In Hybrid Electric Vehicles - Fuel Cell Hybrid Electric Drive Train Design - HEV Applications for Military Vehicles.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the fundamentals of HEV **L1**
- Learn about the advantages and disadvantages of HEV over conventional ones **L2**
- Learn about the challenges and technologies related to HEVs **L3**
- Learn about the hybridization concept in HEV **L4**
- Learn about the design and applications of fuel cell hybridization **L5**

UNIT – V: Advanced Topics

Battery Charger Topologies, Charging Power Levels, and Infrastructure for Plug-In Electric and Hybrid Vehicles - The Impact of Plug-in Hybrid Electric Vehicles on Distribution Networks – Sizing Ultra capacitors for Hybrid Electric Vehicles.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the advanced topics related to the charging of vehicles **L1**
- Learn about the charging power levels in the electric vehicles **L2**
- Learn about the impact of plug in hybrid electric vehicles on distribution network **L3**
- Learn about the sizing of capacitors related to HEV **L4**
- Learn about the infrastructure for plug in electric & Hybrid vehicles **L5**

Text Books:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles – Fundamentals, Theory and Design– Mehrdad Ehsani, Uimin Gao and Ali Emadi - Second Edition - CRC Press, 2010.
2. Electric Vehicle Technology Explained - James Larminie, John Lowry - John Wiley & Sons Ltd, - 2003.
3. Electric Vehicle Battery Systems – Sandeep Dhameja – Newnes - New Delhi – 2002.

Reference Books:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
3. Hybrid electric Vehicles Principles and applications with practical perspectives -Chris Mi, Dearborn - M. AbulMasrur, David Wenzhong Gao - A John Wiley & Sons, Ltd., - 2011.
4. Electric & Hybrid Vehicles – Design Fundamentals - Iqbal Hussain, Second Edition, CRC Press, 2011.
5. **Research Papers:**
   i) The Impact of Plug-in Hybrid Electric Vehicles on Distribution Networks: A Review and Outlook - Robert C. Green II, Lingfeng Wang and MansoorAlam - 2010 IEEE.
   ii) Sizing Ultra capacitors for Hybrid Electric Vehicles - H. Douglas P Pillay -2005 IEEE.
   iii) Review of Battery Charger Topologies, Charging Power Levels, and Infrastructure for Plug-In Electric and Hybrid Vehicles - Murat Yilmaz, and Philip T. Krein, - IEEE transactions on power electronics, vol. 28, no. 5, May 2013.

Course Outcomes:

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

- Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources. **L1**
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles. **L2**
- Choose proper energy storage systems for vehicle applications. **L3**
- Identify various communication protocols and technologies used in vehicle networks. **L4**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

MANAGEMENT SCIENCE

(Common to all Branches)

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the role of entrepreneurship in economic development.
- Identify the general characteristics of entrepreneurs.

UNIT – 1

INTRODUCTION TO MANAGEMENT

Concepts of Management - Nature, importance and Functions of Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Leadership Styles, Social responsibilities of Management.

DESIGNING ORGANIZATIONAL STRUCTURES

Basic concepts related to Organisation - Departmentation and Decentralization, Types of mechanistic and organic structures of organization (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, team structure) their merits, demerits and suitability.

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand the concept of management and organization.	**L1**
• Apply the concepts & principles of management in real life industry.	**L2**

UNIT – II

OPERATIONS MANAGEMENT:

Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study. Statistical Quality Control: *c* chart, *p* chart, (simple Problems) Deming's contribution to quality.

MATERIALS MANAGEMENT: EOQ, Purchase Procedure and Stores Management. Inventory — functions. Types, inventory classification techniques.

Marketing: Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand the core concepts of Management Science and Operations Management.	**L1**
• Evaluate Materials departments & Determine EOQ.	**L2**

UNIT – III

HUMAN RESOURCES MANAGEMENT (HRM):

Concepts of HRM, Personnel Management and Industrial Relations (PMIR), Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation, Merit Rating and methods.

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand the concepts of HRM in Recruitment, Selection, Training & Development.	**L1**

• Apply Managerial and operative Functions.	L2

UNIT – IV

STRATEGIC MANAGEMENT:

Vision, Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

PROJECT MANAGEMENT (PERT/CPM):

Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand Mission, Objectives, Goals & strategies for an enterprise.	L1
• Evaluate PERT and CPM Techniques.	L2

UNIT – V

CONTEMPORARY MANAGEMENT PRACTICES:

Basic concepts of MIS, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma concept, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

Learning Outcomes:

At the end of this unit, the student will be able to

• Analyze CRM, MRP, TQM.	L1
• Understand modern management techniques.	L2

Text Books:

1. **Management Science**,Aryasri: TMH, 2004.
2. **Management** ,Stoner, Freeman, Gilbert, 6th Ed, Pearson Education,New Delhi, 2004.

Reference Books:

1. **Marketing Mangement** , Kotler Philip & Keller Kevin Lane: 12/e, PHI,2005.
2. **Essentials of Management** ,Koontz & Weihrich:, 6/e, TMH, 2005.
3. **Management—Principles and Guidelines**, Thomas N.Duening & John M.Biztantra, 2003.
4. **Production and Operations Management**, Kanishka Bedi, , Oxford University Press, 2004.

Course Outcomes:

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

• Equipping engineers for a lifelong career addressing the critical technical and managerial needs of private and public organizations.	L1
• Exploring and developing analytic abilities, making better decisions, developing and executing strategies while also leading people who innovate.	L2
• Cultivating the technical skills as well as the behavioral challenges of running organizations and complex systems.	L3
• Emphasizing quantitative analytic skills and an entrepreneurial spirit	L4
• Have an introductory understanding of global entrepreneurship concepts.	L5

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

BUSINESS ENVIRONMENT
(Common to all Branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To make the student understand about the business environment.
- To enable them in knowing the importance of fiscal and monitory policy.

UNIT – 1: BUSINESS ENVIRONMENT

Meaning – Various environments affecting business – Social Economic; Political and Legal; Culture; Competitive Demographic; Technological and International environments.

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand the concept of Business environment.	L1
• Explain various types of business environment.	L2

UNIT – II: FISCAL & MONETARY POLICY

FISCAL POLICY - Public Revenues - Public Expenditure - Public debt - Development activities financed by public expenditure - Evaluation of recent fiscal policy of Government of India - Highlights of Budget - **MONETARY POLICY** - Demand and Supply of Money – RBI - Objectives of monetary and credit policy - Recent trends - Role of Finance Commission.

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand the concept of public revenue and public Expenditure	L1
• Explain the functions of RBI and its role.	L2

UNIT – III: TRADE POLICY

INDIA'S TRADE POLICY - Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - **BALANCE OF PAYMENTS** – Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand the role of Indian international trade.	L1
• Analyze causes for Disequilibrium and correction measure.	L2

UNIT – IV: WORLD TRADE ORGANIZATION

WORLD TRADE ORGANIZATION - Nature and Scope - Organization and Structure - Role and functions of WTO in promoting world trade - Agreements in the Uruguay Round – TRIPS, TRIMS, and GATT - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

Learning Outcomes:

At the end of this unit, the student will be able to

• Understand the Dispute Settlement Mechanism.	L1
• Compare and contrast the Dumping and Anti-dumping Measures.	L2

UNIT – V: MARKETS

MONEY MARKETS AND CAPITAL MARKETS - Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI - Stock Exchanges - Investor protection and role of SEBI.

Learning Outcomes:

At the end of this unit, the student will be able to

• Apply the knowledge in future investments.	L1
• Understand the role of SEBI in investor protection.	L2

Text Books:

1. Francis Cherunilam (2009), "International Business": Text and Cases, Prentice Hallof India.
2. K. Aswathappa, "Essentials of Business Environment": Texts and Cases & Exercises 13th Revised Edition.HPH2016.

Reference Books:

1. K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases,Prentice Hall of India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
4. E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

Course Outcomes:

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

• Apply the knowledge of Money markets in future investment.	L1
• Analyze India's Trade Policy.	L2
• Evaluate fiscal and monitory policy.	L3
• Develop a personal synthesis and approach for identifying business opportunities.	L4
• `Understand various types of business environment.	L5

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Skill Course – V : DESIGN OF ELECTRIC VEHICLE

L	T	P	C
1	0	2	2

Course Objectives: The objectives of the course are to make the students learn about

- To understand the concept of vehicle fundamentals and hybrid electric vehicles
- To study the battery performance of an EV
- To understand operation of different motors used for electric vehicles
- To design a converter and controller for an EV

UNIT – I: Introduction to Vehicles **10 Hrs**

History, Components of ICE vehicle and Electric Vehicle, General Layout of EV, EV classification, Comparison of ICE with EV: Technology, Advantages & Disadvantages, Drive Cycles, Vehicle resistance, Types: Rolling Resistance, grading resistance, Aerodynamic drag vehicle performance, Calculating the Acceleration Force, maximum speed, Finding the Total Tractive Effort, Torque Required on The Drive Wheel, Transmission: Differential, clutch & gear box, Braking performance. Report on Total tractive effort calculations with different drive cycles and with different vehicle models.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic concepts of Electric Vehicle **L1**
- Understand the various paramaters of an Electric Vehicle **L2**

UNIT – II: Batteries **10 Hrs**

Basics of Battery technology, Relevance and scenario. Perspective on development of Energy storage systems. Battery capacity, Discharge Rate, SOC, SOD, SOH, DOD, Thermodynamic Voltage, Specific Energy, Specific Power, Energy Efficiency, Battery Technologies (used in Tesla Car), Lead-acid battery, Nickel based battery (Nickel Metal Hydride), Lithium battery (Li-ion and LiPolymer), Introduction to Sodium battery, Compare all Electrochemical batteries.

General approach to modelling batteries, simulation model of a rechargeable Li-ion battery, simulation model of a rechargeable NiCd battery, Parameterization of the NiCd battery model, Simulation examples, Report on the application of different SOC of a battery to a dedicated drive cycle.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn how to size the batteries **L3**
- Learn about different batteries for an EV **L1**

UNIT – III: Motors for Electric Vehicles **10 Hrs**

Condition at Starting, Behavior of Starter during Starting, Characteristics and Types of DC Motors- Overview (Speed torque characteristics) of Permanent Magnet motor, BLDC Motor and Induction motor.

Introduction to Modeling of motors, Modeling of PMMC motor, Modeling BLDC Motor, Modeling of SRM Motors, Numericals.

Switched Reluctance Motor: Basic Magnetic Structure, Torque Production - SRM Drive Converter - Modes of Operation - Generating Mode of Operation (Regenerative Braking) - Sensorless Control - Phase Flux Linkage based Method. Design of Traction Motor for a dedicated drive cycle.

Learning Outcomes:

At the end of this unit, the student will be able to

- To design a traction system for EV **L5**
- To find the performance of various analysis and analyse the solar PV energy output **L4**

UNIT – IV: Power Electronics in Hybrid Electric Vehicles **10 Hrs**

Rectifiers, Voltage source inverter, Current source inverter, Plug-in Hybrid Electric Vehicles, PEV configurations, Power management problems, Component sizing.

Basic Principle of DC–DC Converter - Step-Down (Buck) Converter - Step-Up (Boost) Converter - Buck–Boost Converter - DC–DC Converters Applied in Hybrid Vehicle Systems - Isolated Buck DC–DC Converter - Four-Quadrant DC–DC Converter. Design of Converter for different EV Applications

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the various converters for an EV **L2**
- Learn the performance of different converters for an EV **L5**

UNIT – V: ELECTRIC DRIVE AND CONTROLLER **10 Hrs**

Fundamentals of Mechatronics, Electronics Components, Microprocessor, Ports, Memory, Buses, Microcontroller, Fetch-Execute sequence, Programming, Electronic Control Unit, Testing of Microcontroller Systems. Control System: Open and closed loop control strategies, PID control, Look up tables Development of Control Algorithms using Evaluation Boards .

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to design a controller for an EV **L4**
- Able to test the designed controller for an EV **L3**

Text Books:

1. Iqbal Hussain, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, 2003.
2. William B.Riddens "Understanding Automotive Electronics", 5th edition - Butter worth Heinemann Woburn,1998.
3. K Wang Hee Nam: AC Motor Control & Electrical Vehicle Application, CR Press, Taylor & Francis Group, 2019

Reference Books:

1. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003.
2. Modern Electric, Hybrid Electric and Fuel Cell Vehicles" , Fundamentals, Theory and Design, M. Ehsani, CRC Press, 2005

Course Outcomes:

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

- Compare the different types of an EV **L3**
- To size and understand the characteristics of a battery **L2**
- To design a converter and controller for an EV **L5**
- To test designed motor, converter and controller for an EV **L3**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech. VII-Sem (R20)

MATHEMATICAL MODELING

(Open Elective -III)

L	T	P	C
3	0	0	3

Course Objectives:

- To provide the basic knowledge to understand a Mathematical model.
- To formulate a Mathematical model related to a real world problems of engineering, biological science etc.

UNIT – 1: Mathematical Modeling & Mathematical modeling Through Ordinary differential equations of First Order : **9 Hrs**

Mathematical Modeling : Need, Techniques, Classifications and Simple illustrations.

Mathematical modeling Through Ordinary differential equations of First Order :

Mathematical modeling Through differential equations; Linear growth and decay models; Non-Linear Growth and Decay models; Mathematical modeling in dynamics through ordinary differential equations of first order.

Learning Outcomes:

At the end of this unit, the student will be able to

• Learn various mathematical techniques in modeling a problem.	**L2**
• Learn modeling in dynamics through ordinary differential equations of first order.	**L3**

UNIT – II: Mathematical modeling Through System of Ordinary differential equations of First Order:

Mathematical modeling in population dynamics; Mathematical modeling of Epidemics through system of ordinary differential equations of first order; Compartment models through Systems of ordinary differential equations; Mathematical modeling in dynamics through systems of ordinary differential equations of first order.

Learning Outcomes:

At the end of this unit, the student will be able to

• Develop a modeling of Epidemics through system of ordinary differential equations of first order.	**L4**
• Analyze a modeling in dynamics through systems of ordinary differential equations of first order.	**L3**

UNIT – III: Mathematical modeling Through Ordinary differential equations of Second Order:

Mathematical modeling of Planetary motion ; Mathematical modeling of Circular motion and motion of satellites; Mathematical modeling through linear differential equations of second order.

Learning Outcomes:

At the end of this unit, the student will be able to

• Evaluate a mathematical modeling of Planetary motion.	**L5**
• Analyze a mathematical modeling of Circular motion and motion of satellites	**L3**

UNIT – IV: Mathematical modeling Through Difference equations :

Need for Mathematical modeling Through Difference equations and simple models; Basic theory of Linear difference equations with constant coefficients; Mathematical modeling Through Difference equations in population dynamics and genetics; Mathematical modeling Through Difference equations in

Probability theory.	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• Analyze mathematical modeling through difference equations in population dynamics and genetics.	**L4**
• Analyze mathematical modeling through difference equations in probability theory.	**L4**
UNIT – V: Mathematical modeling Through Functional, Integral, Delay- Differential and Differential-Difference Equations :	
Mathematical modeling Through Functional equations; Mathematical modeling Through Integral equations; Mathematical modeling Through Delay- Differential and Differential-Difference Equations.	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• Analyze a mathematical modeling through functional equations and integral equations.	**L4**
• Analyze a mathematical modeling Through Delay- Differential and Differential-Difference Equations	**L4**
Text Books:	
1. J. N. Kapoor. Mathematical Modeling , NEW AGE INTERNATIONAL PUBLISHERS.	
Reference Books:	
1. A. C. Fowler. Mathematical Models in Applied Sciences, Cambridge University Press.	
Course Outcomes:	
At the end of this Course the student will be able to	
• Understand the basic concepts in mathematical modeling.	**L1**
• Have better insight of the real word problems through mathematical modeling .	**L2**
• Apply various concepts of mathematics in modeling.	**L3**
• Analyze the real word problems through the techniques of modeling.	**L4**
• Evaluate the real word problems through mathematical modeling.	**L5**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF PHYSICS
IV B.TECH – I SEMESTER-R20 (Open elective-Interdisciplinary) –OE-ID.1(THEORY

SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS

(Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

1. To understand basics of sensors, actuators and their operating principles.
2. To educate the students on different types of microfabrication techniques for designing and developing sensors.
3. To explain working of various types of electrochemical sensors and actuators.
4. To provide an understanding on characteristic parameters to evaluate sensor performance.

UNIT – 1: Introduction to Sensors and Actuators — 9 Hrs

Content of the Unit – I

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Learning Outcomes:

At the end of this unit, the student will be able to

• **Classify** different types of Sensors and their characteristics	**L2**
• **Explain** about different fabrication process of Sensors	**L1**
• **Illustrate** Dry and wet etching	**L2**

UNIT – II: Temperature and Mechanical Sensors — 9 Hrs

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors,strain gauges, Pressure sensors: semiconductor, piezoresistive, capacitive, Variable reluctance pressure (VRP) sensors.

Learning Outcomes:

At the end of this unit, the student will be able to

• **Summarize** various types of Temperature sensors	**L2**
• **Explain** basic working principle of different types mechanical sensors	**L1**
• **Summarize** various types of Mechanical sensors	**L2**
• **Explain** the working principle of different types mechanical sensors	**L1**

UNIT – III: Optical, Acoustic and Chemical Sensors — 9 Hrs

Content of the Unit – III

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors: thermal, PIR, thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the working and principle of various optical sensors	**L1**
• **Explain** the working principle of different Acoustic sensors	**L1**
• **Explain** the working and principle of various chemical sensors	**L1**
UNIT – IV: Magnetic, Electromagnetic and Radiation Sensors	**9 Hrs**
Inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors, **Radiation Sensors**: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Mueller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the working principle of different magnetic and electromagnetic sensors	**L1**
• **Explain** the working principle of different radiation sensors	**L1**
• **Identifies** the applications Electronic sensors in various fields	**L1**
• **Identify** the various optical, solid state system components	**L1**
UNIT – V: Actuators Types, Principle, Magnetic, Electromagnetic actuators	**9 Hrs**
Introduction, Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, piezo-electric and piezo-resistive actuators, Simple applications of Actuators. Motors as actuators (linear, rotational, stepping motors),Magneto-strictive actuators, Voice coil actuators (speakers and speaker-like actuators).	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Illustrates** the different types of Actuators	**L2**
• **Explains** the basic principle of working of Actuators	**L1**
• **Identifies** the applications of Actuators sensors	**L1**
Text Books:	
1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015	
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999	
Reference Books:	
1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003	
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999	
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.	
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.	
5. Principles of Industrial Instrumentation By D. Patranabhis	
Course Outcomes:	
At the end of this Course the student will be able to	
➢ to identify the needs of sensors and actuators	**L1**
➢ to understand working principles of various sensors and actuators	**L2**
➢ to identify different type of sensors and actuators used in real life applications	**L1**
➢ to explore common methods for converting a physical parameter into an electrical quantity	**L3**
➢ to summaries use of sensors and actuators for different applications	**L2**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech – IV-I-Sem	L	T	P	C
	3	0	0	3

Chemistry of Nanomaterials and applications (OE.3)
(common to all branches)

Course Objectives:

- To understand synthetic principles of Nanomaterials by various methods
- Characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering
- Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

UNIT-I: **Introduction to nanoscience**	7 Hrs

Introduction,importance of nanomaterials, nanoscience in nature, classification of nanostructured materials, properties and scope of nanoscience and applicationsof nanotechnology.

Learning Outcomes:
At the end of this unit, the student will be able to:

- Classify the nanostructure materials(L2)
- Describe scope of nano science and technology(L2)
- Explain different synthetic methods of nano materials(L2)
- Identify the synthetic methods of nanomaterial which is suitable for preparation of particular material(L3)

UNIT-II: **Synthesis of nanomaterials**	8Hrs

Bottom-Up approach:- Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis.
Top-Down approach:- Arc discharge Plasma arc method, aerosol synthesis, ion sputtering, laser pyrolysis,laser ablation, chemical vapour deposition method, electrodeposition method, and high energy ball milling

Learning Outcomes:
At the end of this unit, the student will be able to:

- Describe the top down approach(L2)
- Explain aerosol synthesis and plasma arc technique(L2)
- Differentiate chemical vapour deposition method and electrodeposition method(L2)
- Discuss about high energy ball milling(L3)

UNIT-III: Characterization of nanomaterials	7 Hrs

Techniques for characterization:Dynamic light scattering for particle size determination, Diffraction technique, electron microscopy techniques, BET method for surface area analysis.

Learning Outcomes:
After completing the course, the student will be able to:

- Discuss different technique for characterization of nanomaterial(L3)

- Explain electron microscopy techniques for characterization of nanomaterial(L3)
- Describe BET method for surface area analysis (L2)
- Apply different spectroscopic techniques for characterization(L3)

UNIT-IV: Structural studies of nanomaterials	8 Hrs

Properties of nanomaterials: fullerenes, carbon nanotubes, core-shell nanoparticles. Nano-crystalline materials, magnetic nanoparticles and important properties in relation to nano-magnetic materials, thermoelectric materials, non-linear optical materials, liquid crystals

Learning Outcomes:

After completing the course, the student will be able to:

- Explain synthesis and properties and applications of nanaomaterials(L2)
- Discuss about fullerenes and carbon nanotubes(L3)
- Differentiate nanomagnetic materials and thermoelectric materials(L2)
- Describe liquid crystals(L2)

UNIT-V: **Applications of Nanomaterials**	7Hrs

Engineering, medicine. aerospace applications of nanomaterials. Technologies based on nano materials.

Learning Outcomes:

After completing the course, the student will be able to:

- Illustrate applications of nanaomaterials(L2)
- Discuss the magnetic applications of nanomaterials(L3)
- List the applications of non-linear optical materials(L1)
- Describe the applications fullerenes, carbon nanotubes(L2)

Text Books:

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012

Reference Books:

1. Ludovico Cademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Concepts of Nanochemistry; Wiley-VCH, 2011.
2. Guozhong Cao, Nanostructures & Nanomaterials; Synthesis, Properties & Applications:, Imperial College Press, 2007
3. C. N. R. Rao, Achim Muller, K.Cheetham, Nanomaterials Chemistry, , Wiley-VCH, 2007

Course Outcomes:

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

- Understand the state of art synthesis of nano materials(L1)
- Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry(L2)
- Analyze nanoscale structure in metals, polymers and ceramics(L3)
- Analyze structure-property relationship in coarser scale structures(L3)

- Understand structures of carbon nano tubes(L1)

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE75A- DISASTER MANAGEMENT AND MITIGATION

(OPEN ELECTIVE-III)

L	T	P	C
3	0	0	3

Course Objectives:

- The objectives of this are to give the basic knowledge of Environmental Hazards and disasters. The syllabus includes the basics of Endogenous and Exogenous hazard's and gives a suitable picture on the different types ofhazardas.

UNIT-I:

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

UNIT-II:

Classification of hazards & Disasters: Natural hazards and Disasters - Man Made hazards & Disasters - Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards

UNIT-III

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

UNIT-IV:

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters Infrequent events: Cyclones – Lightning – Hailstorms Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation)Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves. Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation).Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion Soil Erosion:-- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion. Chemical hazards/ disasters:-- Release of toxic chemicals, nuclear explosion- Sedimentation processes. Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation-Biological hazards/ disasters:- Population Explosion.

UNIT-V:

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage(preparedness)-HVRA Atlas
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

Text Books:

1. Disaster Management by Rajib Shah, Universities Press, India,2003
2. Disaster Mitigation: Experiences And Reflections by PardeepSahni
3. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning
4. National Disaster Management Authority-Guidelines

Reference Books:

1. Kates,B.I& White, G.F The Environment as Hazards, oxford, New York, 1978
2. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
3. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
4. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo,1994
5. Dr.Satender,Disaster Management in Hills, Concept Publishing Co., New Delhi, 2003

Course Outcomes:

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

- Understand the nature, cause and effects of disasters
- Comprehend the importance of Disaster Management and the need of awareness
- Acquire knowledge on disaster preparedness, recovery remedial measures and personal precautions

Annexure-III *R20*

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

IOT APPLICATIONS IN ELECTRICAL ENGINEERING

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To learn about a few applications of Internet of Things
- To distinguish between motion less and motion detectors as IOT applications
- To know about Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
- To understand about applications of IOT in smart grid
- To introduce the new concept of Internet of Energy for various applications

UNIT – I: SENSORS **10 Hrs**

Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic principles of sensors and their classification **L1**
- To learn about various motion less sensors **L2**

UNIT – II: Occupancy and Motion detectors **10 Hrs**

Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about Capacitive occupancy **L1**
- To understand about Motion detectors **L2**

UNIT – III: MEMS **10 Hrs**

Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand about the basic concept of MEMS **L1**
- To know about electrostatic actuation **L2**

UNIT – IV: IOT FOR SMART GRID **10 Hrs**

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

Learning Outcomes:

At the end of this unit, the student will be able to

- To get exposure fundamental applications of IoT to Smart grid **L1**
- To learn about driving factors of IoT in Generation level **L2**

UNIT – V: IOE - Internet of Energy **10 Hrs**

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IOE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid.

Learning Outcomes:

At the end of this unit, the student will be able to

- To get exposed the new concept of internet of energy **L1**
- To learn about architecture of IOE **L2**

Text Books:

1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004
2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017
3. ErsanKabalci and YasinKabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019

Reference Books:

1. Raj Kumar Buyya and Amir VahidDastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD SundaramShriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019

Course Outcomes:

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

- To get exposed to recent trends in few applications of IoT in Electrical Engineering **L1**
- To understand about usage of various types of motionless sensors **L2**
- To understand about usage of various types of motion detectors **L3**
- To get exposed to various applications of IoT in smart grid **L4**
- To get exposed to future working environment with Energy internet **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME75a-INTRODUCTION TO COMPOSITE MATERIALS

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

UNIT – I: Introduction to composites: **10 Hrs**

Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the fundamentals of composites. **L2**
- Classify the composites based on matrix and structure. **L2**
- Identify the practical applications of composites. **L3**
- Summarize the properties and advantages of reinforcement materials. **L2**

UNIT – II: Polymer matrix composites **8 Hrs**

Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave - Injection moulding – sheet moulding compound – properties and applications of PMCs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the properties of polymer matrix composites. **L2**
- Identify the polymer matrix composites. **L3**
- Explain various process used in making the polymer matrix composites. **L2**
- Discuss the auto clave based methods. **L6**

UNIT – III: Metal matrix composites: **8 Hrs**

Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMCs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Outline the various types of metal matrix composite. **L2**
- Explain liquid state processes and solid state processes in MMCs preparation. **L2**
- Demonstrate In-situ processes. **L2**
- Identify the properties and applications of MMCs. **L2**

UNIT – IV: Ceramic matrix composites: **8 Hrs**

Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – In-situ chemical reaction techniques – solgel polymer pyrolsis –SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Summarize the various types of ceramic matrix materials. **L2**
- Explain the sintering, hot pressing, infiltration and lanxide process. **L3**
- Contrast between cold and hot isostatic pressing. **L2**
- Examine the properties and applications of CCMs. **L2**

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UNIT – V: Advances & Applications of composites: **8 Hrs**

Advantages and Limitations of carbon matrix composites – chemical vapour deposition of carbon on carbon fibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications. Bio degradability - introduction to bio composites, classification, processing and, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the advantages and disadvantages of carbon matrix. **L2**
- Identify composites for aerospace applications. **L3**
- Apply chemical vapour deposition of carbon on carbon fibre perform. **L3**
- Select the carbon - carbon composites. **L1**
- Classify various bio- degradable composites. **L3**

Text Books:

1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

Reference Books:

1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.

Course Outcomes:

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

- Identify the practical applications of composites. **L3**
- Identify the polymer matrix composites. **L3**
- Classify of bio- degradable composites. **L2**
- Outline the various types of ceramic matrix materials. **L2**

Online Learning Resources:

- https://nptel.ac.in/courses/112104229
- https://nptel.ac.in/courses/112104168
- https://nptel.ac.in/courses/101104010
- https://nptel.ac.in/courses/105108124
- https://nptel.ac.in/courses/112104221

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B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME75b-CUSTOMER RELATIONSHIP MANAGEMENT

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce basic concepts and principles of customer relationship management (CRM).
- Familiarize with appreciate the role and changing face of CRM as an IT enabled function.
- Describe concept of managing and sharing customer data.
- Explain the principles of CRM links in e-Business.
- Expose the students on Enterprise resource planning (ERP),supply chain management (SCM) and Supplier relationship management (SRM).

UNIT – I: CRM concepts **10 Hrs**

CRM concepts - Acquiring customers, - Customer loyalty and optimizing customer relationships - CRM defined - success factors, the three levels of Service/ Sales Profiling - Service Level Agreements (SLAs), creating and managing effective SLAs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concepts of customer relationship management. **L2**
- Define customer relationship management (CRM). **L1**
- Illustrate the service level agreements (SLAs). **L2**

UNIT – II: CRM in Marketing : **8 Hrs**

CRM in Marketing - One-to-one Relationship Marketing - Cross Selling & Up Selling - Customer Retention, Behaviour Prediction - Customer Profitability & Value Modeling - Channel Optimization - Event-based marketing. - CRM and Customer Service - The Call Centre, Call Scripting - Customer Satisfaction Measurement.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of one-to-one relationship marketing. **L2**
- Develop the skills related to predict the behaviour and retention of the customer. **L6**
- Discus about customer profitability and value modeling. **L6**
- Illustrate the various methods for CRM and customer service. **L2**

UNIT – III: Sales Force Automation **8 Hrs**

Sales Force Automation - Sales Process, Activity, Contact- Lead and Knowledge Management - Field Force Automation. - CRM links in e-Business - E-Commerce and Customer Relationships on the Internet - Enterprise Resource Planning (ERP), - Supply Chain Management (SCM), - Supplier Relationship Management (SRM), - Partner relationship Management (PRM). - Case studies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of CRM links in e-Business. **L1**
- Discus E-commerce and customer relationship on the internet. **L6**
- Describe Enterprise resource planning (ERP), Supply chain management (SCM). **L2**
- Explain terms supplier relationship management and partner relationship management. **L2**

UNIT – IV: Analytical CRM **8 Hrs**

Analytical CRM - Managing and sharing customer data - Customer information databases - Ethics and legalities of data use - Data Warehousing and Data Mining concepts - Data analysis - Market Basket Analysis (MBA), Click stream Analysis, Personalization and Collaborative Filtering.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain how to manage and sharing the customer data. **L2**

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- List the various ethics and legalities of customer database use. **L1**
- Describe various data warehousing and data mining concepts **L3**
- Discus about market basket analysis (MBA). **L6**

UNIT – V: CRM Implementation **8 Hrs**

CRM Implementation - Defining success factors - Preparing a business plan requirements, justification and processes. - Choosing CRM tools - Defining functionalities - Homegrown versus out-sourced approaches - Managing customer relationships - conflict, complacency, Resetting the CRM strategy. Selling CRM internally - CRM development Team - Scoping and prioritizing - Development and delivery - Measurement.

Learning Outcomes:

At the end of this unit, the student will be able to

- Define success factors for implementing the customer relationship management. **L1**
- Define functionalities of CRM. **L1**
- Explain the functions of CRM development team. **L2**
- Compare Home grown and out-sourced approaches. **L2**

Text Books:

1. Alok Kumar Rai, Customer Relationship Management Concept & Cases, Prentice Hall Of India Private Limted, New Delhi. 2011.
2. S. Shanmugasundaram, Customer Relationship Management, Prentice Hall Of India Private Limted, New Delhi, 2008.

Reference Books:

1. Kaushik Mukherjee, Customer Relationship Management, Prentice Hall Of India Private Limted, New Delhi, 2008.
2. Jagdish Seth, Et Al, Customer Relationship Management.
3. V. Kumar & Werner J., Customer Relationship Management, Willey India, 2008.

Course Outcomes:

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

- Summarizes the how CRM works in industries. **L2**
- Discuss about market basket analysis (MBA). **L6**
- Develop the skills related to predict the behaviour and retention of the customer. **L6**
- Explain the concepts of customer relationship management. **L2**

Online Learning Resources:

- https://nptel.ac.in/courses/110105145
- https://onlinecourses.swayam2.ac.in/imb19_mg10/preview
- https://www.classcentral.com/course/swayam-customer-relationship-management-13977
- https://www.edx.org/course/customer-relationship-management

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC75a- FUNDAMENTALSTO IMAGE PROCESSING

(Open Elective-III)

L – T – P - C
3 – 0 – 0 – 3

Course Objectives:

- To learn the fundamentals of Image Processing and learn the different types of image transforms.
- To study different types of filtering techniques for image enhancement.
- To understand various types of image segmentation and thresholding techniques.
- To gain knowledge on wavelets and multi resolution image processing techniques.
- To comprehend various types of image compression and colour image processing methods.

UNIT I

Digital Image Fundamentals: Fundamental steps of digital image processing, Components of Digital Image processing, image sampling and quantization, basic relationships between pixels – neighbourhood, adjacency, connectivity, distance measures. Applications of Digital Image Processing.

Image Transforms: Fourier Transform and its properties in one dimensional and Two dimensional, Discrete Fourier Transform, Discrete Cosine Transform, Discrete Sine transform, Walsh transform, Hadamard transform, Slant transform, KL Transforms and its properties.

Learning Outcomes:

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

- Understand the fundamentals of digital image processing.(L2)
- Analyze the image transforms in one and two dimensions.(L4)

UNIT II

Image Enhancements and Filtering: Gray level transformations, Histogram processing, histogram equalization, Enhancement of Frequency domain, Homomorphic filtering, Filtering in the frequency domain. Image Restoration: A Model of the Image Degradation \ Restoration Process, Noise Models, Inverse filtering, Minimum Mean Square Error (Weiner) Filtering, Constrained least squares filtering.

Learning Outcomes:

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

- Analyze the filters in spatial and frequency domains. (L4)
- Understand the image restoration model and various types of noises in image restoration.(L2)

UNIT III

Image Segmentation: Detection of Discontinuities: Point detection, Line detection, Edge detection, Edge linking and boundary detection, Thresholding, Region based segmentation.

Learning Outcomes:

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

- Learn the concept of image segmentation.(L1)
- Analyze various types of thresholding techniques.(L4)

UNIT IV

Wavelets and Multi-resolution image processing: Back ground, Image Pyramids, Sub band coding, The HaarTransform.Multi resolution Expansions: Series Expansions, Scaling Functions, Wavelet Functions, Wavelet Transform in One dimension: The wavelet series expansions, The Discrete wavelet transform, The Continuous Wavelet Transform, The Fast wavelet Transform, Wavelet transform in two dimensions, Wavelet Packets.

Learning Outcomes:

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

- Understand the wavelets in one dimension and two dimensions.(L2)
- Explain the multi-resolution expansions and fast wavelet transform.(L1)

UNIT V:

Image Compression: Redundancy, coding, inter-pixel and psycho-visual: Loss less compression Huffmann coding, predictive coding: Lossy Image compression- predictive and transform coding: Image compression standards.

Color Image Processing: Color Fundamentals, Color models-RGB, CMY, HSI; Pseudo color Image Processing, Basics of Full color Image Processing.

Learning Outcomes:

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

- Understand the need for image compression and its types.(L2)
- Learn the color image processing and various types of color models. (L1)

TEXT BOOKS:

1. R.C. Gonzalez and R.E. Woods, "Digital Image Processing", Second Edition, Pearson Education, 2008.
2. Anil Kumar Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 2nd edition 2004.

REFERENCES:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, "Digital Image processing using MATLAB", Tata McGraw Hill, 2010.
2. S Jayaraman, S Esakkirajan and T Veerakumar, "Digital Image processing", Tata McGraw Hill.
3. William K. Pratt, "Digital Image Processing", John Wiley, 3rd Edition, 2004.

Course outcomes:

At the end of this course, the students will be able to

- Understand the fundamentals of Image Processing and apply different types of image transforms. (L2)
- Correlate different types of filtering techniques for image enhancement. (L4)
- Understand various types of image segmentation and thresholding techniques.(L2)
- Gain knowledge on wavelets and multi resolution image processing techniques.(L1)
- Summarize different types of image compression and colour image processing methods.(L2)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC75b- BASICS OF VLSI DESIGN

(Open Elective-III)

L – T – P - C
3 – 0 – 0 – 3

Course Objectives:

- To give exposure to different steps involved in the fabrication of ICs and electrical properties of MOS devices.
- To know the design rules in drawing the layout of any logic circuit.
- To design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
- To learn the concepts scaling and designing building blocks of data path of any system using gates.
- Understand the design and operation of basic programmable logic devices.

UNIT I

MOS Technology: Introduction to IC Technology. The IC Era, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, nMOS and CMOS Fabrication processes.

Basic Electrical Properties of MOS Circuits: I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Transconductance and Output Conductance, nMOS Inverter, Determination of Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, CMOS Inverter.

Learning Outcomes:

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

- Understand different steps involved in the fabrication of ICs and electrical properties of MOSdevices.(L2).
- Analyze the operation of NMOS, CMOS and BiCMOS inverters.(L4)

UNIT II

MOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2μm Double Metal, Double Poly CMOS rules, Layout Diagrams-A Brief Introduction, Symbolic Diagrams-Translation to Mask Form.

Learning Outcomes:

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

- Know the VLSI design flow and stick diagrams.(L1)
- Understand the design rules in drawing the layout of any logic circuit.(L2)

UNIT III

Basic Circuit Concepts: Sheet Resistance. Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, standard unit of capacitance, area Capacitance calculations, the Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances.

Learning Outcomes:

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

- Understand different types of logics in gate level design.(L2)
- Learn and compare different performance parameters in gate level design.(L1)

UNIT IV

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling.

Sub System Design and Layout: Switch logic, Gate logic, Examples of Structured Design, parity generator, multiplexers, grey to binary code converter.

Learning Outcomes:

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

- Appreciate the importance, models and limitations of scaling.(L1)
- Explain the building blocks of data path of any system using gates.(L1)

UNIT V

Programmable Logic Devices: Read only memories, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL), Complex programmable logic devices, Field programmable gate arrays.

Learning Outcomes:

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

- Explain different programmable logic devices.(L1)
- Compare the performance parameters and applications of different programmable logic devices.(L2)

TEXTBOOKS:

1. Kamran Eshraghian. Douglas, A. Pucknell and SholehEshraghian, "Essentials of LSI Circuits and Systems", Prentice Hall of India Private Limited, 2005 Edition.
2. Neil H.E.WESTE, David HarrisandAyan Banerjee, "CMOS VLSI Design A Circuits and systems perspective", Pearson Education, 2006 Third Edition

REFERENCES:

1. Richa Jain and Amrita Rai, "Principles of VLSI and CMOS Integrated Circuits", S.Chandand Company Limited. First edition.2012.
2. Wayne Wolf, "Modern VLSI Design", Pearson Education, 3rd Edition.

Course Outcomes:

At the end of this course, the students will be able to

- Understand different steps involved in the fabrication of ICs and electrical properties of MOS devices. (L2)
- Know the design rules in drawing the layout of any logic circuit.(L1)
- Compare different types of logic gates using CMOS inverter and their transfer characteristics.(L2)
- Learn the concepts to design building blocks of data path of any system using gates.(L1)
- Gain knowledge about basic programmable logic devices and testing of CMOS circuits.(L1)

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS75A- APPLICATIONAS OF AI

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:

- Define Artificial Intelligence and establish the cultural background for study Understand various learning algorithms
- Explore the searching and optimization techniques for problem solving
- Provide basic knowledge on Natural Language Processing and Robotics

UNIT – I: Introduction

What is AI, Foundations of AI, History of AI, The State of Art. Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recognize the importance of Artificial Intelligence **L1**
- Identify how intelligent agent is related to its environment **L2**

UNIT – II: Solving Problems by searching:

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain how an agent can formulate an appropriate view of the problem it faces. **L2**
- Solve the problems by systematically generating new states **L2**

UNIT – III: Reinforcement Learning:

Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL 10 Page Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction..

Learning Outcomes:

At the end of this unit, the student will be able to

- Examine how an agent can learn from success and failure, reward and punishment. **L5**
- Develop programs that make queries to a database, extract information from texts, and retrieve relevant documents from a collection using Natural Language Processing. **L6**

UNIT-IV: Natural Language for Communication

Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

Learning Outcomes:

At the end of this unit, the student will be able to

- Develop programs that translate from one language to another, or recognize spoken words. **L6**
- Explain the techniques that provide robust object recognition in restricted context. **L2**

UNIT – V: Robotics:

Introduction, Robot Hardware, Robotic Perception, Planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right

direction, What if AI does succeed.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the role of Robot in various applications.
- List the main philosophical issues in AI.

Text Books:

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Course Outcomes:

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

- Apply searching techniques for solving a problem **L3**
- Design Intelligent Agents **L6**
- Develop Natural Language Interface for Machines **L6**
- Design mini robots **L6**
- Summarize past, present and future of Artificial Intelligence **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS75B- MOBILE APPLICATION DEVELOPMENT

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:

- Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices. The student will learn the basics of Android platform and get to understand the application lifecycle

UNIT – I:

Introduction Android Programming: What is Android, Activities, Linking Activities Using Intents, Fragments, Calling Built – in Applications using Intents, Displaying Notifications.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their understanding of the fundamentals of Android operating systems **L2**
- demonstrate their skills of using Android software development tools **L2**

UNIT – II:

Android User Interface: Understanding the Components of a Screen, Adapting to Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Listening for UI Notifications.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their ability to develop software with reasonable complexity on mobile platform **L3**
- demonstrate their ability to deploy software to mobile devices **L3**

UNIT – III:

Designing User Interface with Views: Basic Views, Picker Views, Using List Views to Display Long Lists.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their ability to debug programs running on mobile devices **L4**
- demonstrate their ability to deploy software to mobile devices **L4**

UNIT-IV:

Displaying pictures and menus with views and Data Persistence: Views to Display pictures, menus with views, additional views, saving and loading user preferences, persisting data to files, creating and using databases.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their skills of using Android software development tools **L4**
- demonstrate their ability to develop software with reasonable complexity on mobile platform **L5**

UNIT – V:

Content Providers: Sharing data in android, using a content provider, creating your own content providers.

Messaging and Networking: SMS Messaging, Sending E-Mail, Networking

Location-Based Services: Displaying Maps, Getting Location Data.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their ability to deploy software to mobile devices **L5**
- demonstrate their ability to debug programs running on mobile devices **L5**

Text Books:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India
2. Beginning Swift Programming, Wei-Meng Lee, December 2014, ISBN: 978-1-119-00931-3

Reference Books:

1. Enterprise J2ME: Developing Mobile Java Applications, Michael Juntao Yuan, Pearson Education, 2004.
2. Android Application Development for Java programming by James C. Sheusi, Cengage Learning
3. Android A Programmers Guide by Jerome DiMargio, TMH.

Course Outcomes:

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

- demonstrate their understanding of the fundamentals of Android operating systems **L3**
- demonstrate their skills of using Android software development tools **L4**
- demonstrate their ability to develop software with reasonable complexity on mobile platform **L5**

Honors in Electrical Engineering

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

INTELLIGENT CONTROL TECHNIQUES

L	T	P	C
4	0	0	4

Course Objectives: The objectives of the course are to make the students learn about

- Learn about basic concepts of AI
- Understand concepts of ANN and various learning algorithms
- Learn about Genetic Algorithm, ACO and Tabu search concepts
- Understand the concepts of Fuzzy
- Learn about Fuzzy logic controller and design using MATLAB

UNIT – I: INTRODUCTION **12 Hrs**

Introduction to control techniques, need of intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule - based systems, the AI approach. Knowledge representation. Expert systems. Data Pre - Processing: Scaling, Fourier transformation, principal - component analysis and wavelet transformations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need of intelligent control. **L1**
- Know the data pre-processing methods **L2**

UNIT – II: ARTIFICIAL NEURAL NETWORKS **12 Hrs**

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch - Pitts neuron model, simple perceptron, Adaline and Madaline, Feed - forward Multilayer Perceptron. Learning and Training the neural network. Networks: Hopfield network, Self organizing network and Recurrent network. Neural Network based controller, Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab / Neural Network toolbox.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of artificial neural networks **L1**
- Distinguish between different networks **L2**

UNIT – III: GENETIC ALGORITHM **12 Hrs**

Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Solution of typical control problems using genetic algorithm. Concept on some other than GA search techniques like tabu search and ant -colony search techniques for solving optimization problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of genetic algorithm **L1**
- Understand the concepts other than GA **L2**

UNIT – IV: FUZZY LOGIC **12 Hrs**

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to Fuzzy logic modeling and control of a system. Fuzzification, inference and Defuzzification. Fuzzy knowledge and rule bases.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the operation of fuzzy sets **L1**

- Analyze about fuzzification and defuzzification **L2**

UNIT – V: FUZZY MODELLING **12 Hrs**

Fuzzy modeling and control schemes for nonlinear systems. Self - organizing fuzzy logic control. Implementation of fuzzy logic controller using Matlab fuzzy - logic toolbox. Stability analysis of fuzzy control systems. Intelligent Control for SISO/MIMO Nonlinear Systems. Model Based Multivariable Fuzzy Controller.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the fuzzy modelling **L1**
- Understand the intelligent control for SISO/MIMO systems **L2**

Text Books:

1. Simon Haykins, Neural Networks: A comprehensive Foundation, Pearson Edition, 2003.
2. T.J.Ross, Fuzzy logic with Fuzzy Applications, Mc Graw Hill Inc, 1997.

Reference Books:

1. M.T.Hagan, H. B. Demuth and M. Beale, Neural Network Design, Indian reprint, 2008.
2. Fredric M.Ham and Ivica Kostanic, Principles of Neurocomputing for science And Engineering, McGraw Hill, 2001

Course Outcomes:

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

- Learn about basic concepts of AI **L1**
- Understand concepts of ANN and various learning algorithms **L2**
- Learn about Genetic Algorithm, ACO and Tabu search concepts **L3**
- Understand the concepts of Fuzzy **L4**
- Learn about Fuzzy logic controller and design using MATLAB **L5**

Honors in Electrical Engineering

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

MACHINE MODELING AND ANALYSIS

L	T	P	C
4	0	0	4

Course Objectives: The objectives of the course are to make the students learn about

- To study the basic components of Electrical Machines
- To understand the concept of Armature winding both AC&DC
- To understand Concept of m/c variables and transform variables
- To understand the Application of approximate method to power system analysis.

UNIT – I: INTRODUCTION **12 Hrs**

Primitive machine, voltage and torque equation. Concepts of transformation change of variables & m/c variables and transform variables. Application to D.C. machine for steady state and transient analysis, and equation of cross field commutator machine.

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to understand the performance of electrical machines. **L1**
- Analyze the mathematical analysis of electrical machines. **L2**
- Apply different mathematical principles on DC machines. **L3**

UNIT – II: INDUCTION MACHINE **12 Hrs**

Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of single phase induction motor & Schrage motor.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the working of induction machine **L1**
- Analyze the dynamic performance of induction machines. **L2**
- Understand the steady state operation of induction machines **L3**

UNIT – III: SYNCHRONOUS MACHINES **12 Hrs**

Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of asynchronous machine with two damper coils.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the operation of synchronous machines. **L1**
- Apply the mathematical techniques on synchronous machines **L2**

UNIT – IV: OPERATIONAL IMPEDANCES AND TIMECONSTANTS OF SYNCHRONOUS MACHINES **12 Hrs**

Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactance's, time constants, Derived synchronous machine time constants, parameters from short circuit characteristics.

Learning Outcomes:

At the end of this unit, the student will be able to

- To analyze the operation of synchronous machines using park's equation **L4**
- To derive time constants of synchronous machines **L3**

UNIT – V: APPROXIMATE METHODS FOR GENERATOR & SYSTEM ANALYSIS 12 Hrs

The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis

Learning Outcomes:

At the end of this unit, the student will be able to

- To analyze equivalent circuit of generator **L4**
- To apply approximate methods on power systems **L3**

Text Books:

1. Paul C. Krause, Oleg Wasynczuk, Scott S, Sudhoff,—Analysis of Electric Machinery and Drive Systems , IEEE Press, Second Edition,2002
2. R. Krishnan, -Electric Motor Drives, Modeling, Analysis and Control, Prentice Hall of India, 2002

Reference Books:

1. Samuel Seely,—Electromechanical Energy Conversion, Tata Mc Graw Hill Publishing Company,1962
2. A.E, Fitzgerald, Charles Kingsley,Jr, and Stephan D,Umans,— Electric Machinery‖,Tata McGrawHill, 5thEdition, 1992

Course Outcomes:

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

- Able to learn the design concepts of Electrical Machine **L1**
- Understand the Design parameters of DC Machine **L2**
- Able to understand the stator and rotor design aspects of induction motors. **L3**

Honors in Electrical Engineering

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

RESTRUCTURED POWER SYSTEMS

L	T	P	C
4	0	0	4

Course Objectives: The objectives of the course are to make the students learn about

- To introduce the restructuring of power industry and market models.
- To impart knowledge on fundamental concepts of congestion management.
- To analyze the concepts of locational marginal pricing and financial transmission rights.
- To Illustrate about various power sectors in India.

UNIT – I: KEY ISSUES IN ELECTRIC UTILITIES **12 Hrs**

Introduction – Restructuring models – Independent System Operator (ISO) – Power Exchange - Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intrazonal Congestion.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the restructuring models. **L1**
- Know the different types of pricing **L2**

UNIT – II: OPEN ACCESS SAME –TIME INFORMATION SYSTEM(OASIS) & MARKET POWER **12 Hrs**

Structure of OASIS - Posting of Information – Transfer capability on OASIS. Market Power: Introduction-Different types of market Power – Mitigation of Market Power - Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the structure of OASIS **L1**
- Distinguish between market powers **L2**

UNIT – III: AVAILABLE TRANSFER CAPABILITY(ATC) & ELECTRICITY PRICING **12 Hrs**

Transfer Capability Issues – ATC – TTC – TRM – CBM Calculations – Calculation of ATC based on power flow. Electricity Pricing: Introduction – Electricity Price Volatility Electricity Price Indexes – Challenges to Electricity Pricing – Construction of Forward Price Curves –Short-time Price Forecasting.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand transfer capability issues **L1**
- Understand the electrical pricing methods **L2**

UNIT – IV: POWER SYSTEM OPERATION IN COMPETITIVE ENVIRONMENT **12 Hrs**

Introduction – Operational Planning Activities of ISO- The ISO in Pool Markets – The ISO in Bilateral Markets – Operational Planning Activities of a GENCO.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the operational activities of ISO **L1**
- Analyze about different markets **L2**

UNIT – V: TRANSMISSION COST ALLOCATION METHODS & ANCILLARY SERVICES MANAGEMENT **12 Hrs**

Introduction –Transmission Cost Allocation Methods: Postage Stamp Rate Method - Contract Path Method – MW – Mile Method– Unused Transmission Capacity Method-MVA-Mile method – Comparison of cost allocation methods. Ancillary Services Management: Introduction – Reactive Power as an Ancillary Service – a Review – Synchronous Generators as Ancillary Service Providers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the transmission allocation methods **L1**
- Understand the ancillary service management methods **L2**

Text Books:

1. Kankar Bhattacharya, Math H. J. Bollen and Jaap E. Daalder, Operation of Restructured Power System, Kulwer Academic Publishers, 2001.
2. Mohammad Shahidehpour and Muwaffaq alomoush, Restructured Electrical Power Systems, Marcel Dekker, Inc., 2001.

Reference Books:

1. Loi Lei Lai, Power System Restructuring and Deregulation, John Wiley & Sons Ltd., England.

Course Outcomes:

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

- Bring out the differences between the conventional power system operation and the restructure done. **L1**
- Design power markets and market architectural aspects. **L2**
- Analyze the concepts of locational marginal pricing and financial transmission rights **L3**
- Prepare a background with fundamentals of microeconomics. **L4**

Honors in Electrical Engineering

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

MODERN POWER ELECTRONICS

L	T	P	C
4	0	0	4

Course Objectives: The objectives of the course are to make the students learn about

- To learn the characteristics of modern power semiconductor devices.
- To understand the operation of resonant converters.
- To analyze the performance of different topologies of Multilevel Inverters.

UNIT – I: HIGH-POWER SEMICONDUCTOR DEVICES **12 Hrs**

Introduction – High-Power Switching Devices – Diodes – Silicon-Controlled Rectifier (SCR) – Gate Turn-Off (GTO) Thyristor –Gate-Commutated Thyristor (GCT) –Insulated Gate Bipolar Transistor (IGBT) –Other Switching Devices –Operation of Series-Connected Devices –Main Causes of Voltage Unbalance –Voltage Equalization for GCTs– Voltage Equalization for IGBTs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to understand the high power semi conductor devices. **L1**
- Analyze the operation of high semi conductor devices. **L2**
- Apply different combination of devices. **L3**

UNIT – II: RESONANT PULSE INVERTERS **12 Hrs**

Resonant pulse inverters–series resonant inverters-series resonant inverters with unidirectional switches–series resonant inverters with bidirectional switches-analysis of half bride resonant inverter-evaluation of currents and Voltages of a simple resonant inverter–analysis of half bridge and full bridge resonant inverter with bidirectional switches–Frequency response of series resonant inverter-for series loaded inverter–for parallel resonant inverters–Voltage control of resonant inverters-class-E resonant inverter–class-E resonant rectifier- evaluation of values of C's and L's for class E inverter and Class E rectifier – numerical problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the resonance phenomenon in converters **L1**
- Analyze different types of resonant pulse inverters. **L2**
- Understand the control of resonant pulse inverters **L3**

UNIT – III: RESONANT CONVERTERS **12 Hrs**

Resonant converters- zero current switching resonant converters – L type ZCS resonant converter- M type ZCS resonant converter – zero voltage Switching resonant converters – comparison between ZCS and ZVS resonant converters- Two quadrant ZVS resonant converters – resonant dc – link inverters- evaluation of L and C for zero current switching inverter – Numerical problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of zero voltage and zero current switchings. **L1**
- Apply the ZVS and ZCS techniques in power converters **L2**

UNIT – IV: MULTILEVEL INVERTERS-I **12 Hrs**

Sinusoidal PWM –Modulation Scheme –Harmonic Content –Over modulation– Third Harmonic Injection PWM – Space Vector Modulation – Switching States – Space Vectors –Dwell Time Calculation – Modulation Index – Switching Sequence– Spectrum Analysis –Even-Order Harmonic Elimination – Discontinuous Space Vector Modulation– H-Bridge Inverter– Bipolar Pulse-Width Modulation – Unipolar Pulse-Width Modulation

Learning Outcomes:

At the end of this unit, the student will be able to

- To analyze the multi level inverters using different PWM techniques **L4**
- To apply Modulation techniques on inverters **L3**

UNIT – V: MULTILEVEL INVERTERS-II **12 Hrs**

Multilevel Inverter Topologies–CHB Inverter with Equal dc Voltage – H-Bridges with Unequal dc Voltages Carrier Based PWM Schemes – Phase-Shifted Multicarrier Modulation–Level-Shifted Multicarrier Modulation– Comparison Between Phase- and Level-Shifted PWM Schemes –Staircase Modulation –Diode-Clamped Multilevel Inverters – Three-Level Inverter – Converter Configuration – Switching State – Commutation – Space Vector Modulation –Stationary Space Vectors – Dwell Time Calculation –Relationship Between V_{ref} Location and Dwell Times – Switching Sequence Design – Inverter Output Waveforms and Harmonic Content– Even-Order Harmonic Elimination.

Learning Outcomes:

At the end of this unit, the student will be able to

- To analyze different types of multi level inverters **L4**
- To apply space vector modulation techniques on inverters **L3**

Text Books:

1. Power Electronics: Mohammed H. Rashid- Pearson Education-Third Edition –first Indian reprint - 2004
2. Power Electronics – Ned Mohan,Tore M. Undeland and William P.Robbind –John wiley & Sons – Second Edition, 2003
3. High-Power Converters and AC Drives Bin Wu IEEE Press John Wiley & Sons–Second Edition.2006

Reference Books:

1. Power Electronics – Daniel W. Hart, Mc-Graw Hill Publications,2010
2. Power Electronics Devices, Circuits and Industrial applications, V.R.Moorthi, Oxford University Press, 2005.
3. Power Electronics, Dr.P.S.Bimbhra, Khanna Pubishers, 1990.
4. Elements of Power Electronics, Philip T. Krein, Oxford University Press,1997.

Course Outcomes:

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

- To choose appropriate device for a particular converter topology **L1**
- To analyze and design various power converters and controllers **L2**
- Apply the modulation techniques on inverters. **L3**