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 R19 Regulations

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	MC	2-0-3-0
5	Proficiency Modules & Productivity Tools	MC	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills - focus on Listening, Speaking, Reading, Writing skills	MC	2-1-2-0
10	Concepts of Programming	MC	2-0-2-0

B.Tech I Year I Semester

Semester –1					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	19ABS06	Linear Algebra and Calculus	BS	3-1-0	4
2	19ABS03	Chemistry	BS	3-0-0	3
3	19ACS01	Problem Solving & Programming	ES	3-1-0	4
4	19AHS01	Communicative English - I	HS	2-0-0	2
5	19AEEE01	Electrical & Electronics Engineering Workshop	LC	0-0-2	1
6	19ABS04	Chemistry Lab	BS	0-0-3	1.5
7	19ACS02	Problem Solving & Programming Lab	ES	0-0-3	1.5
8	19AHS02	Communicative English -I Lab	HS	0-0-2	1
				Total	**18**

B.Tech I Year II Semester

Semester – 2					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	19AEE02	Electrical Circuits-I	ES	3- 0-0	3
2	19ABS07	Differential Equations and Vector Calculus	BS	3-1-0	4
3	19ABS09	Applied Physics	BS	3-0-0	3
4	19ACS05	Data Structures	ES	3-0-0	3
5	19AME01	Engineering Graphics	ES	1-0-3	2.5
6	19AME02	Engineering Workshop	LS	0-0-3	1.5
7	19AEE03	Electrical Circuits Lab	ES	0-0-3	1.5
8	19ABS10	Applied Physics Lab	BS	0-0-3	1.5
9	19ACS06	Data Structures Lab	ES	0-0-3	1.5
				Total	**21.5**

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B.Tech II Year I Semester

Semester – 3					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	19ABS12	Complex Variables & Transforms	BS	3-0-0	3
2	19AEC11	Semiconductor Devices and Circuits	PC	3-0-0	3
3	19AEE07	Control Systems	PC	3-0-0	3
4	19AEE09	Performance of DC Machines	PC	3-1-0	4
5	19AEE10	Electromagnetic Field Theory	PC	3-0-0	3
6	19AEE11	Electric Circuits – II	PC	3-0-0	3
7	19AEC12	Semiconductor Devices And Circuits Lab	PC	0-0-2	1
8	19AEE08	Control Systems Lab	PC	0-0-3	1.5
9	19AHS04	Constitution of India	MC	3-0-0	0
				Total	**21.5**

B.Tech II Year II Semester

Semester – 4					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	19ABS15	Numerical Methods, Probability and Statistics	BS	3-0-0	3
2	19AEE12	Electrical Power Generation and Distribution	PC	3-0-0	3
3	19ACS28	Introduction to Python Programming	PC	2-1-0	3
4	19AEC13	Analog Electronic Circuits	PC	3-0-0	3
5	19AEE13	Performance of Transformers and Induction Machines	PC	3-1-0	4
6.	19AEE14	Electrical and Electronic Measurements	PC	3-0-0	3
7	19AEE15	Dc Machines Lab	PC	0-0-3	1.5
8	19AEC14	Analog Electronics Lab	PC	0-0-2	1
9	19ABS14	Environmental Science	MC	3-0-0	0
10	19AHS03	Universal Human Values and Professional Ethics	MC	2-0-0	2
				Total	**23.5**

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B.Tech III Year I Semester

Semester - 5					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	19AHS12	English Language Skills	HS	2-0-0	2
2	19AEE51	Performance of Synchronous and Special Machines	PC	3-0-0	3
3	19AEE52	Electrical Power Transmission and Utilization	PC	3-0-0	3
4	19AEE53	Power Electronics	PC	3-1-0	4
5	19AEE54	Professional Elective – I	PE	3-0-0	3
	19AEE54a	Electrical Distribution Systems			
	19AEE54b	Advanced Control Systems			
	19AEE54c	AI techniques in Electrical Engineering			
6	19AEE55	Open Elective – I (Interdisciplinary)- **ANNEXURE-I**	OE	3-0-0	3
7	19AHS13	English Language Skills Lab	HS	0-0-3	1.5
8	19AEE56	AC Machines Lab	PC	0-0-2	1
9	19ACE59	Socially Relevant Projects (30 hours/sem)	PR	-------	1
10	19AHS17	Research Methodology	MC	3-0-0	0
				Total	**21.5**

B.Tech III Year II Semester

Semester - 6					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	19AEE61	Power System Operation and Control	PC*	3-1-0	4
2	19AEE62	Signals and Systems	PC	3-0-0	3
3	19AEE63	Switchgear and Protection	PC	3-0-0	3
4	19AEE64	Professional Elective – II	PE	3-0-0	3
	19AEE64a	Energy Auditing, Conservation & Management			
	19AEE64b	Digital Computer Platforms			
	19AEE64c	Applications of Power Electronics to Renewable Energy Sources			
5	19AEE65	Open Elective –II (Interdisciplinary)- **ANNEXURE-II**	OE	3-0-0	3
6	19AHS14	Humanities Elective – I	HS	3-0-0	3
	19AHS14a	MEFA			
	19AHS14b	Entrepreneurship & Innovation Management			
7	19AEE66	Power Electronics Lab	PC	0-0-3	1.5
8	19AEE67	Electrical Measurements Lab	PC	0-0-2	1
9	19AHS16	Organizational Behaviors	MC	3-0-0	0
10	Industrial Training/Internship/Research Projects in National Laboratories/Academic Institutions *		PR	4 Weeks Summer Internship	
				Total	**21.5**

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B.Tech IV Year I Semester

Semester - 7					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	19AEE71	Digital Electronics and Logic Design	PC	3-0-0	3
2	19AEE72	Power Semi-Conductor Drives	PC	3-0-0	3
3	19AEE74	Professional Elective – III	PE	3-0-0	3
	19AEE74a	Switched mode Power Converters			
	19AEE74b	Power Quality			
	19AEE74c	Instrumentation			
4	19AEE76	Professional Elective – IV	PE	3-0-0	3
	19AEE76a	HVDC and Flexible AC Transmission systems			
	19AEE76b	Smart Grid Technologies			
	19AEE76c	Hybrid Electric Vehicles			
5	19AEE75	Open Elective – III -**ANNEXURE-III**	OE	2-0-0	2
6	19AHS15	Humanities Elective – II	HS	3-0-0	3
	19AHS15a	Management Science			
	19AHS15b	Business Environment			
7	19AEE77	Power Systems Lab	PC	0-0-3	1.5
8	19AEE78	Industrial Training/Internship/Research Projects in National Laboratories/Academic Institutions *	PR	-------	2
9	19AEE79	Project Stage – I	PR	-------	2
				Total	**22.5**

B.Tech IV Year II Semester

Semester - 8					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	19AEE81	Professional Elective - V (MOOC)	PE	3-0-0	3
2	19AEE82	Open Elective – IV (MOOC)	OE	3-0-0	3
3	19AEE89	Project Stage – II	PR	---------	6
				Total	**12**

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ANNEXURE – I

Open Elective I (Interdisciplinary)

Branch	Subject Code	Subject
Humanities	19AHS10	Campus Recruitment Training & Soft Skills
Mathematics	19ABS20	Mathematical Modeling
	19ABS21	Fuzzy Set Theory, Arithmetic and Logic
	19ABS22	Number Theory
Physics	19ABS31	Sensors and Actuators for Engineering Applications
	19ABS32	Physics of Electronic Materials
Chemistry	19ABS41	Chemistry of Energy Materials
	19ABS42	Advanced Polymers and Their Applications
	19ABS43	Marine Chemistry
CIVIL	19ACE55a	Air Pollution and Control
	19ACE55b	Green Buildings
	19ACE55c	Basics of Civil Engineering Materials and Construction Practice
ME	19AME55a	Introduction to Hybrid and Electric Vehicles
	19AME55b	Rapid Prototyping
	19AME55c	Design for Manufacturing and Assembly
	19AME55d	Power Plant Operation and Control
	19AME55e	Smart Materials
	19AME55f	Supply Chain Management
ECE	19AEC55a	Fundamentals of Electronics and Communication Engineering
	19AEC55b	Transducers and Sensors
	19AEC55c	Principles of Communications
CSE	19ACS55a	Object Oriented Programming Concepts Through Java
	19ACS55b	Introduction to Internet Of Things
	19ACS55c	Introduction to Operating Systems

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ANNEXURE – II

Open Elective II (Interdisciplinary)

Branch	Subject Code	Subject Name
Humanities	19AHS11	Competitive &Spoken English
Mathematics	19ABS23	Integral Transforms And ITS Applications
	19ABS24	Numerical Analysis
	19ABS25	Optimization Techniques
Physics	19ABS33	Functional Nanomaterials For Engineers
	19ABS34	Materials Characterization Techniques
Chemistry	19ABS44	Green Chemistry and Catalysis for Sustainable Environment
	19ABS45	Chemistry of Nanomaterials and Applications
	19ABS46	Environmental Management and Audit
CIVIL	19ACE65a	Remote Sensing and GIS
	19ACE65b	Environmental Impact Assessment
	19ACE65c	Disaster Management and Mitigation
ME	19AME65a	Automobile Electronics, Sensors & Drives
	19AME65b	Programming of Robots and Control
	19AME65c	Sensors in Intelligent Manufacturing
	19AME65d	Non-Conventional Sources of Energy
	19AME65e	NEMS & MEMS
	19AME65f	Optimization Techniques Through MAT lab
ECE	19AEC65a	Introduction to Microcontrollers & Applications
	19AEC65b	Principles of Digital Signal Processing
	19AEC65c	Introduction to Image Processing
CSE	19ACS65a	Introduction to Machine Learning
	19ACS65b	Introduction to Computer Networks
	19ACS65c	Web Design and Management

ANNEXURE – III - Open Elective III

Branch	Subject Code	Subject Name
CIVIL	19ACE75a	Architecture and town planning
	19ACE75b	Experimental stress analysis
	19ACE75c	Finite element methods
EEE	19AEE75a	Electrical engineering materials
	19AEE75b	Digital signal processors and applications
	19AEE75c	IOT applications in electrical engineering
ME	19AME75a	Special types of vehicles
	19AME75b	Six sigma and lean manufacturing
	19AME75c	Reverse engineering
	19AME75d	Energy auditing
	19AME75e	Introduction to composite materials
	19AME75f	Customer relationship management
ECE	19AEC75a	Embedded systems & IOT
	19AEC75b	Electronic instrumentation
	19AEC75c	Basics of VLSI design
CSE	19ACS75a	Mobile application development
	19ACS75b	Real time operating systems and applications
	19ACS75c	Fundamentals of block chain and applications

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

Subject Code	Title of the Subject	L	T	P	C
	Linear Algebra and Calculus	3	1	-	4

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 to 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- dimensional coordinate systems
CO5	Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

Mapping between Course Outcomes and Programme Outcomes

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

SYLLABUS

Unit I: Matrix Operations and Solving Systems of Linear Equations **10 hrs**

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations 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, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Unit II: Mean Value Theorems **06 hrs**

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

Unit III: Multivariable calculus **08 hrs**

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: Double Integrals **08 hrs**

Double integrals, change of order of integration, change of variables, areas enclosed by plane curves

Unit V: Multiple Integrals and Special Functions **08 hrs**

Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.

Textbooks:

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

References:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

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

Subject Code	Title of the Subject	L	T	P	C
	Differential Equations and Vector Calculus	3	1	-	4

COURSE OBJECTIVES	
1	To enlighten the learners in the concept of differential equations and multivariable 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 differential equations related to various engineering fields
CO2	Identify solution methods for partial differential equations that model physical processes
CO3	interpret the physical meaning of different operators such as gradient, curl and divergence
CO4	estimate the work done against a field, circulation and flux using vector calculus

Mapping between Course Outcomes and Programme Outcomes

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

SYLLABUS

UNIT I: Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT II: Equations Reducible to Linear Differential Equations 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 **08 hrs**

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

UNIT IV: Multivariable Calculus (Vector differentiation)

Scalar and vector point functions, gradient, divergent, curl and their properties (Identities and applications)

UNIT V: Multivariable Calculus (Vector integration)

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

Textbooks:

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

References:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
3. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
4. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF CHEMISTRY
I B.TECH – II SEMESTER (common to EEE, ECE & CSE)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
19A53201	Chemistry	3		-	3

COURSE OBJECTIVES	
1	To familiarize engineering chemistry and its applications
2	To train the students on the principles and applications of electrochemistry and polymers
3	To introduce instrumental methods, molecular machines and switches

COURSE OUTCOMES	
CO1	**apply** Schrodinger wave equation to hydrogen and particle in a box, **illustrate** the molecular orbital energy level diagram of different molecular species, **explain** the band theory of solids for conductors, semiconductors and insulators **discuss** the magnetic behaviour and colour of complexes.
CO2	**apply** Nernst equation for calculating electrode and cell potentials, **differentiate** between pH metry, potentiometric and conductometric titrations, **explain** the theory of construction of battery and fuel cells, **solve** problems based on cell potential
CO3	**explain** the different types of polymers and their applications, **explain** the preparation, properties and applications of Bakelite, Nylon-66, and carbon fibres, **describe** the mechanism of conduction in conducting polymers, **discuss** Buna-S and Buna-N elastomers and their applications
CO4	**explain** the different types of spectral series in electromagnetic spectrum, **understand** the principles of different analytical instruments, **explain** the different applications of analytical instruments
CO5	**explain** the band theory of solids for conductors, semiconductors and insulators, **explain**supramolecular chemistry and self assembly, **demonstrate** the application of Rotaxanes and Catenanes as artificial molecular machines

Mapping between Course Outcomes and Programme Outcomes

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

SYLLABUS

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

Planck's quantum theory, dual nature of matter, Schrodinger Wave equation, significance of Ψ and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order, crystal field theory – salient features – splitting in octahedral and tetrahedral geometry,

magnetic properties and colour, band theory of solids – band diagrams for conductors, semiconductors and insulators, role of doping on band structures.

Unit 2: Electrochemistry and Applications: (10 hrs)

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc- MnO_2 battery (Laclanche cell), Secondary cells – lead acid and lithium ion batteries- working of the batteries including cell reactions. Fuel cells, hydrogen-oxygen, methanol – oxygen fuel cells – working of the cells- Applications.

Unit 3: 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 – Bakelite, carbon fibres, Biodegradable polymers, Conducting polymers – polyacetylene, polyaniline, mechanism of conduction and applications.

Unt 4: Instrumental Methods and Applications: (10 hrs)

Electromagnetic spectrum, Absorption of radiation: Principle and applications of UV-Visible, IR and Basic concepts of Chromatographic techniques and their applications. pH metry, potentiometry and conductometry,

Unit 5: Advanced Engineering Materials:(10 hrs)

(i) Concepts and terms of supra molecular chemistry, complementarity, Basic Lock and Key principle, examples of Supramolecules, Applications of Supra molecules (sensors, catalysts, gas storage, medical and molecular switches)

ii) Semiconducting and Super Conducting materials-Principles and some examples

iii) Electrical Insulators or Dielectric materials: Definition and classification, Characteristics of electrical insulators and applications of electrical insulating materials, Super capacitors.

(iv) Nanochemistry: Introduction, classification of nanomaterials properties and applications of Fullerenes, Carbon nano tubes and Graphines nanoparticles.

Text Books:

1. Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, Foruth Edition, New Delhi
2. A Text Book of Enigneering Chemistry, Jain and Jain, Dhanapathi Rai Publications, New Delhi

References:

1. A Text book of Engineering Chemistry by K. Sesha Maheswaramma and Mridula Chugh, Pearson's Publications Pvt. Ltd., (PAN India Title)
2. A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi
3. Engineering Chemistry by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Pubblications India Pvt Limited.
4. A Text book of Engineering Chemistry by Prasanta Rath, B. Rama Devi, Ch.Venkata Ramana Reddy and Subhendu Chakroborty, Cengage learning India Pvt.Ltd.
5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu
6. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

Problem Solving and Programming

(Common to All Branches of Engineering)

B. Tech – I Semester **L-T-P-C**
3-1-0-4

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

Outcomes:

Student should be able to

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

Unit 1:

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, 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, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Unit 2:

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: Student should be able to

1. Solve Computational problems (L3)
2. Apply Algorithmic approach to solving problems (L3)
3. Analyze the algorithms (L4)

Unit 3:

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-Dowhile, 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: Student should be able to

1. Recognize the programming elements of C Programming language (L1)
2. Select the control structure for solving the problem (L4)
3. Apply modular approach for solving the problem (L3)

Unit 4:

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: Student should be able to

1. Solve mathematical problems using C Programming language (L3)
2. Structure the individual data elements to simplify the solutions (L6)
3. Facilitate efficient memory utilization (L6)

Unit 5:

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, Miscellaneous Functions.

Learning Outcomes: Student should be able to

1. Select sorting algorithm based on the type of the data (L4)
2. Organize heterogeneous data (L6)
3. Design a sorting algorithm (L6)

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:

1. Construct his own computer using parts (L6).
2. Recognize the importance of programming language independent constructs (L2)
3. Solve computational problems (L3)
4. Select the features of C language appropriate for solving a problem (L4)
5. Design computer programs for real world problems (L6)
6. Organize the data which is more appropriated for solving a problem (L6)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA - 516390, A.P, INDIA.
HUMANITIES & SOCIAL SCIENCES DEPARTMENT

COMMUNICATIVE ENGLISH - 1

Subject Code	Title of the Subject	L	T	P	C
	Communicative English - 1	2	0	0	2

COURSE OBJECTIVES	
1	Facilitates effective listening skills for better comprehension of academic lectures and English spoken by native speakers.
2	Helps to improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations.
3	Imparts effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information.
4	Provides knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.

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

Introduction

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

Unit 1

Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Reading for Writing :**Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Learning Outcomes

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

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 2

Lesson: The Brook: Alfred Tennyson

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

Learning Outcomes

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

- comprehend short talks on general topics
- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well structured paragraphs on specific topics
- identify basic errors of grammar/ usage and make necessary corrections in short texts

Unit 3

Lesson: The Death Trap: Saki

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

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

- comprehend short talks and summarize the content with clarity and precision
- participate in informal discussions and report what is discussed
- infer meanings of unfamiliar words using contextual clues
- write summaries based on global comprehension of reading/listening texts
- use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing

Unit4

Lesson: Inspiration: Chindu Yellamma

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Learning Outcomes

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

- infer and predict about content of spoken discourse
- understand verbal and non-verbal features of communication and hold formal/informal conversations
- interpret graphic elements used in academic texts
- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

Unit 5
Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

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

- take notes while listening to a talk/lecture and make use of them to answer questions
- make formal oral presentations using effective strategies
- comprehend, discuss and respond to academic texts orally and in writing
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors

Prescribed Text:

1. English all round: Communication Skills for Undegurdation Learners Vol. I, Orient BlackSwan Publisers, First Edition 2019, Authored by Y.Prabhavathi, M.Lalitha Sridevi and Ruth Z Hauzel.

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.
- Oxford Learners Dictionary, 12th Edition, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING PULIVENDULA

I B.Tech – I Sem (Electrical & Electronics Engineering) **L T P C**

0 0 2 1

Electrical & Electronics Engineering Workshop

Course Objectives :

1. To know about different tools, abbreviations and symbols in Electrical Engineering
2. To learn about types of measuring instruments to measure electrical quantities
3. To gain knowledge on different types of earthing and earth resistance
4. To study different types of wiring

List of Exercises / Experiments:

1. Study of Introduction to Electrical tools, symbols and abbreviations
2. Study of types of sizes of wires and making "T" joint and straight joint for wires
3. Measurements of Electrical quantities (like Voltage, Current, Power, Power factor in RLC circuits)
4. Study of measurements of Energy (using Single phase and Three phase Energy meter) by connecting different loads
5. Study of earthing and measurement of earth resistance
6. Study and performance of residential wiring (using Energy meter, Fuses, Switches, Indicator, Lamps, etc.)
7. Study of Fluorescent lamp wiring
8. Study of various electrical gadgets (CFL and LED)
9. Study of PV Cell
10. Study of Induction motor and Transformer
11. Assembly of choke or small transformer
12. Study of trouble shooting of electrical equipments (fan, iron box, mixer-grinder, etc.)
13. Introduction to basics of Electronic components: Solder practice, Multi meter, Power supply
14. Measurement of wire guages using guage meter
15. Identification of color code, resistors, ICs, Transistors, capacitors, diodes, SCRs, IGBTs etc.

References:

1. Lab manual of Electrical Engineering by TTTI, Chennai.

Course Outcomes:

1 Able to demonstrate knowledge on different tools, abbreviations and symbols used in Electrical Engineering
2. Able to measure different electrical quantities using measuring instruments
3. Able to demonstrate how to trouble shoot the electrical equipments (like fan, grinder, motor, etc.)
4. Able to do wiring and earthing for residential houses

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
****** DEPARTMENT OF CHEMISTRY ******
I B.TECH – II SEMESTER(common to EEE, ECE & CSE)
(CHEMISTRY LAB)

Subject Code	Title of the Lab	L	T	P	C
19A53202	Chemistry lab	-	-	3	1.5

COURSE OBJECTIVES	
1	Verify the fundamental concepts with experiments

COURSE OUTCOMES	
CO1	**determine** the cell constant and conductance of solutions
CO2	**prepare** advanced polymer materials
CO3	**measure** the strength of an acid present in secondary batteries
CO4	**analyse** the IR and NMR of some organic compounds

Mapping between Course Outcomes and Programme Outcomes

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

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 emf
5. Estimation of Ferrous Iron by Dichrometry.
6. Determination of strength of an acid in Pb-Acid battery
7. Preparation of a polymer
8. Verify Lambert-Beer's law
9. Thin layer chromatography
10. Identification of simple organic compounds by IR
11. Separation of Organic mixtures by paper chromatography.
12. Preparation of Copper/Silver colloidal Nano materials

TEXT BOOKS:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, Pearson Education.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera

Problem Solving and Programming Laboratory

(Common to All Branches of Engineering)

B.Tech – I Semester **L-T-P-C**
0-0-3-1.5

Laboratory 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. Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
20. Design a C program which sorts the strings using array of pointers.

The above list is not exhaustive. Instructors may add some experiments to the above list. Moreover, 50% of the experiments are to be changed every academic year. Instructors can choose the experiments, provided those experiments are not repetitions.

Course outcomes: Student should be able to

1. Construct a Computer given its parts (L6)
2. Select the right control structure for solving the problem (L6)
3. Analyze different sorting algorithms (L4)
4. Design solutions for computational problems (L6)
5. Develop C programs which utilize the memory efficiently using programming constructs like pointers.

References:

1. B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", Tata McGraw-Hill, 2nd edition, 2002.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA - 516390, A.P, INDIA.
HUMANITIES AND SOCIAL SCIENCES DEPARTMENT

COMMUNICATIVE ENGLISH - 1 LAB

Subject Code	Title of the Subject	L	T	P	C
	Communicative English - 1 Lab	0	0	2	1

COURSE OBJECTIVES	
1	To expose the students to variety of self-instructional, learner friendly modes of language learning.
2	To help the students cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.
3	To enable them to learn better pronunciation through stress, intonation and rhythm.
4	To train them to use language effectively to face interviews, group discussions, public speaking.
5	To initiate them into greater use of the computer in resume preparation, report writing, format making etc.

COURSE OUTCOMES	
CO1	To remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2	To apply communication skills through various language learning activities.
CO3	To analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4	To evaluate and exhibit acceptable etiquette essential in social and professional settings.
CO5	To create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Unit 1

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

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. JAM
2. Small talks on general topics
3. Debates

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. Situational dialogues – Greeting and Introduction
2. Summarizing and Note making
3. Vocabulary Building

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. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

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. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

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

- Young India Films
- Walden Infotech
- Orell

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY. ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS): PULIVENDULA
ELECTRICAL AND ELECTRONICS ENGINEERING

I B. Tech - II SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
	ELECTRICAL CIRCUITS - I	2	1	0	3

COURSE OBJECTIVES:

To make the student learn about:

1.	Basic characteristics of R,L,C parameters, their Voltage and Current Relations and Various combinations of these parameters.
2.	The Single Phase AC circuits and concepts of real power, reactive power, complex power, phase angle and phase difference.
3.	Series and parallel resonances, bandwidth, current locus diagrams.
4.	Network theorems and their applications.
5.	Network Topology and concepts like Tree, Cut-set , Tie-set, Loop, Co-Tree.

COURSE OUTCOMES:

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

CO1	Understand the network reduction techniques, different basic laws, concepts related to magnetic circuits, network topology and concepts like Tree, Cut-set , Tie-set, Loop, Co-Tree.
CO2	Analyze the steady state performance of R,L and C in series and parallel combination.
CO3	Design and develop the LOCUS diagrams for R, L and C series and parallel combination.
CO4	Apply the network theorems suitably for electrical circuits.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

The course outcomes of the course are mapped to the program outcomes with a level of emphasis being either strongly correlated (2) and moderately correlated (1).

SYLLABUS:

UNIT- 1 INTRODUCTION TO ELECTRICAL & MAGNETIC CIRCUITS

Electrical Circuits: Circuit Concept – Types of elements - Source Transformation-Voltage - Current Relationship for Passive Elements (For Different Input Signals-Square, Ramp, Saw Tooth, Triangular).

Kirchhoff's Laws – Network Reduction Techniques-Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation. Examples

Magnetic Circuits: Faraday's Laws of Electromagnetic Induction-Concept of Self and Mutual Inductance-Dot Convention-Coefficient of Coupling-Composite Magnetic Circuit-Analysis of Series and Parallel Magnetic Circuits, MMF Calculations.

UNIT OUTCOMES:

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

1. Able to understand the basic circuit elements for different input signals.
2. Analyze the network reduction techniques.
3. Apply different basic laws to solve the electric circuits.

UNIT- II SINGLE PHASE A.C CIRCUITS

R.M.S, Average Values and Form Factor for Different Periodic Wave Forms – Sinusoidal Alternating Quantities – Phase and Phase Difference – Complex and Polar Forms of Representations, J-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) With Sinusoidal Excitation- Phasor diagrams - Concept of Power Factor-Concept of Reactance, Impedance, Susceptance and Admittance-Apparent Power, Active and Reactive Power, Examples.

UNIT OUTCOMES:

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

1. Understand the average and rms values for different periodic waveforms.
2. Analyze the steady state performance of R,L,and C in series ,parallel &series-parallel system.
3. Understand the concept of p.f,reactance,impedance,susceptance,admittance.

UNIT- III LOCUS DIAGRAMS & RESONANCE

Series R-L, R-C, R-L-C and Parallel Combination with Variation of Various Parameters - Resonance-Series, Parallel Circuits, Frequency Response, Concept of Bandwidth and Q Factor.

UNIT OUTCOMES:

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

1. Unserstand and develop the locus diagrams for Series R-L, R-C, R-L-C and Parallel Combination.
2. Analyse the concept of resonance for series and parallel circuits.

UNIT- IV NETWORK THEOREMS

Superposition and Reciprocity Theorems, Thevenin's, Norton's, Maximum Power Transfer, Millman's Theorems, Tellegen's, and Compensation Theorems for D.C and Sinusoidal Excitations.

UNIT OUTCOMES:

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

1. Understand the concept of different Theorems.
2. Apply the concept of theorems to different circuits to find the Thevenin's, voltage ,resistance..RMS power etc.

1 2 3 4 5

6 7 8 9 10

UNIT- V NETWORK TOPOLOGY

Definitions – Graph – Tree, Basic Cutset and Basic Tieset Matrices for Planar Networks – Loop and Nodal Methods of Analysis of Networks with Dependent & Independent Voltage and Current Sources – Duality & Dual Networks. Nodal Analysis, Mesh Analysis, Super Node and Super Mesh for D.C Excitations.

UNIT OUTCOMES:

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

1.Understand the concept of network topology.
2.Apply the tieset,cutest for different electrical circuits.
3.Apply the mesh & nodal analysis for D.C. excitations.

TEXT BOOKS:

1. Engineering circuit analysis by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company.
2. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill.
3. Circuit Theory (Analysis & Synthesis) by A. Chakrabarti, Dhanpat Rai & Sons

REFERENCE BOOKS:

1. Network Analysis by M.E Van Valkenberg, Prentice Hall (India), 3rd Edition.
2. Electrical Engineering Fundamentals by V. Del Toro, Prentice – Hall International.
3. Electric Circuits by N.Sreenivasulu, REEM Publications
4. Electric Circuits- Schuam Series
5. Electrical Circuit Theory and Technology by John Bird, Routledge, Taylor & Fransis
6. Circuits & Networks by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill

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

Subject Code	Title of the Subject	L	T	P	C
	Differential Equations and Vector Calculus	3	1	-	4

COURSE OBJECTIVES	
1	To enlighten the learners in the concept of differential equations and multivariable 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 differential equations related to various engineering fields
CO2	Identify solution methods for partial differential equations that model physical processes
CO3	interpret the physical meaning of different operators such as gradient, curl and divergence
CO4	estimate the work done against a field, circulation and flux using vector calculus

Mapping between Course Outcomes and Programme Outcomes

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

SYLLABUS

UNIT I: Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT II: Equations Reducible to Linear Differential Equations 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 **08 hrs**

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

UNIT IV: Multivariable Calculus (Vector differentiation)

Scalar and vector point functions, gradient, divergent, curl and their properties (Identities and applications)

UNIT V: Multivariable Calculus (Vector integration)

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

Textbooks:

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

References:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
3. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
4. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF PHYSICS
I B.TECH – II SEMESTER (common to EEE, ECE & CSE)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Applied Physics	3	0	-	3

COURSE OBJECTIVES	
1	To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
2	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.
3	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 semiconductors in the functioning of electronic devices.
4	To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices
5	To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications. Considering the significance of micro miniaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their properties and applications in modern emerging technologies are to be elicited.

COURSE OUTCOMES	
CO1	**Explain** the need of coherent sources and the conditions for sustained interference (L2). **Identify** engineering applications of interference including homodyne and heterodyne detection (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)
CO2	**Explain** various types of emission of radiation (L2). **Identify** the role of laser in engineering applications (L3). **Describe** the construction and working principles of various types of lasers (L1). **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 medical, communication and other fields (L2). **Apply** the fiber optic concepts in various fields (L3).
CO3	**Describes** the dual nature of matter (L1). **Explains** the significance of wave function (L2). **Identify** the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). **Identify** the role of classical and quantum free electron theory in the study of electrical conductivity (L3). **Classify** the energy bands of semiconductors (L2). **Outline** the properties of n-type and p-type semiconductors and charge carriers (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)
CO4	**Explain** the concept of dielectric constant and polarization in dielectric materials (L2). **Summarize** various types of polarization of dielectrics (L2). **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics (L2). **Classify** the magnetic

	materials based on susceptibility and their temperature dependence (L2). **Explain** the applications of dielectric and magnetic materials (L2). **Apply** the concept of magnetism to magnetic devices (L3)
CO5	**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). **Identify** the nano size dependent properties of nanomaterials (L2). **Illustrate** the methods for the synthesis and characterization of nanomaterials (L2). **Apply** the basic properties of nanomaterials in various Engineering branches (L3).

Mapping between Course Outcomes and Programme Outcomes

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

SYLLABUS OF APPLIED PHYSICS

Unit-I: Physical Optics

Interference-Principle of superposition –Interference of light – Conditions for sustained interference- Interference in thin films (reflected light)- Newton's Rings: determination of wavelength - Engineering applications of Interference

Diffraction- Fraunhofer Diffraction-Single and Double slits - Diffraction Grating – Grating Spectrum - Engineering applications of diffraction.

Polarization-Polarization by double refraction-Nicol's Prism--Half wave and Quarter wave plates-Engineering applications of polarization.

Unit-II: Lasers and Fiber optics

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Pumping mechanisms – Nd:YAG laser – He-Ne laser – Applications of lasers.

Fiber optics- Introduction to Optical Fibers-Total Internal Reflection -Acceptance Angle-Numerical Aperture-Classification of fibers based on refractive index profile –Propagation of electromagnetic wave through optical fibers – Modes -Importance of V-number –Block diagram of fiber optic communication system– Applications

Unit III: Quantum Mechanics, Free Electron Theory and Semiconductors

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.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
****** DEPARTMENT OF PHYSICS ******
I B.TECH – II SEMESTER (common to EEE, ECE & CSE)
(APPLIED PHYSICS LAB)

Subject Code	Title of the Lab	L	T	P	C
	Applied Physics lab	-	-	3	1.5

COURSE OBJECTIVES	
1	To make the students gain practical knowledge to co-relate with the theoretical studies. To develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

COURSE OUTCOMES	
CO1	**Operate** optical instruments like microscope and spectrometer (L2)
CO2	**Estimate** the desired physical parameters by performing the concerned experiments (L2)
CO3	**Plot** the concerned physical parameter to know their related variations (L3)
CO4	**Identify** the role of various physical phenomenon in relation with the experimental concepts (L3)

Mapping between Course Outcomes and Programme Outcomes

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

LIST OF EXPERIMENTS

Any TEN of the following experiments has to be performed during the SEMESTER

1. Determination of thickness of thin object by wedge method
2. Determination of radius of curvature of lens by Newton's rings
3. Determination of wavelengths of different spectral lines of mercury light using diffraction grating in normal incidence method
4. Determination of dispersive power of the grating.
5. Determination of dielectric constant and Curie temperature of a ferroelectric material
6. Study of B-H Curve of ferromagnetic material.
7. Determination of numerical aperture and acceptance angle of an optical fiber
8. Determination of wavelength using diffraction grating by laser source.
9. Determination of particle size by laser source.
10. Determination of the resistivity of semiconductor by four probe method

Free Electron Theory: Classical free electron theory – Sources of electrical resistance – Equation for electrical conductivity – Quantum free electron theory– Fermi-Dirac distribution- Band theory of Solids.

Semiconductors: Origin of energy bands - Classification of solids based on energy bands – Intrinsic semiconductors – Intrinsic carrier concentration-Fermi energy – Electrical conductivity - extrinsic semiconductors P-type & N-type - Dependence of Fermi energy on carrier concentration and temperature- Direct and Indirect band gap semiconductors-Hall effect- Hall coefficient and its applications - Drift and Diffusion currents (Qualitative) - Continuity equation - Applications of Semiconductors.

Unit-IV: Dielectric and Magnetic Materials

Dielectric Materials -Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic, Ionic and Orientation polarizations (Qualitative) - Lorentz (internal) field- Clausius-Mossotti equation-Applications of dielectrics: Ferroelectricity and Piezoelectricity.

Magnetic Materials - Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment –Bohr Magneton, Classification of magnetic materials - Hysteresis - soft and hard magnetic materials-Applications

Unit – V: Superconductors and Nanomaterials

Superconductors: Properties of superconductors – Meissner effect– Type I and Type II superconductors – ac and dc Josephson effects – BCS theory (qualitative treatment) – Applications of superconductors.

Nanomaterials: Introduction – Surface to volume ratio and quantum confinement – Physical properties: optical, mechanical, electrical and magnetic- Synthesis of nanomaterials: Top-down: Ball Milling, Bottom-up: Chemical Vapour Deposition – Applications of nanomaterials.

Text books:

1. M. N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012.

Reference Books:

1. K Thyagarajan " Engineering Physics", Mc Graw Hill Publishing Company Ltd., 2016
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education, 2018
4. T Pradeep "A Text book of Nano Science and Nano Technology"- Tata Mc Graw Hill, 2013
5. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press
6. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
7. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill
8. Introduction to Nanotechnology – C P Poole and F J Owens, Wiley

1. K Thyagarajan 4. 7.
2. M. Sai Shankar 5.
3. 6. Manorama

11. Study of Energy gap of a material using p-n junction diode
12. Study of variation of Magnetic field along the axis of a current carrying coil – Stewart-Gee's Method
13. Determination of mobility of charge carriers in semiconductor by Hall effect.
14. Measurement of resistance of a semiconductor with varying temperature
15. Measurement of magnetic susceptibility by Kundt's tube method.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. R. Padma Suvarna, K. Thyagarajan "Engineering Physics Practicals" – NU Age Publishing House.

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Data Structures

(Common to All Branches of Engineering)

B. Tech – II Semester | **L-T-P-C** **3-0-0-3**

Course Objectives:

1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithm analysis
3. To introduce different data structures for solving the problems
4. To demonstrate modeling of the given problem as a graph
5. To elucidate the existing hashing techniques

Unit – 1: Introduction

Algorithm Specification, Performance analysis, Performance Measurement, Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions, Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

Learning Outcomes:

Student should be able to

1. Analyze the given algorithm to find the time and space complexities (L4)
2. Select appropriate sorting algorithm (L4)
3. Design a sorting algorithm (L6)

Unit – 2: Stack, Queue and Linked lists

Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

Learning outcomes: Student should be able to

1. Evaluate expressions (L5)
2. Develop the applications using stacks and queues (L3)
3. Construct the linked lists for various applications (L6)

Unit – 3: Trees

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, **Counting Binary Trees,** Optimal Binary search Trees, AVL Trees. B-Trees: BTrees, B + Trees.

Learning outcomes

1. Explain the concept of a tree (L2)
2. Compare different tree structures (L4)
3. Apply trees for indexing (L3)

Unit – 4: Graphs and Hashing

The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure.

Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

Learning outcomes:
Student should be able to
1. Recognize the importance of Graphs in solving real world problems (L2)
2. Apply various graph traversal methods to applications (L3)
3. Design a minimum cost solution for a problem using spanning trees (L6)
4. Select the appropriate hashing technique for a given application (L5)
5. Design a hashing technique (L6)

Unit – 5: Files and Advanced Sorting & Searching
File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization.
Advanced sorting and searching: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

Learning outcomes: Student should be able to
1. Organize data in the form of Files (L6)
2. Apply sorting on large amount of data (L3)

Text Books:
1. Ellis Horowitz, Sartaj Sahni and Susan Anderson Freed "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2007.
2. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.

Reference Books:
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education.
2. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
3. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016
4. Richard F.Gilberg, Behrouz A.Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.

Course Outcomes:
Students should be able to
1. Select Appropriate Data Structure for solving a real world problem (L4)
2. Select appropriate file organization technique depending on the processing to be done (L4)
3. Construct Indexes for Databases (L6)
4. Analyze the Algorithms (L4)
5. Develop Algorithm for sorting large files of data (L3)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) :: PULIVENDULA

DEPARTMENT OF MECHANICAL ENGINEERING

(Common to all branches)

Subject Code	Title of the Subject	L	T	P	C
19A03102	Engineering Graphics	1	0	3	2.5

COURSE OBJECTIVES	
1	To bring awareness that Engineering Drawing is the Language of Engineers.
2	To familiarize how industry communicates technical information.
3	To teach the practices for accuracy and clarity in presenting the technical information.
4	To develop the engineering imagination essential for successful design.
5	To instruct the utility of drafting & modeling packages in orthographic and isometric drawings.
6	To train the usage of 2D and 3D modeling.
7	To instruct graphical representation of machine components.

COURSE OUTCOMES	
CO1	**Draw** various curves applied in engineering.
CO2	**Show** projections of Lines, planes and solids..
CO3	**Draw** the sections of solids and development of surfaces of solids.
CO4	**Use** computers as a drafting tool.
CO5	**Draw** isometric and orthographic drawings.

Mapping between Course Outcomes and Programme Outcomes

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

UNIT – I:

Introduction to Engineering Graphics: 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

(2L + 6P hrs)

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UNIT – II:

Projection of Points, Lines and Planes: 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.

(2L + 6P hrs)

UNIT – III:

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

Sections of Solids: Section planes and sectional view of right regular solids – Prism, Cylinder, Pyramid and Cone. True shapes of the sections. **(2L + 6P hrs)**

UNIT – V:

Development of Surfaces: Development of surfaces of right regular solids – Prism, Cylinder, Pyramid, Cone and their sectional parts. **(1L + 6P hrs)**

UNIT – V:

Orthographic Projections: Systems of projections, Conventions and Application to Orthographic Projections.

Isometric Projections: Principles of Isometric Projection – Isometric scale, Isometric views – Lines, Planes, Figures, Simple and Compound Solids. **(5L + 15P hrs)**

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.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

I YEAR I SEMESTER

ENGINEERING WORKSHOP (19AME02)
(Common to CE, MECH & CSE)

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

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

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) Semi-circular fit
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

ELECTRIC CIRCUITS AND SIMULATION LAB

L	T	P	C
0	0	3	1.5

Objectives:

- To verify all theorems with practically.
- To know performance of RLC series and parallel circuits.
- To know the measurement of three phase power.
- To emphasis a brief introduction to PSPICE for analysis of DC Circuits.

List of Experiments

1) Verification of Thevenin's and Norton's Theorems
2) Verification of Superposition Theorem and Maximum Power Transfer Theorem
3) Verification of Compensation Theorem
4) Verification of Reciprocity , Millmann's Theorems
5) Locus Diagrams of RL and RC Series Circuits
6) Series and Parallel Resonance
7) Determination of Self, Mutual Inductances and Coefficient of Coupling
8) Z and Y Parameters
9) Transmission and Hybrid Parameters
10) Measurement of Active and Reactive Power for Star and Delta Connected Balanced Loads
11) Measurement of 3-Phase Power by Two Wattmeter Method for Unbalanced Loads

Any four simulation experiments are to be conducted

1) DC Transient Response
2) Mesh Analysis
3) Nodal Analysis
4) Frequency response of RLC Series Circuits
5) Analysis of RL and RC Series circuits for DC and AC Excitation
6) Analysis of Three Phase balanced and unbalanced systems
7) Verification of the maximum power dissipation (plot the power dissipated versus the load).

References:

1. Simulation of Power Electronics Circuit, M B Patil, V Ramanarayan and V T Ranganat, Alpha Science International Ltd., 2009.

2. Public Domain Simulator: http:// www.ee.iitb.ac.in/~sequel
3. PSPICE A/D user's manual – Microsim, USA.
4. PSPICE reference guide – Microsim, USA.

Outcomes:

1. Understand and compare basic electric circuit theorems with actual working circuits.
2. Students can Design and understand RLC series and parallel circuits and its resonance condition.
3. They can able to measure power in three phase circuits in day to day life.
4. They can also be able to understand simulation programs for DC circuit analysis using PSPICE.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Applied Physics Laboratory

(Common to I B.Tech II Semester 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.

EXP No.1: Determination of the thickness of thin object using wedge shape method

Learning Outcomes:

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

- **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**

EXP No. 2 : Determination of the radius of curvature of the lens by Newton's rings

Learning Outcomes:

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

- **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**

EXP No. 3: Determination of wavelengths of various spectral lines of mercury source using diffraction grating in normal incidence method

Learning Outcomes:

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

- **Operates** optical instrument like spectrometer. **L2**
- **Estimate** the wavelength of the given source **L2**
- **Identifies** the formation of grating spectrum due diffraction. **L2**

EXP No. 4: Determination of dispersive power of prism

Content of the Unit – IV

Learning Outcomes:

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

- **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**

EXP No. 4: Determination of dispersive power of prism.

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

- **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**

EXP No. 5: Determination of wavelength using diffraction grating by laser source.

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

- **Operates** various instrument **L2**
- **Estimate** the wavelength of laser source **L2**
- **Identifies** the formation of grating spectrum due diffraction. **L2**

EXP No. 6: Determination of particle size by laser source

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

- **Operates** various instrument **L2**
- **Estimate** the Particles size using laser **L2**
- **Identifies** the application of laser **L2**

EXP No. 7: Determination of numerical aperture and acceptance angle of an optical fiber

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

- **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**

EXP No. 8: Study of variation of Magnetic field along the axis of a current carrying coil – Stewart-Gee's Method.

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

- **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**

EXP No. 9: Study of B-H curve of Ferromagnetic material.

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

- **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**

EXP No. 10: Study of Energy gap of a material using p**-**n junction diode

Learning Outcomes:

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

- **Operates** various instruments and connect them as per the circuit. **L2**
- **Estimate** the hysteresis loss, coercivity and retentivity of the ferromagnetic material. (L2) **L2**
- **Classifies** the soft and hard magnetic material based on B-H curve. **L2**
- **Estimate** the energy gap of a semiconductor. **L2**
- **Illustrates** the engineering applications of energy gap. **L3**
- **Plots 1/T** with log R **L3**

Reference Books:

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

Course Outcomes:

At the end of this Course the student 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**

Data Structures Lab

(Common to All Branches of Engineering)

B. Tech – II Semester **L-T-P-C**
0-0-3-1.5

Course Objectives:

1. To introduce to the different data structures
2. To elucidate how the data structure selection influences the algorithm complexity
3. To explain the different operations that can be performed on different data structures
4. To introduce to the different search and sorting algorithms.

Laboratory Experiments:

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue.
   While implementing you should be able to store elements equal to the size of the queue.
   No positions should be left blank.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using 'Ladies first' principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table.

The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table.
User may like to remove row/column. Create table data type and support different operations on it.

Course Outcomes:

At the end of the course students should be able to

1. Select the data structure appropriate for solving the problem (L5)
2. Implement searching and sorting algorithms (L3)
3. Design new data types (L6)
4. Illustrate the working of stack and queue (L4)
5. Organize the data in the form of files (L6)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA
B.Tech – II-I Sem (R19)

L	T	P	C
3	0	0	3

COMPLEX VARIABLES AND TRANSFORMS

(Common to ECE & EEE)

Course Objective:

This course aims at providing the student to acquire the knowledge on the calculus of function of complex variables. The student develops the idea of using continuous/discrete transforms.

Unit-I: 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. Conformal mappings-standard and special transformations (z^2, sin z, cos z, e^z, lnz) Mobius transformations (bilinear) and their properties.

Unit Outcomes:
Students will be able to

- Understand functions of Complex variable and its properties.
- Find derivatives of complex functions.
- Understand the analyticity of complex functions.
- Understand the conformal mappings of complex functions.

Unit-II: Complex Variables – Integration:

Line integral-Contour integration, Cauchy's integral theorem (with proof), Cauchy Integral formula, generalized Cauchy Integral formula (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).

BOS Maths

Unit Outcomes:

Students will be able to

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

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.

Unit Outcomes:

Students will be able to

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

Unit-IV: Fourier series &Fourier transforms

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

Fourier Integrals & Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form ofFourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem – Finite Fourier Sine and Cosine transforms.

Unit Outcomes:

Students will be able to

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

- Understand Fourier transforms.
- Apply properties of Fourier transforms.

Unit-V: Z 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.

Unit Outcomes:
Students will be able to
- Understand Z transforms.
- Apply properties of Z transforms.
- Apply Z transforms to solve difference equations.

Course Outcomes:
After the completion of course, students will be able to
- Understand the analyticity of complex functions and conformal mappings.
- Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
- Understand the usage of Laplace Transforms, Fourier Transforms and Z transforms.
- Evaluate the Fourier series expansion of periodic functions.

Text Books:
1. B.S.Grewal, "Higher Engineering Mathematics", Khanna publishers.
2. 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.

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

B.Tech – II-I Sem

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SEMICONDUCTOR DEVICES AND CIRCUITS

Course Objectives:

- To study the characteristics of various types of semiconductor devices.
- To apply the characteristics of semiconductor devices to develop engineering solutions.
- To analyze functioning of various types of electronic devices and circuits.

Unit 1

P-N junction Diode: Qualitative theory of the p-n junction, p-n junction as a diode, current components in a p-n diode, Volt-Ampere characteristics, Temperature dependence of p-n diode characteristics, Diode resistance, Qualitative treatment of Transition and Diffusion capacitances. Diode as Rectifier: Half wave and Full wave rectifier, Bridge rectifier, Filters – Inductor and Capacitor Filter. Ripple factor with and without filters.

Unit Outcomes:

- Explain the concept of p-n junction as diode (L2)
- Apply the concept of diode for developing rectifiers (L3)
- Analyse temperature dependence of diode characteristics (L4)

Unit 2

Special Purpose Diodes: Zener versus Avalanche breakdown, Principle of operation, characteristics and applications of Zener diode, Tunnel diode, Photo diode, LED, PIN diode, Schottky barrier diode and Varactor diode.
Bi-Polar Junction Transistor: Junction transistor, Transistor current components, Transistor as an amplifier, Input and Output characteristics of BJT in Common Base, Common Emitter and Common Collector configurations. Transistor as a switch.

Unit Outcomes:

- Study the characteristics of various special purpose diodes and BJT (L2)
- Apply the concepts of special purpose diodes and BJT to solve engineering problems (L3)
- Compare the BJT characteristics in various configurations (L4)

Unit 3

Transistor biasing and Stabilization: The Operating Point, DC & AC load lines, Bias Stability, Fixed Bias, Collector-to-Base Bias, Self-Bias, Bias Stabilization, Bias Compensation, Thermistor and Sensistor Compensation, Thermal Runaway, Thermal Stability.

Small Signal Low-frequency Transistor Models: Transistor Hybrid Model, Determination of the h parameters from the characteristics, Analysis of Transistor amplifier using h parameters, Comparison of Transistor amplifier configurations.

Unit Outcomes:

- Explain the concept of biasing and its temperature stability and compensation (L2)
- Apply transistor hybrid model to calculate h-parameters (L3)
- Analyse transistor amplifier using h-parameters (L4)

Unit 4

Low-frequency Transistor Amplifier circuits: Simplified Common-emitter Hybrid Model, Simplified Calculations for the Common-Collector, Common-base and Common-emitter amplifier, Common emitter amplifier by passed and un-bypassed Emitter Resistance, Miller's Theorem, Dual of Miller's Theorem.

Unit outcomes:

- State Miller's and dual of Miller's theorems (L1)
- Apply the concept of BJT to develop amplifier circuits (L3)
- Analyse the simplified hybrid model of transistor in various configurations (L4)

Unit 5

Field-effect Transistors: The Junction Field-effect Transistor, The Pinch-off Voltage, The JFET Volt-Ampere Characteristics, MOSFET characteristics (Enhancement and depletion mode), The FET and MOSFET Small-signal Model, Biasing of FET and MOSFET.

The Common-source Amplifier, The Common-drain Amplifier, A Generalized FET Amplifier, The FET as a Voltage-variable Resistor.The Unijunction Transistor.

Unit outcomes:

- Study the characteristics of JFET, MOSFET and UJT (L2)
- Apply the characteristics of FETs and UJT to develop engineering solutions (L3)

Course Outcomes:

CO1: List various types of semiconductor devices (L1)
CO2: Study the characteristics of various types of semiconductor devices (L2)
CO3: Apply the characteristics of semiconductor devices to develop engineering solutions (L3)
CO4: Analyze functioning of various types of electronic devices and circuits (L4)

Text Books:

1. J.Millman, C. C. Halkias and Satyabrata Jit, "Electronic Devices and Circuits",4th edition, Mc Graw Hill, 2015.
2. S. Salivahanan, N. Suresh Kumar, "Electronic Devices and Circuits", 4th edition, McGraw- Hill, 2017.

References:

1. J.Milliman, C. C. Halkias and Chetan Parikh, "Integrated Electronics", 2nd edition, Mc Graw Hill, 2010.
2. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford, 2008.

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COLLEGE OF ENGINEERING (Autonomous) PULIVENDULA

II B.Tech I Sem (E.C.E) **L – T – P – C 3 - 0 – 0 - 3**

CONTROL SYSTEMS

COURSE OBJECTIVES:

1. Merits and demerits of open loop and closed loop systems; the effect of feedback.
2. The use of block diagram algebra and Mason's gain formula to find the overalltransfer function.
3. Transient and steady state response, time domain specifications and the concept of Root loci.
4. Frequency domain specifications, Bode diagrams and Nyquist plots.
5. State space modelling of Control system

UNIT–I

Control SystemsConcepts: Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transferfunction of DC servo motor - AC servo motor,Synchros.

Learning Outcomes:

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

- Write the differential equations for mechanical and electricalsystems.
- Obtain the transfer function from block diagrams, servo motors and signal flowgraphs.

UNIT-II

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

Learning Outcomes:

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

- Analyze the time domainspecifications.
- Calculate the steady stateerrors.
- Understand about Proportional, Integral and Derivative controllers along withcombinations.

UNITIII

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

Learning Outcomes:

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

- Analyze the concept of stability in timedomain
- Apply the concept of Routh's stability and Root locus in timedomain

UNIT–IV

Frequency ResponseAnalysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-StabilityAnalysis.

Compensation techniques – Study of Effects and Design of Lag, Lead, Lag-Lead Compensator design in frequency Domain on a second order system.

Learning Outcomes:

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

- Evaluate the frequency domain specifications from Bode, Polar and Nyquistplots
- Design Compensators for varioussystems
- Deducing transfer functions from Bode Plots
- Understand difference between Phase and Gainmargins

UNIT–V

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

Learning Outcomes:

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

- Understand the concept of state space, controllability andobservability
- Obtain the transfer function from sate space and viceversa
- Understand the state transition method of solving time invariant stateequations

TEXTBOOKS:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.

2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition,2007.

REFERENCE BOOKS:

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

COURSE OUTCOMES:

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

1. Understandtheconceptsofcontrolsystemsclassification,feedbackeffect,mathematical modelling, time response and frequency responsecharacteristics, state space analysis
2. Apply the concepts of Block diagram reduction, Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of thesetechniques.
3. Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.
4. Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.

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ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH I SEM

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Performance of DC Machines

Course Objectives:

- To understand the basic principles of electromechanical energy conversion
- To understand the working and performance of DC generators
- To understand the working and performance of DC motors
- To understand the design of DC machines

UNIT-I

Magnetic circuit and core loss

Basic laws for calculating magnetic field – Biot-savart law – Ampere's circuital law – Reluctance and permeance – Different zones of BH characteristics – Review of series and parallel magnetic circuits – Eddy current loss – Its derivation – Hysteresis loop with alternating exciting current – hysteresis loss – separation of core loss– Numerical Problems

Principles of Electromechanical Energy conversion

Energy in magnetic system - field energy, co-energy, mechanical force, torque in single and multiply-excited magnetic field systems with permanent magnets – dynamic equations of electromechanical systems– Numerical Problems

Learning outcomes:

- Learn about basics of magnetic circuits and their loss
- Learn about basics of electromechanical energy conversions

UNIT-II

DC Generators – Construction, Armature Reaction and Commutation

Working principle – Constructional details and Applications – Armature windings: Lap and Wave windings, Simplex and multiplex winding, dummy coils – Types of Generators – EMF equation – Total Losses and condition for maximum efficiency – Armature reaction : Demagnetizing and Cross magnetizing MMF – Compensating windings requirement – Commutation – methods to improve commutation– Numerical Problems

Learning outcomes:

- Learn about working and construction of DC generators
- Learn about armature reaction and commutation process

UNIT-III

DC Generators – Characteristics

Internal and External Characteristics of separately and self excited (series, shunt and compound) DC generators – OCC curve – Voltage build up process and precautionary measures – Load sharing – parallel operation of DC generators (series, shunt and compound) – Numerical Problems

(BOS-Chairman)

DC Motors – Principle

Principle of working , Applications , Back EMF – Torque production and equation– Numerical Problems.

Learning outcomes:

- Learn about characteristics of DC generators
- Learn about the working of DC motors

UNIT-IV

DC Motors – Speed control

Types of DC motors – Characteristics of DC motors (series, shunt and compound) – Speed control methods of DC motors (series, shunt and compound) – Armature and field control methods – Ward leonard system – Braking of DC shunt and series motors – 3 point and 4 point starters for DC motors – Calculations of step resistance– Numerical Problems

Learning outcomes:

- Learn about speed control of DC motors
- Learn about the starting methods of DC motors

UNIT-V

DC Motors – Testing

Direct and Indirect testing – Brake test – Swinburne's Test – Hopkinson's Test – Field's Test – Retardation Test – Numerical Problems

DC Machines – Design

Output equation and main dimensions - choice of flux density - choice of ampere-conductors - Selection of number of poles - Length of air gap - Design of field winding – Numerical Problems

Learning outcomes:

- Learn about testing of DC motors
- Learn about the design of DC machines

Text Books:

1. Electrical Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers, 3rd 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 DC Machines – by Clayton & Hancock, BPB Publishers, 2004.
2. Electrical Machines – S.K. Battacharya, 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: After completion of the course, the student will be able to:

- Understand the basic principles of electromechanical energy conversion
- Understand the working and performance of DC generators
- Understand the working and performance of DC motors
- Understand the design of DC machines

(BOS-Chairman)

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ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH I SEM

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Electromagnetic Field Theory

Course Objectives:

- To understand the basic principles of electrostatics
- To understand the basic principles of magneto statics for time invariant and time varying fields
- To understand the principles of dielectrics, conductors and magnetic potentials

UNIT-I ELECTROSTATICS

Electrostatic Fields - Coulomb's Law - Electric Field Intensity (EFI) due to Line, Surface and Volume charges- Work Done in Moving a Point Charge in Electrostatic Field-Electric Potential due to point charges, line charges and Volume Charges - Potential Gradient - Gauss Law- Application of Gauss Law-Maxwell's First Law – Numerical Problems.

Laplace and Poisson Equations - Solution of Laplace Equation in one Variable. Electric Dipole - Dipole Moment - Potential and EFI due to Electric Dipole - Torque on an Electric Dipole in an Electric Field – Numerical Problems.

Learning outcomes:

- Able to Determine electric field and potentials using Coulomb's law & Gauss law.
- Analyze Potential differences for different configurations.
- Able to Classify static electric magnetic fields in different engineering situations.
- Able to Determine the Concepts of Electric dipole, Electrostatic Energy and Energy density.

UNIT- II CONDUCTORS AND DIELECTRICS

Behaviour of Conductors in an Electric Field-Conductors and Insulators – Electric Field Inside a Dielectric Material – Polarization – Dielectric Conductors and Dielectric Boundary Conditions – Capacitance-Capacitance of Parallel Plate, Spherical & Co-axial capacitors – Energy Stored and Energy Density in a Static Electric Field – Current Density – Conduction and Convection Current Densities – Ohm's Law in Point Form – Equation of Continuity – Numerical Problems.

Learning outcomes:

- Analyze the Concepts of Conduction and Convection currents.
- Understand the concept of capacitance for parallel plates, spherical & co-axial capacitors.
- Able to Calculate Energy stored and energy density in a static electric fields.

UNIT-III MAGNETO STATICS

Static Magnetic Fields – Biot-Savart Law – Oersted's experiment – Magnetic Field Intensity (MFI) due to a Straight, Circular &Solenoid Current Carrying Wire – Maxwell's Second Equation. Ampere's Circuital Law and its Applications Viz., MFI Due to an Infinite Sheet of Current and a Long Current Carrying Filament – Point Form of Ampere's Circuital Law – Maxwell's Third Equation – Numerical Problems.

Magnetic Force — Lorentz Force Equation – Force on Current Element in a Magnetic Field - Force on a Straight and Long Current Carrying Conductor in a Magnetic Field - Force Between two Straight and Parallel Current Carrying Conductors – Magnetic Dipole and Dipole moment- A Differential Current Loop as a Magnetic Dipole – Torque on a Current Loop Placed in a Magnetic Field – Numerical Problems.

Learning outcomes:

- Analyze the Concepts of Magnetic field intensity using Biot-Savart Law & Ampere Law.
- Able to understand Maxwell's equations.
- Develop MFI due to an infinite sheet of current and a long filament carrying conductor
- Able to calculate the magnetic forces and torque produced by currents in Magnetic Field.

BOS-Chairman

UNIT – IV MAGNETIC POTENTIAL

Scalar Magnetic Potential and Vector Magnetic Potential and its Properties - Vector Magnetic Potential due to Simple Configuration – Vector Poisson's Equations.

Self and Mutual Inductances – Neumann's Formulae – Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane – Energy Stored and Intensity in a Magnetic Field – Numerical Problems.

Learning outcomes:

- Understand scalar magnetic potential and vector magnetic potential and its applications.
- Ability to calculate self and mutual Inductances.
- Analyze the Concepts of Magnetic boundary conditions & Energy stored in the Magnetic field.

UNIT-V TIMEVARYING FIELDS

Faraday's Law of Electromagnetic Induction – It's Integral and Point Forms – Maxwell's Fourth Equation. Statically and Dynamically Induced E.M.F's – Simple Problems – Modified Maxwell's Equations for Time Varying Fields – Displacement Current.

Wave Equations – Uniform Plane Wave Motion in Free Space, Conductors and Dielectrics – Velocity, Wave Length, Intrinsic Impedence and Skin Depth – Poynting Theorem – Poynting Vector and its Significance.

Learning outcomes:

- Acquires knowledge on time varying fields & Faraday's law for Electromagnetic induction
- Analyze the Concepts Maxwell's Equations in Different Forms.
- Understand the Concepts Calculation of Poynting vector & Theorem.
- Analyze the Concepts of Wave Theory

TEXT BOOKS:

1. Principles of Electromagnetics, Sadiku, Kulkarni, OXFORD University Press, 6th Edition, 2015
2. Engineering Electromagnetics, William.H.Hayt, Mc.Graw Hill, 2010.

REFERENCE BOOKS:

1. Electromagnetics by J.D.Kraus,Mc.Graw Hill Inc, 5th edition,1999.
2. Field & Electromagnetic waves by David K. Cheng, 2nd edition, 1989.
3. Electromagnetics by Joseph A. Edminister, Schaum's Outline, Mc Graw Hill, 2nd Edition, 2017.

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

- Understand the concept of electrostatics
- Understand the concepts of Conductors and Dielectrics
- Understand the fundamental laws related to Magneto Statics
- Understand the concepts of Magnetic Potential and Time varying Fields

(BOS-Chairman)

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ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH I SEM

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Electrical Circuits-II

Course Objectives:

- To know the analysis of three phase balanced and unbalanced circuits and to measure active and reactive powers in three phase circuits.
- To analyze the networks using different two port parameters
- Knowing how to determine the transient response of R-L, R-C, R-L-C circuits for D.C and A.C excitations
- To know the applications of Fourier series to electrical circuits excited by nonsinusoidal Sources
- Study of Different types of filters.

Unit - I: Three Phase A.C. Circuits

Introduction - 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. Analysis of Three Phase Unbalanced Circuits - Loop Method - Star Delta Transformation Technique – for balanced and unbalanced circuits – Advantages of Three Phase System – Numerical problems

Learning outcomes:

- Learn about different three phase circuit types
- Learn about different analysis to solve three phase circuits

Unit - II: Two Port Networks

Two Port Network Parameters – Impedance – Admittance - Transmission and Hybrid Parameters and their Relations – Interconnection of two port networks – Numerical analysis - Concept of Transformed Network - Two Port Network Parameters Using Transformed Variables

Learning outcomes:

- Understand and estimate the network parameters of DC circuits
- Understand how Laplace transforms can be applied to energy storage elements in electrical circuits

Unit - III: DC Transients

Transient Response of series and parallel combinations of R-L, R-C, R-L-C Circuits for D.C Excitation - Initial Conditions – Final conditions - Solution Methods Using Differential Equation and Laplace Transforms - Numerical analysis

Learning outcomes:

- Understand the transient analysis of DC circuits
- Distinguish between different solution methods for DC circuits

(BOS-Chairman)

Unit - IV: AC Transients

Response of R-L & R-C Networks to Pulse Excitation – Transient Response of series and parallel combinations of R-L, R-C, R-L-C Circuits for Sinusoidal Excitations - Solution Method Using Differential Equations and Laplace Transforms – Numerical analysis

Learning outcomes:

- Understand the transient analysis of AC circuits
- Distinguish between different solution methods for AC circuits

Unit - V: Applications of Fourier series and Filters

Applications of Fourier series to series RL, RC and RLC circuits under steady state conditions - Passive filters – Low Pass – High Pass - Band Pass – Band elimination – T and π section filters – Analysis of constant k, m-derived and composite filters – Numerical analysis

Learning outcomes:

- Understand the applications of Fourier series to Electrical circuits
- Understand different filters

Text Books:

1. Engineering circuit analysis by William Hayt, Jack E. Kemmerly and Jamie Phillips, Mc Graw Hill, 9th Edition, 2019.
2. Circuit Theory: Analysis & Synthesis by A. Chakrabarti, Dhanpat Rai & Sons, 2008.
3. Network Analysis by G K Mithal, Khanna Publishers, 2011.
4. Networks, Lines and Fields by John D. Ryder, Pearson Education, 2015

Reference Books:

1. Network Analysis by M.E. Van Valkenberg, Prentice Hall (India), 3rd Edition, 1980.
2. Electrical Engineering Fundamentals by V. Del Toro, Prentice – Hall International, 2009.
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill, 5th Edition, 2013.
4. Electric Circuits by Mahamood Nahvi and Joseph Edminister, Schaum's Series, 6th Edition, 2013.
5. Electrical Circuit Theory and Technology by John Bird, Routledge, Taylor & Francis, 5th Edition, 2014.

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

- Understand the analysis of three phase balanced and unbalanced circuits
- Understand the Representation of circuits using two port parameters are known
- Understand the transient responses of R-L, R-C, R-L-C series circuits for D.C and A.C excitations
- Understand applications of Fourier series to electrical circuits excited by non-sinusoidal sources
- Understand the filters

(BOS - Chairman)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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B.Tech – II-I Sem

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SEMICONDUCTOR DEVICES AND CIRCUITS LAB

List of Experiments:

1. Draw and study the characteristics of Semi-conductor diode and calculate static and dynamic resistance
2. Draw and study the characteristics of Zener Diode and study its application as Regulator
3. Draw and study the input and output characteristics of Transistor in Common Emitter configuration
4. Draw and study the input and output characteristics of Transistor in Common Base configuration
5. Draw and study the drain and transfer characteristics of FET in Common Source Configuration
6. Draw and study the characteristics of UJT
7. Rectifiers
   a. To simulate the rectifiers and trace their output waveforms with and without filters using PSPICE / Multisim
   b. To design half wave, full wave & bridge rectifiers with and without filters, using discrete components and calculate ripple factor in each case.
8. Common Emitter Amplifier (Self bias Amplifier)
   a. Design and simulate self- bias Common Emitter amplifier using PSPICE / Multisim and study the Gain and Bandwidth of the amplifier
   b. Design self- bias Common Emitter amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response
9. Miller's and Dual of Miller's theorem
   a. Design and simulate to Prove the Miller's and dual of Miller's theorem in CE amplifier
   b. Design and construct the amplifier with discrete components to prove Miller's and dual of Miller's theorem
10. FET Amplifier
    a. Design and simulate common source FET amplifier using PSPICE /Multisim and study the Gain and Bandwidth of amplifier
    b. Design common source FET amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response

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ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH I SEM

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CONTROL SYSTEMS LAB

COURSE OBJECTIVES

1. Determination of transfer functions of various systems and control of it by different methodologies.
2. To provide knowledge in the analysis and design of controllers and compensators.
3. The characteristics of servo mechanisms which are helpful in automatic control systems.
4. To know the stability analysis using MATLAB.

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

COURSE OUTCOMES

- CO1 Get the knowledge of feedback control and transfer function of DC servo motor.
- CO2 Model the systems and able to design the controllers and compensators.
- CO3 Get the knowledge about the effect of poles and zeros location on transient and steady state behavior of second order systems and can implement them to practical systems and MATLAB
- CO4 Determine the performance and time domain specifications of first and second order systems.

Any Eight of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchros
3. Effect of feedback on DC servo motor
4. Transfer function of DC Machine
5. Effect of P, PD, PI, PID Controller on a second order system
6. Lag and lead compensation – Magnitude and phase plot
7. Temperature controller using PID
8. Characteristics of magnetic amplifiers
9. Characteristics of AC servo motor

Any two simulation experiments are to be conducted:-

1. PSPICE simulation of Op-Amp based Integrator and Differentiator circuits.
2. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
3. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
4. State space model for classical transfer function using MATLAB – Verification.

REFERENCE BOOKS:

1. Simulation of Electrical and electronics Circuits using PSPICE – by M.H.Rashid, M/s PHI Publications.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user's manual and – Mathworks, USA.

(BOS-Chairman)

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College of Engineering (Autonomous), Pulivendula - 516390, A.P, INDIA.

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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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA
B.Tech – II-II Sem (R19)

L	T	P	C
3	0	0	3

Numerical Methods, Probability and Statistics
(Common to CIVIL, ME, EEE& CSE)

Course Objectives:

1) To familiarize the students with numerical methods of solving the non-linear equations, interpolation, differentiation, integration, and ordinary differential equations.
2) To impart knowledge in basic concepts and few techniques in probability and statistics in various applications in engineering.

Unit I: Solution to algebraic and transcendental equations& Interpolation

Solution of algebraic and transcendental equations: bisection method, Newton-Raphson method and Regula-Falsi method, Finite differences, relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Learning Outcomes:

After completion of this unit student able to

- find approximate roots of the an equation by using different numerical methods
- explain various discrete operators and find the relation among operators
- apply Newton forward and backward formulas for equal and unequal intervals

Unit II: Numerical differentiation, integration & Solution of Initial Value Problems to Ordinary Differential Equations of first order.

Numerical Differentiation and Numerical integration: Numerical differentiation using Newton's forward & backward interpolation formulae; Numerical Integration by trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Numerical Solutions of Ordinary differential equation: Solution by Taylor's series, Picard's method of successive approximations, Euler's method, modified Euler's method and Runge-Kutta method of fourth order.

Learning Outcomes:

After completion of this unit student able to

- find integration of a function by different numerical methods
- solve ordinary differential equations using different numerical schemes

Unit III: Probability & Random Variables

Probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem.

Random variables (discrete and continuous), probability distribution: Binomial - Poisson approximation to the binomial distribution and normal distribution-their properties. (All concepts without proofs)

Learning Outcomes:

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

- explain the terms sample space, random variable, expected value
- apply probability theory via Baye's theorem
- identify the notations of discrete and continuous distribution functions
- evaluate Binomial and Poisson distributions
- explain the properties of normal distribution

Unit IV: Testing of hypothesis

Formulation of hypothesis, critical region, level of significance. Large sample tests: test for single proportion, difference of two proportions, test for single mean and difference of two means.

Learning Outcomes:

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

- explain the concept of testing of hypothesis
- apply the concept of hypothesis testing for large samples

Unit V: Small Sample Tests

Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi 2$ - test for independence of attributes and goodness of fit.

Learning Outcomes:

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

- apply the concept of testing hypothesis for small samples
- estimate the goodness of fit

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008
3. S.S.Sastry, "Introductory methods of Numerical Analysis", 5th edition, PHI, 2012.

References:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons publications, 2012.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.
3. P. Kandasamy, K. Thilagavathy, S. Gunavathy, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.

Course Outcomes:

Students will be able to

- apply different methods to find roots of the equations
- find approximate the solutions of ordinary differential equations
- apply the Laplace transform for solving differential equations
- explain the concepts of probability and their applications
- apply discrete and continuous probability distributions in practical problems
- use the statistical inferential methods based on small and large sampling tests

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH II SEM

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Electrical Power Generation and Distribution

Course Objectives:

To make the student learn about:

- ☐ The block diagram and operation of Conventional Power generating systems and their components.
- ☐ The role of non conventional power generating systems and their operation and economic aspects.
- ☐ Calculation of different transmission line parameters and their use.
- ☐ Modeling of transmission line and evaluation of constants.

Course Outcomes:

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

CO1 Remember and understand the concepts of conventional and nonconventional power generating systems.

CO2 Apply the economic aspects to the power generating systems.

CO3 Analyse the transmission lines and obtain the transmission line parameters and constants.

CO4 Design and Develop the schemes to improve the generation and capability of transmission line to meet the day to day power requirements.

UNIT-I CONVENTIONAL POWER GENERATING SYSTEMS

Thermal Power: Block Diagram of Thermal Power Station (TPS), Brief Description of TPS Components
Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.
Nuclear Power: Nuclear Fission and Chain Reaction-Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors.

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

1. Understand the concept of layout and design aspects of Thermal, Hydro and Nuclear Power Plants.
2. Obtain the principle of operation of Thermal, Hydro and Nuclear Power Plants.

(BOS-Chairman)

UNIT -II NON CONVENTIONAL POWER GENERATING SYSTEMS

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.
Wind Power Generation: Role and potential of Wind Energy Options, Horizontal and Vertical Axis
Wind Mills- Performance Characteristics-Pitch & Yaw Controls – Economic Aspects.
Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters – Characteristics of Bio-Gas- Utilization- Economic and Environmental Aspects.
Geothermal and Ocean Power Generation: Principle of Geothermal Energy Methods of Harnessing-Principle of Ocean Energy-Tidal and Wave Energy- Mini Hydel Plants- Economic Aspects.

Learning Outcomes: *At the end of the unit, the student will be able to*
1. Understand the concept of design of Solar, Wind, Bio-Gas, Geothermal and Ocean Power generation.
2. Obtain the principle of operation of Solar, Wind, Bio-Gas, Geothermal and Ocean Power generation.

UNIT-III: ECONOMIC ASPECTS OF POWER GENERATION & TARIFF

Economic Aspects –load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, base and peak load plants.
Tariff Methods– costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

Learning Outcomes: *At the end of the unit, the student will be able to*
1. Compute various factors like, load factor, driving factor, plant factor
2. Evaluate the tariffs to be changed for the consumers
3. Plot the load curve, load duration curve and hence determine the load capacity of the plant

UNIT-IV GENERAL ASPECTS OF DISTRIBUTION SYSTEMS

Classification of Distribution Systems - Comparison of DC & AC and Under-Ground & Over - Head Distribution Systems. Voltage Drop and power loss in D.C Distributors for the following cases: Radial D.C Distributors fed at one end and at ends (equal/unequal Voltages), Uniform loading and Ring Main Distributor, LVDC Distribution Network. Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, feeder loading; basic design of secondary distribution. Voltage Drop and power loss in A.C. Distributors.

Learning Outcomes: *At the end of the unit, the student will be able to*
1. Compare DC vs AC and Under-Ground vs Over - Head Distribution Systems, types of Distribution Systems.
2. Get the knowledge about Design of Distribution Feeders, Voltage Drop and power loss in A.C. Distributors.

(BOS - Chairman)

UNIT-V SUBSTATIONS:

Substations

Classification of substations:

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment.

Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations.

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

1. Learn Substation and types of Substations,
2. Learn various arrangements in Substations.

TEXT BOOKS:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.
3. Non Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.

REFERENCE BOOKS:

1. Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group, 2006.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Principles of Power Systems by V.K. Mehta and Rohit Mehta, S.CHAND & COMPANY LTD., New Delhi 2004.
4. Wind Electrical Systems by S. N. Bhadra, D. Kastha & S. Banerjee – Oxford University, Press, 2013.

(BOS-chairman)

Introduction to Python Programming 19ACS28

(EEE)

B. Tech – IV Semester (R19)

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

OBJECTIVES:

- To introduce object oriented programming using an easy-to-use language.
- To use iterators and generators.
- To test objects and handle changing requirements.
- To be exposed to programming over the web.

UNIT I - INTRODUCTION, DATA TYPES AND EXPRESSIONS

Introduction: Computer science, Computer algorithms, Computer software, The Python programming language, First program in Python.

Data Types and Expressions: Literals, Variables and Identifiers, Operators, Expressions and Data types.

UNIT II - CONTROL STRUCTURES, LISTS

Control Structures: Control structures, Boolean expressions, Selection control and Iterative control.

Lists: List structures, Lists in Python, Iterations over lists, Assigning and copying lists, List comprehensions.

UNIT III – DICTIONARIES, TUPLES AND SETS

Dictionaries, Tuples and Sets: Dictionary types in Python, Implementation of Dictionary, Tuples, Set data type - the Set data type in Python, Implementation of sets.

UNIT IV - DESIGN WITH FUNCTIONS, RECURSION, STRINGS AND TEXT FILES

Program routines, Functions: calling value returning functions, calling non value returning functions, parameter passing, variable scope, Recursion-Recursive functions, Recursive problem solving, Iteration Vs Recursion, Text files: Using text files, String processing, Exception handling.

UNIT V - OBJECTS AND THEIR USE

Objects and Their Use: Software objects: Object, Object References, Turtle graphics-Creating a turtle graphics window, The default turtle, Fundamental turtle attributes and behavior, Additional turtle Attributes, creating multiple turtles.

TEXT BOOKS:

1. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2016.
2. Mark Lutz, "Programming Python," O'Reilly Publications, Fourth Edition, 2011.

REFERENCE BOOK:

1. Kenneth Lambert and B.L. Juneja, *Fundamentals of Python,* Cengage Learning, Third Edition, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

II B.Tech -II Sem **L T P C 3 0 0 3**

ANALOG ELECTRONIC CIRCUITS

Course Objectives:

- List various types of feedback amplifiers, oscillators and large signal Amplifiers.
- Explain the operation of various electronic circuits and linear ICs.
- Apply various types of electronic circuits to solve engineering problems
- Analyse various electronic circuits and regulated power supplies for proper understanding
- Justify choice of transistor configuration in a cascade amplifier.
- Design electronic circuits for a given specification.

Unit 1

Multistage Amplifiers: Classification of amplifiers, different coupling schemes used in amplifiers, general analysis of cascade amplifiers, Choice of transistor configuration in a cascade amplifier, frequency response and analysis of two stage RC coupled and direct coupled amplifiers, principles of Darlington amplifier, Cascode amplifier.

Unit outcomes:

- Name different coupling schemes in amplifiers (L1)
- Explain the principles of Darlington amplifier (L2)
- Apply multistage amplifiers to solve engineering problems (L3)
- Analyse multistage amplifiers (L4)
- Justify choice of transistor configuration in a cascade amplifier (L5)

Unit 2

Feedback Amplifiers: Concepts of Feedback, Classification of Feedback Amplifiers, Transfer Gain with Feedback, General Characteristics of Negative-Feedback Amplifiers, Effect of Feedback on Amplifier characteristics, Analysis of a feedback Amplifiers - Voltage – Series, Current-Series, Current-shunt and Voltage – shunt.

Oscillators

Sinusoidal Oscillators, Conditions for oscillations, Phase - shift Oscillator, Wien Bridge Oscillator, L-C Oscillators (Hartley and Colpitts).

Unit Outcomes:

- Classify feedback amplifiers and oscillators (L1)
- Explain the concept of feedback and conditions for oscillations (L2)

- Apply the feedback amplifiers and oscillators to solve engineering problems (L3)
- Analyse feedback amplifiers and oscillator (L4)

Unit 3

Large Signal Amplifiers (Power Amplifiers): Introduction, Classification, Class A large signal amplifiers, Second - Harmonic Distortion, Higher - Order Harmonic Generations, Transformer Coupled Class A Audio Power Amplifier, Efficiency of Class A, Class B, Class AB Amplifiers, Distortion in Power Amplifiers, Class C Power Amplifier.

Unit Outcomes:

- Classify the large signal amplifiers (L1)
- Explain the operation of different types of large signal amplifiers (L2)
- Apply large signal amplifiers in a given engineering situation (L3)
- Analyse harmonic distortion in large signal amplifiers (L4)

Unit 4: Linear Integrated Circuits:

Operational Amplifier: Introduction, Block diagram, Characteristics and Equivalent circuits of an ideal op-amp, Various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, Inverting and non-inverting amplifier configurations. The Practical op-amp: Introduction, Input offset voltage, Offset current, Thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and Gain – bandwidth product, frequency limitations and compensations, transient response.

Unit Outcomes:

- Understand different Offsets present in Op amp & nullification circuits. (L1)
- Examine performance of Op-Amp in open loop and closed configurations. (L2)
- Analyse emitter-coupled differential amplifier. (L3)
- Compare ideal and practical Op-Amps. (L5)

Unit 5: Applications of Linear Integrated Circuits:

Adder, Integrator, Differentiator, Difference amplifier and Instrumentation amplifier, Converters: Current to voltage and voltage to current converters, Active Filters: First order filters, second order low pass, high pass, band pass and band reject filters, Oscillators: RC phase shift oscillator, Wien bridge oscillator, Square wave generator.

Special Purpose Integrated Circuits: Functional block diagram, working, design and applications of Timer 555 (Monostable & Astable), Functional block diagram, working and applications of VCO 566, PLL 565, Fixed and variable Voltage regulators.

Unit Outcomes:

- Understand various applications of Linear ICs (L1)
- Explain operation of Op. Amp. in various applications, Timer, Fixed voltage

regulators(L2)

- Apply linear ICs in a given engineering situation (L3)

Course outcomes:

On successful completion of the course, the student shall be able to

CO1. List various types of feedback amplifiers, oscillators and large signal amplifiers (L1)
CO2. Explain the operation of various electronic circuits and linear ICs (L2)
CO3. Apply various types of electronic circuits to solve engineering problems (L3)
CO4. Analyse various electronic circuits and regulated power supplies for proper understanding (L4)
CO5. Justify choice of transistor configuration in a cascade amplifier (L5)
CO6. Design electronic circuits for a given specification (L6)

Text Books:

1. Millman, Halkias and Jit, "Electronic Devices and Circuits", 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2015.
2. Salivahanan and N. Suresh Kumar, "Electronic Devices and Circuits", 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2017.
3. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", 4th Edition, Pearson, 2017.

Reference Books:

1. Millman and Taub, Pulse, Digital and Switching Waveforms, 3rd Edition, Tata McGraw- Hill Education, 2011.
2. J. Milliman, C. C. Halkias and Chetan Parikh, "Integrated Electronics", 2nd Edition, Mc Graw Hill, 2010.
3. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford Press, 2008.
4. D. Roy Choudhury, "Linear Integrated Circuits", 2nd Edition,New Age International (p) Ltd, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH II SEM

L	T	C
3	1	4

Performance of Transformer and Induction Machines

Course Objectives:

- To understand the working and performance of transformers
- To understand the working and performance of induction motors
- To understand the design of transformers and induction motos

UNIT-I

Single phase transformers

Introduction – Transformer construction and practical consideration – Transformer on No load – Ideal transformer – Real transformer, exact and approximate equivalent circuits, phasor diagrams – Transformer losses – Transformer testing (polarity, open circuit, short circuit and sumpner's tests) – The per unit system – Power efficiency, energy efficiency, effect of load and power factor on efficiency – voltage regulation - Numerical problems

Learning outcomes:

- Learn about the working of single phase transformer
- Learn about the testing of transformers

UNIT-II

Excitation phenomenon in transformers and switching transients - Auto transformer and its comparison with two winding transformer – Three phase transformer connections (star-star, delta-delta, star-delta, delta-star, delta-zig zag star, star-zig zag star) – phase groups – choice between transformer connections – harmonics – three phase bank of single phase transformers (star/star, delta/delta, star/delta and delta/star) – parallel operation of transformers and load division – three winding transformers and stabilization by teritary winding- Phase conversion (scott connection, three to one phase, three to six phase) – Numerical problems

Learning outcomes:

- Learn about auto transformer
- Learn about different three phase transformer connections
- Learn about parallel operation of transformers

UNIT-III

Induction Motor

Construction – Principle of working, flux and MMF waveforms, slip, rotor MMF, torque production – Equivalent circuit – Power across air gap, torque, power output – torque-slip characteristics for different modes, maximum torque, starting torque, maximum power – Tests (No load test, blocked rotor test, voltage ratio test), separation of losses – Circle diagram – Numerical problems

(BOS - Chairman)

Learning outcomes:

- Learn about the principle of working of Induction motor
- Learn about various tests on Induction motors
- Learn about circle diagram

UNIT-IV

Starting – Starting of squirrel cage induction motors (direct, reduced voltage, stator impedance, auto transformer, star-delta starting methods) - Starting of slip ring induction motors (rotor resistance starting method) – Cogging and crawling – speed control methods - slip control (voltage control, rotor resistance control, slip frequency EMF injection in rotor circuit) – pole changing - Method of consequent poles - pole amplitude modulation – frequency control – Induction generator – working principle – acceleration time of induction machine – Numerical problems

Learning outcomes:

- Learn about of starting methods of Induction motors
- Learn about the speed control of Induction motors

UNIT-V

Transformers – Design

Output of transformer, Design of core, Selection of type of winding, Design of insulation, Overall design, No-load current estimation, Design of tank with tubes-Numerical examples.

Induction Machines – Design

Three phase Induction machine output equation and main dimensions, Selection of stator and rotor slots, Length of air gap, and Reduction of harmonic torques, Hemitropic, whole coil and Mush windings-Numerical examples.

Learning outcomes:

- Learn about design of transformers
- Learn about the design of Induction machines

Text Books:

1. Electrical Machines by I.J. Nagrath & D.P. Kothari, The Mc Graw – Hill companies, 4th Edition, 2010.
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. The performance and design of alternating current machines by M G Say – PB 2002
2. Electrical Machines – S.K. Battacharya, 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: After completion of the course, the student will be able to:

- Understand the working and performance of transformers
- Understand the working and performance of Induction motors
- Understand the design of transformers and Induction motors

(BOS-Chairman)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH II SEM

L	T	C
3	0	3

Electrical and Electronic Measurements

Course Objectives: The student has to acquire knowledge about:

1. The basic principles of different types of electrical instruments for the measurement of voltage, current, power factor, power and energy.
2. The measurements of RLC parameters using bridge principles.
3. The principles of magnetic measurements
4. The principle of working of CRO and its applications

UNIT- I MEASURING INSTRUMENTS

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 the unit, the student will be able to*

1. Understand the operation of different instruments.
2. Know the different types of errors and their compensation
3. Distinguish between MC and MI type of instruments
4. Know how control of torque is required in measurements
5. Solve numerical examples and interchangeability of ammeters as voltmeters and vice- versa

UNIT – II MEASUREMENT OF POWER, POWER FACTOR AND ENERGY

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 the unit, the student will be able to*

1. Understand the working principles and construction of different types of Energy meters
2. Calculate the different parameters of the meters
3. Distinguish between low and high power factor ranges in watt meters
4. Know about occurrence of errors and need for compensation for precise and accurate measurement
5. Distinguish between 3-ϕ power factor meters and Energy meters

UNIT – III INSTRUMENT TRANSFORMERS, POTENTIOMETERS, AND MAGNETIC MEASUREMENTS

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 the unit, the student will be able to*

1. Understand the principles and working of various measuring instruments used to detect electrical circuit parameters R,L,C
2. Design the various voltage and current measuring instruments for the various electric / magnetic field applications
3. Distinguish between CTs and PTs
4. Distinguish between DC and AC potentiometers
5. Identify errors in measurements and to mitigate them for desired precision and accuracy

UNIT – IV D.C & A.C BRIDGES

Method of Measuring Low, Medium and High Resistances – Sensitivity of Wheatstone'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 the unit, the student will be able to*

1. Understand the bridge configurations and their applications for various ranges of resistance measurement
2. Compute the unknown parameters of Inductance using the bridges
3. Compute the unknown parameters of Capacitance using the bridges
4. Be able to select appropriate bridge configuration for measurement of R,L and C

UNIT – V CRO AND DIGITAL METERS

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 Multimeter-Digital Tachometer.

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

1. Understand the operation of CRO and its parts
2. Know about various applications of CRO
3. Understand various Lissajous patterns
4. Know about Digital voltmeters and Distinguish between analog and digital meters
5. Know about measurement of speed using Tachometer and to distinguish between analog and digital ones

TEXT BOOKS:

(BOS- Chairman)

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. Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011.

REFERENCE BOOKS:

1. Electronic Instrumentation by H. S. Kalsi, Tata Mcgrawhill, 3rd Edition, 2011.
2. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, 2010.
3. Electrical & Electronic Measurement & Instrumentation by R. K. Rajput, 2nd Edition, S. Chand & Co., 2nd Edition, 2013.

Course Outcomes:

1. 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
2. Able to analyze and solve the varieties of problems and issues coming up in the vast field of electrical measurements.
3. Analyse the different operation of extension range ammeters and voltmeters, DC and AC bridge for measurement of parameters and different characteristics of periodic and aperiodic signals using CRO.
4. Design and development of various voltage and current measuring meters and the varieties of issues coming up in the field of electrical measurements.

BOS-Chairman

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH II SEM

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DC MACHINES LAB

Learning objectives:

- To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self excitation.
- To control the speed of DC motors.
- To determine and predetermine the performance of DC machines.
- To test DC Generators and Motors

Any 10 of the following experiments are to be conducted

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Load test on DC series generator. Determination of characteristics.
4. Load test on DC compound generator. Determination of characteristics.
5. Brake test on DC shunt motor. Determination of performance curves.
6. Hopkinson's tests on DC shunt machines. Predetermination of efficiency.
7. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
8. Speed control of DC shunt motor by Field and Armature Control.
9. Retardation test on DC shunt motor..
10. Separation of losses in DC shunt motor.
11. Fields test on DC series machines. Determination of efficiency.
12. Brake test on DC compound motor. Determination of performance curves.

Learning outcomes:

After the completion of the course the student should be able to:

- Determine and predetermine the performance of DC machines
- Control the speed of DC motor.

(Bos - Chairman)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF CHEMISTRY
II B.TECH – I/II SEMESTER Mandate Course (MC)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Environmental Science	3	0	-	0

COURSE OBJECTIVES	
1	To make the student understand multi disciplinary nature of environment and its components.
2	To investigate the relationship between human life and environment from scientific prospective.
3	To impart knowledge to the students about fundamental concepts of Ecosystem and Biodiversity
4	Necessasity of analyzing regional, national and global environmental problems
5	To understand and apply the fundamentals of Environmental science to important local, regional, national and global environmental problems and potential issues

COURSE OUTCOMES	
CO1	Able to solve the environmental problems based fundamental concepts of Environmental Science.
CO2	Enable the students to understand the structure and function of significant environmental systems
CO3	Knowledge of concepts makes them differentiate Natural and Polluted environment..
CO4	Enable to apply the Pyramid of number, mass and Energy, understand about Renweable energy resources. Illustrate the Forest ecosystem, Discuss about Grass and Net biomass productivity
CO5	Differentiate between Forest and desert Ecosystems, Critically evaluate arguments regarding environmental issues. Illustrate the Food chain and food web, Identify the applications of rain water harvesting, Interpret advantages of In-situ and Ex-situ conservation of biodiversity

Mapping between Course Outcomes and Programme Outcomes

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

SYLLABUS

UNIT-I:

i) Multidisciplinary nature of environmental studies

The **Multidisciplinary** nature of environmental studies Definition; Scope and importance, Need for public awareness.

ii) Natural Resources:

Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and Over-exploitation, deforestation, case studies. Dams, benefits and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water

c) Earth: Geomorphology, Weathering, Structure of Earth - inner core, outer core, mantle and the crust, magma.

d) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

e) Food resources: World food problems, changes caused by agriculture, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

UNIT-II:

i) Ecosystems

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession. Food chains, food webs and ecological pyramids.

Types of some ecosystems: -

a. Forest ecosystem b. Desert ecosystem

d. Aquatic ecosystems (ponds, rivers, oceans, estuaries).

ii) Biodiversity and its Conservation

Introduction-Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, India as a mega-diversity nation.

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III:

Environmental Pollution and Disaster management:

Definition - Causes, effects and control measures of:

a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution

e. Noise pollution f. Thermal pollution g. Nuclear hazards

Disaster management: floods, earthquake, cyclone and landslides.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

UNIT-IV:

Social Issues and the Environment

From Unsustainable to Sustainable development. Water conservation, rain water harvesting, watershed management.

Resettlement and rehabilitation of people; its problems and concerns. Case studies.

Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

Issues involved in enforcement of environmental legislation. Public awareness.

UNIT-V:

i) Human Population and the Environment

Population growth, variation among nations. Population explosion-Family welfare Programme. Environment and human health, Women and Child Welfare, Role of information Technology in Environment and human health, Case Studies.

ii) Field Work

- Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of simple ecosystems-pond, river, hill slopes, etc.

Text Books:

1. Shashi Chawla, A Text Book of Environmental Studies, Mc Graw Hill Education, 4th edition, 2014

2. De A.K., Environmental Chemistry, Wiley Eastern Ltd , 2012

Reference Books

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad -380013, India, Email: mapin@icenet. net (R).

2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.

3. Cunningham, W.P.Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING PULIVENDULA(AUTONOMOUS) -PIN: 516390(A.P.)

L	T	P	C
2	0	0	2

UNIVERSAL HUMAN VALUES

OBJECTIVES

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of Others

Unit I: HUMAN VALUES

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Self interest - Spirituality, Moral dilemmas- Consensus and controversy.

Unit II: PERSONALITY DEVELOPMENT

Concept of personality, types of personalities, Knowing of self(SWOT), improving personality – techniques, interpersonal skills, intrapersonal skills, building right attitude, developing the spirit of universal human goodness.

Unit III: ENGINEERING AS SOCIAL EXPERIMENTATION AND

Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

RESPONSIBILITY FOR SAFETY AND RISK

Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk- Safety and the Engineer- Designing for the safety.

UNIT IV: UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY.

Understanding Harmony in the family – the basic unit of human interaction, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the harmony

in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family.

UINIT V: GLOBAL ISSUES

Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics and Research – Analyzing Ethical Problems in research – Intellectual property Rights(IPR).

Outcomes:

- Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field.
- Identify the multiple ethical interests at stake in a real-world situation or practice.
- Articulate what makes a particular course of action ethically defensible.
- Assess their own ethical values and the social context of problems.
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects.
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.
- Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

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 McGraw-Hill– 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.
6. **"Indian Culture, Values and Professional Ethics"** by PSR Murthy-BS Publication.

7. **"Professional Ethics and Human Values"** by Prof.D.R.Kiran.

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

II B.Tech II Sem (E.E.E)

ANALOG ELECTRONIC CIRCUITS LAB

Minimum of TEN experiments to be conducted in Hardware and Software (Multisim)

1. Design Common Emitter Amplifier for given specifications. Determine gain and Band width from its frequency response curve.
2. Design Two Stage RC Coupled Amplifier for given specifications. Determine gain and Band width from its frequency response curve.
3. Design Darlington pair Amplifier. Determine gain and Band width from its frequency response curve.
4. Design Voltage Series Feedback Amplifier for given specifications .Determine the effect of feedback on the frequency response of a Voltage Series Feedback Amplifier.
5. Design Hartley and Collpits oscillator for given specifications. Determine the frequency of oscillation.
6. Design RC phase shift oscillator for given specifications. Determine the frequency of oscillation.
7. Design Wien Bridge oscillator for given specifications. Determine the frequency of oscillation.
8. Analyze Class A power amplifier for given specifications. Determine the maximum output power and efficiency.
9. Analyze Class B complementary symmetry power amplifier and observe the output wave form s with and without cross over distortion. Determine the maximum output power and efficiency.
10. Design inverting and non inverting amplifiers for given specifications using OPAMP and verify same experimentally.
11. Design practical Integrator and Differentiator circuits using OPAMP for given specifications. Verify them practically.
12. Design first orders low pass and high pass active filters using OPAMP for given specifications. Verify them practically.
13. Design an Astable multivibrator circuit for given specifications using 555 Timer. Plot the output wave form.
14. Design an square wave generator circuit for given specifications Plot the output wave form.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS12-ENGLISH LANGUAGESKILLS

(Common to EEE , ECE & CSE)

L	T	P	C
3	0	0	3

Course Objectives:

- Facilitate active listening to enable inferential learning through expert lectures and talks
- Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids

UNIT – I: **12 Hrs**

Listening: Listening to famous speeches for structure and style
Speaking: Oral presentations on general topics of interest.
Reading: Reading for meaning and pleasure – reading between the lines.
Writing: Appreciating and analyzing a poem –Paraphrasing, note-taking.
Grammar and Vocabulary: Tenses (Advanced Level) Correcting errors in punctuation -Word roots and affixes.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the purpose of rhythm and rhyme and the use of figures of speech in making the presentation lively and attractive. **L1**
- Apply the knowledge of structure and style in a presentation, identify the audience and make note of key points. **L2**

UNIT – II: **12 Hrs**

Listening: Following the development of theme; answering questions on key concepts after listening to stories online.
Speaking: Narrating personal experiences and opinions.
Reading: Reading for summarizing and paraphrasing; recognizing the difference between facts and opinions.
Writing: Summarizing, precis writing, letter and note-making
Grammar and Vocabulary: Subject-verb agreement, noun-pronoun agreement, collocations.
Learning Outcomes:

- At the end of this unit, the student will be able to
- Make formal structured presentations on academic topics. **L1**
- Use correct English avoiding common errors in formal speech and writing. **L2**

UNIT – III: **12 Hrs**

Listening: Identifying views and opinions expressed by different speakers while listening to speeches.
Speaking: Small talks on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.
Reading: Identifying claims, evidences, views, opinions and stance/position.
Writing: Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences.
Grammar and Vocabulary: The use of Active and passive Voice, vocabulary for academic texts.
Learning Outcomes:
At the end of this unit, the student will be able to

- Participate in group discussions using appropriate conventions and language. Strategies. **L1**
- Use appropriate vocabulary to express ideas and opinions. **L2**

UNIT – IV **12 Hrs**

Listening: Listening to identify important moments - Understanding inferences; processing of information using specific context clues from the audio.

Speaking: Group discussion; reaching consensus in group work (academic context).

Reading: Reading for inferential comprehension.

Writing: Applying for internship/ job - Writing one's CV/Resume and cover letter.

Grammar and Vocabulary: Phrasal verbs, phrasal prepositions and technical vocabulary.

Learning Outcomes:

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

- Express thoughts and ideas with acceptable accuracy and fluency **L1**
- Draw inferences and conclusions using prior knowledge and verbal cues **L2**

UNIT – V **12 Hrs**

Listening: Understanding inferences - processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge.

Speaking: Formal team presentations on academic/ general topics.

Reading: Intensive and extensive reading.

Writing: Structure and contents of a Report – Abstract – Project report features.

Grammar and Vocabulary: Correcting common errors, improving vocabulary and avoiding cliches and jargons.

Learning Outcomes:

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

- Develop advanced listening skills for in-depth understanding of academic texts. **L1**
- Collaborate with a partner to make effective presentations. **L2**

Text Books:

1. "Forging Ahead": A Course Book for B.Tech Students. Orient BlackSwan,2020.
2. Meenakshi Raman &Sangeeta Sharma, "Technical Communication" O U Press2009.

Reference Books:

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

Course Outcomes:

- At the end of this Course the student will be able to
- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English. **L1**
- Apply grammatical structures to formulate sentences and correct word forms **L2**
- Analyze discourse markers to speak clearly on a specific topic in informal discussions. **L3**
- Evaluate reading/listening texts and to write summaries based on global comprehension of the setexts. **L4**
- Create a coherent paragraph interpreting a figure/graph/chart/table. **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE51- 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

19AEE52- 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 AND MODELING **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. 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

- Determine resistance , inductance and Capacitance of transmission line **L1**
- Learn about classification of transmission lines and their modeling. **L2**

UNIT – II: 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 – III: 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 – IV: ILLUMINATION and ELECTRIC HEATING **10 Hrs**

Definition –Laws of Illumination–Polar Curves – Calculation of MHCP and MSCP. Requirement of Good Lighting Scheme – Types, Design and Calculation of Illumination. Street Lighting and Factory Lighting – Numerical Problems. Electrical Heating: Advantages. Methods of Electric Heating – Resistance, Arc, Induction and Dielectric Heating. Electric Welding: Types – Resistance, Electric Arc, Gas Welding. Ultrasonic, Welding Electrodes of Various Metals, Defects in Welding.

Learning Outcomes:

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

- Design lightning Scheme and Methods of Electric Heating **L1**
- Compare various types of Electric Welding **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 most appropriate heating & welding techniques for suitable applications and design the levels of illumination based on the applications **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

19AEE53- POWER ELECTRONICS

L	T	P	C
3	1	0	4

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 I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE54a- ELECTRICAL DISTRIBUTION SYSTEMS

(Professional Elective-I)

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 III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE54b- ADVANCED CONTROL SYSTEMS

(Professional Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- To give an overview of system analysis and design based on state space.
- Design of state feedback control and observer.
- The properties of Nonlinearities. Stability analysis for linear and nonlinear systems.
- Design of optimal control problem.

UNIT – I: STATE VARIABLE DESCRIPTION **10 Hrs**

State space representation of systems – State diagrams for continuous time state models – Solution of state equations – State transmission matrix. Controllability and observability for continuous time systems, Principle of Duality, Controllability and observability of state models in Jordan canonical form and other canonical forms – Numerical problems Learning Outcomes: At the end of the unit the student will be able to: Obtain the State Space Modelling for linear time-invariant systems. Know about controllability of a system Know about observability of a system To understand tests for controllability and observability of a given system.

Learning Outcomes:

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

- Obtain the State Space Modelling for linear time-invariant systems. **L1**
- To understand tests for controllability and observability of a given system. **L2**

UNIT – II: POLE PLACEMENT OBSER **10 Hrs**

Fundamental theorem of feedback control - Pole assignment by state feedback using Ackermann's formula – Eigen structure assignment problem-Design of full order observer using Ackermann's formula. - Full order Observer based controller design. Reduced order observer design - Numerical problems

Learning Outcomes:

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

- To know about design of pole assignment **L1**
- To know about full order based controller design aspects **L2**

UNIT – III: DESCRIBING FUNCTION AND PHASE-PLANE ANALYSIS **10 Hrs**

Introduction to nonlinear systems, Types of nonlinearities, Concepts of describing functions, describing functions for Dead zone, Saturation, backlash, relay with dead zone and Hysteresis - Jump Resonance. Introduction to phaseplane analysis, Method of Isoclines for Constructing Trajectories, Singular points, Phase-plane analysis of nonlinear control systems – Numerical problems

Learning Outcomes:

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

- Develop the describing function for the nonlinearity present to assess the stability of the system **L1**
- To understand about classification of describing functions **L2**

UNIT – IV: STABILITY ANALYSIS **10 Hrs**

Stability in the sense of Lyapunov. Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems – Numerical problems.

Learning Outcomes:

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

- Develop Lyapunov function for the stability analysis of nonlinear systems **L1**
- To understand and solve direct method of Lyapunov with numerical examples **L2**

UNIT – V: OPTIMAL CONTROL **10 Hrs**

Discrete time linear state regulator – Algorithm for the solution, Use of observer in implementing the control law. Continuous time linear state regulator – Matrix Riccati equation. Time invariant linear state regulator – the reduced matrix Riccati equation - An iterative method to solve the reduced matrix Riccati equation – Numerical problems

Learning Outcomes:

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

- Introduction to optimal control **L1**
- To know about discrete and continuous time linear state regulators **L2**

Text Books:

1. M. Gopal, "Modern Control System Theory" 2nd edition, New Age International Publishers, 1996
2. K. Ogata, "Modern Control Engineering" 3rd edition, Prentice Hall of India, 1998

Reference Books:

1. M. Gopal, "Digital Control and State Variable Methods" Tata Mc Graw-Hill, 1997.
2. Gene F. Franklin, "Feedback Control of Dynamic Systems", 6th Edition, J.D. Powell, Pearson, 2010.
3. Stainslaw H. Zak , "Systems and Control", Oxford Press, 2003
4. N. K. Sinha, "Control Systems", 3rd Edition, New Age International, 2005.
5. Graham C. Goodwin, "Control System Design", Stefan F. Graebe and Mario E. Salgado, Pearson, 2000

Course Outcomes:

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

- To develop state variable models and its solution for various systems **L1**
- To understand and develop models for full order and reduced order based observers **L2**
- To know about describing function and analyse systems **L3**
- To understand about phase plane analysis of non-linear control systems **L4**
- To understand and develop models for Lyapunov's stability criterion **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE54c- 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

19AHS10-CAMPUS RECRUITMENT TRAINING & SOFT SKILLS

(Open Elective-I)

L	T	P	C
3	0	0	3

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 Developments. 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**

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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't 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 **CornerstoneDeveloping 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 I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS20-MATHEMATICAL MODELING

(Open Elective -I)

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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B.Tech III year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS21-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, Characteristics and Significance of the Paradigm Shift.

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 , Fuzzy Relation Equations Based on Sup-i Compositions , Fuzzy Relation Equations Based on Inf- ω_i Compositions

Possibility Theory:

Fuzzy Measures, Evidence Theory, Possibility Theory, Fuzzy Sets and Possibility 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, Multivalued 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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B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS22-NUMBER THEORY

(Open Elective -I)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing the basic knowledge

- To understand basic concepts of Number theory and
- To analyze the applications of Riemann Zeta Function and Dirichlet L Function of Number theory related to real word problems of engineering, biological science etc.

UNIT – 1: Divisibility and Primes & Congruences **9 Hrs**

Divisibility and Primes:

Division algorithm, Euclid's algorithm for the greatest common divisor- Linear Diophantine equations - Prime numbers, fundamental theorem of arithmetic, infinitude of primes- Distribution of primes, twin primes, Goldbach conjecture - Fermat and Mersenne primes - Primality testing and factorization.

Congruences:

Modular arithmetic- Linear congruences- Simultaneous linear congruences, Chinese Remainder Theorem- An extension of Chinese Remainder Theorem (with non-coprime moduli).

Learning Outcomes:

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

- Learn Division algorithm, Euclid's algorithm etc. **L2**
- Analyze linear congruences- Simultaneous linear congruences, and Chinese Remainder Theorem. **L3**

UNIT – II: Congruences with a Prime-Power Modulus, Euler's Function and RSA Cryptosystem, and Units Modulo an Integer

Congruences with a Prime-Power Modulus:

Arithmetic modulo p, Fermat's little theorem, Wilson's theorem - Pseudo-primes and Carmichael numbers- Solving congruences modulo prime powers.

Euler's Function and RSA Cryptosystem:

Definition of Euler function, examples and properties - Multiplicative property of Euler's function - RSA cryptography.

Units Modulo an Integer:

The group of units modulo an integer, primitive roots- Existence of primitive roots.

Learning Outcomes:

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

- Analyze the Congruences with a Prime-Power Modulus **L3**
- Analyze the Euler's Function, RSA Cryptosystem and Units Modulo an Integer **L4**

UNIT – III: Quadratic Residues and Quadratic Forms

Quadratic residues, Legendre symbol, Euler's criterion- Gauss lemma, law of quadratic reciprocity- Quadratic residues for prime-power moduli and arbitrary moduli- Binary quadratic forms, equivalent forms- Discriminant, principal forms, positive definite forms, indefinite forms- Representation of a number by a form, examples- Reduction of positive definite forms, reduced forms- Number of proper representations, automorph, class number.

Learning Outcomes:

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

- Analyze the Quadratic residues **L3**
- Analyze the Quadratic Forms **L4**

UNIT – IV: Sum of Powers, Continued Fractions and Pell's Equation

Sum of Powers:

Sum of two squares, sum of three squares, Waring's problem- Sum of four squares-Fermat's Last Theorem.

Continued Fractions and Pell's Equation:

Finite continued fractions, recurrence relation, Euler's rule- Convergents, infinite continued fractions, representation of irrational numbers- Periodic continued fractions and quadratic irrationals- Solution of Pell's equation by continued fractions.

Learning Outcomes:

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

- Compute sum of powers and learn Fermat's last theorem. **L3**
- Solve Pell's equation by continued fractions **L4**

UNIT – V: Arithmetic Functions, The Riemann Zeta Function and Dirichlet L Function

Arithmetic Functions:

Definition and examples, multiplicative functions and their properties- Perfect numbers, Mobius function and its properties- Mobius inversion formula- Convolution of arithmetic functions.

The Riemann Zeta Function and Dirichlet L Function:

Historical background for the Riemann Zeta function, Euler product formula, convergence. - Applications to prime numbers- Dirichlet L-functions, Products of two Dirichlet L functions, Euler product formula.

Learning Outcomes:

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

- Analyze the arithmetic functions **L3**
- Analyze the Riemann Zeta function and its Applications to prime numbers **L4**

Text Books:

1. G. A. Jones & J.M. Jones, Elementary Number Theory, Springer UTM, 2007.
2. Niven, H. S. Zuckerman & H.L. Montgomery, Introduction to the Theory of Numbers, Wiley, 2000.
3. D. Burton; Elementary Number Theory, McGraw-Hill, 2005

Reference Books:

1. Tom M. Apostol, Introduction to Analytical Number theory, Narosa Publishing house, 1998.
2. Elementary number theory and its applications, BEL laboratories.

Course Outcomes:

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

- Understand the basic concepts such as Learn Division algorithm, Euclid's algorithm etc. **L1**
- Analyze the Congruences with a Prime-Power Modulus and RSA Cryptosystem. **L2**
- Analyze the Quadratic residues and Quadratic forms. **L3**
- Solve Pell's equation by continued fractions **L4**
- Analyze the real word problem through the technique of Number theory. **L5**

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B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS31-SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- To provide exposure to various kinds of sensors, actuators and their Engineering applications.
- Capable of understanding the principles and physics of various kinds of sensors from macro to micro/nano level.

UNIT – 1: Introduction to sensors **9 Hrs**

Content of the Unit – I

Sensors, Sensor systems, Nanosensors, -Types of sensors(based on Functions, temperature, pressure, strain, ranging and motion, time- active and passive sensors). Materials used and their fabrication process (Deposition, Pattern and Etching), General characteristics of sensors. Actuators, Functional diagram of actuators, Design of Actuators, Types of actuators (Hydraulic, Pneumatic, Mechanical, Electromagnetic, EAP and EM actuators). Applications of Actuators.

Learning Outcomes:

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

- Classify different types of Sensors, Actuators and their characteristics
- Identifies the applications of Actuators in different fields
- Explain about different fabrication process of Sensors
- Illustrate functional diagram of Actuators

UNIT – II: Mechanical sensors **9 Hrs**

Content of the Unit – II

Principles of mechanical sensors (piezoresistivity, piezoelectricity, capacitive, inductive and resonant techniques), Displacement sensors, velocity sensors, Torque sensors, flow sensors, Micro and nanosensors, Multimodal nanosensors.

Learning Outcomes:

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

- Summarize various types of Mechanical sensors
- Explain the working principle of different types mechanical sensors
- Identifies the applications of Mechanical sensors in different environmental conditions
- Understand the basic concepts of micro and nano sensors

UNIT – III: Thermal sensors and Magnetic sensors **9 Hrs**

Content of the Unit – III

Introduction – Principles of Thermal sensors, Thermocouples, Types of thermocouples, Bi-metallic thermometer, Resistance Temperature Detectors (RTD), Advantages and Applications of these temperature sensors.

Introduction, Difference between conventional and magnetic sensors, Types of magnetic sensors (Low field, Earth field and BIAS magnetic field sensors), Working of variable reluctance sensors, Inductive sensors (LVDT), Eddy current sensors, Hall effect sensors, Applications of magnetic sensors.

Learning Outcomes:

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

- Analyse the difference between conventional sensors and magnetic sensors
- Explain the working principle of different magnetic sensors
- Identifies the applications of Thermal and Magnetic sensors
- Summarize various types of thermal and magnetic sensors

UNIT – IV: Electronic and Optical Sensors-I **9 Hrs**

Content of the Unit – IV

Introduction, Block diagram of electronic sensor system, Microelectronic sensors, semiconductor strain gauge, Gas sensors – Basic principle and working, Applications of electronic sensors – Electronic nose. Optical system components, Solid state optical systems, Optical radiation sources.

Learning Outcomes:

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

- Explain the working and principle of various electronic and optical sensors
- Explain the block diagram of electronic sensor system
- Identifies the applications Electronic sensors in various fields
- Identify the various optical, solid state system components

UNIT – V: Electronic and Optical Sensors –II **9 Hrs**

Content of the Unit – V

Optical system components, Solid state optical systems, Optical transmitter and filters type (Geometrical optics, Fiber optics, optical Filters), Solid state photoelectric sensors, Photoconductive cells, Photo junction sensors, photon couplers, Example: MEMS transducers, Sensors calibration and compensation.

Learning Outcomes:

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

- Understand the optical system components and solid state optical systems
- Classify different types of Optical filters
- Explain the solid state photoelectric sensors, photo junction sensors and photoconductive cells
- Understand basics of MEMS transducers, sensors calibration and compensation

Text Books:

1. Sensors and Signal Conditioning Wiley-Blackwell, 2008 Jacob Fraden,
2. Piezoelectric Sensors and Actuators: Fundamentals and Applications, Springer,2018Senturia S. D.

Reference Books:

1. Doebelin, "Measurement Systems: Application and Design", McGraw Hill Kogakusha Ltd.
2. Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim "Microsensors, MEMS and Smart Devices", New York: Wiley, 2001.
3. Henry Bolte, "Sensors – A Comprehensive Sensors", John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Microsystem Design, Kluwer Academic Publisher, 2001 J.D. Plummer, M.D. Deal, P.G. Griffin

Course Outcomes:

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

- recognize the need of sensors
- types of sensors which they will able to utilize for the concerned engineering application

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS32-PHYSICS OF ELECTRONIC MATERIALS

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- Be able to explain the fundamentals of materials.
- Be able to explain the kinds of semiconductor materials, their physical properties, and their applications.
- Be able to explain the kinds of magnetic materials, their physical properties, advances and their applications.
- Be able to explain the kinds of dielectric materials, their physical properties, advances and their applications.

UNIT – 1: Fundamentals of Materials **9 Hrs**

Content of the Unit – I

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Elementary idea of point, line and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RT and glow discharge).

Learning Outcomes:

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

- Understand the basic concepts of Phase and Phase diagram
- Understand the straight forward information of Nucleation and Growth
- Explain the preparation and deposition of Thin film using various methods
- Illustrate the methods of Crystal growth
- Summarize the different defects in crystal growth

UNIT – II: Semiconductors **9 Hrs**

Content of the Unit – II

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, diffusion length, diffusion and recombination. The Fermi level & Fermi dirac distribution, Temperature dependence of carrier concentration, Invariance of the Fermi level at equilibrium. Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Transistors, MOSFETs.

Learning Outcomes:

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

- Understand the basics concepts regarding drift, diffusion, diffusion length and recombination.
- Classifies the energy bands of a Semiconductors
- Analyse how the position of the fermi level changes with carrier concentration and temperature.
- Explain the concepts regarding PN junctions, Transistors and MOSFETs.

UNIT – III: Optoelectronics **9 Hrs**

Content of the Unit – III

Introduction, Optoelectronic concepts, Hetrostructure p-n junction, Schottky junction and Ohmic contacts, Light emission and absorption, amplification and modulation in semiconductors, Semiconductor Light sources [Light emitting diodes (LEDs) , LASER, vertical cavity surface emitting laser (VCSEL), Quantum well laser {device structure – characteristics – Materials and applications}] and semiconductor Photo detectors [General Characteristics, Responsivity and Impulse response, photoconductors, semiconductor photodiodes].

Learning Outcomes:

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

- Understand the basic concepts of PN junction and Schottky junction

- Explain about absorption, emission, amplification and modulation
- Illustrate various semiconductor light sources and their structure
- Identifies the characteristics and applications of optoelectronic devices
- Elucidate semiconductor photodetectors

UNIT – IV: Dielectric Materials and their applications **9 Hrs**

Content of the Unit – IV

Introduction, Dielectric properties, Electronic polarisability and susceptibility, dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties.

Learning Outcomes:

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

- Understand the concepts of dielectric constant, polarisability, susceptibility
- Describe how the polarisation of the dielectric constant depends on the frequecy
- Explain about dielectric strength and dielectric loss
- Comprehend dielectric and piezoelectric properties

UNIT – V: Magnetic Materials and their applications **9 Hrs**

Content of the Unit – V

Introduction, Magnetism & various contributions to para and dia magnetism, Fero and Ferri magnetism and ferrites, concepts of Spin waves and Magnons, antiferromagnetism, domains and domain walls, coercive force, hysteresis, Nanomagnetism, Superparamagnetism – Properties and applications.

Learning Outcomes:

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

- Differentiate different types of magnetic materials depending upon their properties
- Understand the concepts of Spin waves and Magnons
- Interpret the concepts of domains and domain walls
- Explain about the properties of Nanomagnetism, Super paramagnetism
- Identify the applications of magnetic materials

Text Books:

1. S.O. Kasap Principles of Electronic Materials and Devices, 3rd edition, McGraw-Hill Education (India) Pvt. Ltd., 2007.
2. Electrical Engineering Materials",by A.J. Dekker, PHI Pub.
3. "Electronic Components and Materials" Grover and Jamwal, DhanpatRai and Co.

Reference Books:

1. B.G. Streetman and S. Banerjee, Solid State Electronic Devices, 6th edition, PHI Learning,
2. Eugene A. Irene, Electronic Materials Science, Wiley, 2005
3. Wei Gao, Zhengwei Li, Nigel Sammes, An Introduction to Electronic Materials for Engineers, 2nd Edition, World Scientific Publishing Co. Pvt. Ltd., 2011
4. W D Callister, Materials Science and Engineering – An Introduction, Jr., John Willey and Sons, Inc, New York, 7th edition, 2007.
5. "A First Course In Material Science" by Raghvan, McGraw Hill Pub.
6. "Solid State Physics" by S.O.Pillai,New Age Publication.
7. 'The Science and Engineering of materials' by Donald R.Askeland,Chapman& Hall Pub.

Course Outcomes:

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

- Recognize the need of semiconductors
- Dielectric and magnetic materials which they will able to utilize for the concerned engineering application

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS41-CHEMISTRY OF ENERGY MATERIALS

(Open Elective-I)

L	T	P	C
3	0	0	3

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
- Necessasity 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 – 1: Electrochemical Systems **9 Hrs**

Galvanic cell, standard electrode potential, application of EMF, Electrode mechanism, polarization, 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

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

- 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
- Classify the fuel cell L2

UNIT – III: Hydrogen Storage

Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures (Carbon nano tubes, fullerenes), metal oxide porous structures, hydrogen storage by high pressure methods. Liquefaction method

Learning Outcomes:

At the end of this unit, 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

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:

At the end of this unit, 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: Photo and Photoelectrochemical Conversions

Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

Learning Outcomes:

At the end of this unit, 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 L2

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

19ABS42-ADVANCED POLYMERS AND THEIR APPLICATIONS

(Open Elective-I)

L	T	P	C
3	0	0	3

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 – 1: 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, radical chain, ionic and coordination copolymerization, Zeigler-Natta and Ring opening metathesis polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers, 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

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

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:

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

- Describe the properties and applications of polymers **L2**

- Interpret the properties of cellulose, lignin, starch, rosin, latex etc., **L2**
- Discuss the special plastics of PES, PAES, PEEK etc., **L3**
- Explain modified cellulosics **L2**

UNIT – IV: Hydrogels of Polymer networks and Drug delivery

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, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

Learning Outcomes:

At the end of this unit, 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: Surface phenomena

Surface tension, adsorption on solids, electrical phenomena at interfaces including electro-kinetics, micelles, reverse micelles, solubilization. XPS principle-application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

Learning Outcomes:

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

- Demonstrate electrical phenomena at interfaces including electrokinetics, miselles, reverse micelles etc., **L3**
- Explain photoelectron spectroscopy **L2**
- Discuss ESCA and Auger spectroscopy to the study of surfaces **L3**
- Differentiate micelles and reverse micelles **L2**

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**
- Characterize polymers materials using XPS. **L2**
- Analyze surface phenomenon of micelles and characterize using photoelectron spectroscopy, ESCA and Auger spectroscopy. **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS43-Marine Chemistry

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- To classify the different dissolved gases in sea water.
- To predict the role of biological processes in affecting oceanic carbonate system.
- To describe chemical and pharmacological properties of bioactive substances in marine organisms.
- To determine micro-nutrient elements (N, P, Si) in seawater.
- To identify dissolved elements in the estuary.

UNIT – 1: Dissolved gases in seawater **9 Hrs**

Dissolution of gases in seawater and their solubility; classification of dissolved gases and factors affecting their concentration in seawater; distribution of dissolved oxygen in seawater and affecting factors, Apparent Oxygen Utilization (AOU) and oxygen minimum zone formation in the ocean, origin and consequences of ocean hypoxia, Methane hydrate, clathrates

Learning Outcomes:

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

- Explain the factors affecting on the dissolution of gases **L1**
- Understand apparent oxygen utilization and ozygen minimum zone formation in ocean. **L1**
- Compare the distribution of dissolved gaseous in sea water **L4**
- Analyze origin and consequences of ocean hypoxia, methane hydrate and clathrates **L3**

UNIT – II: : Carbonate systems in the ocean

Acid base equilibria in seawater, carbon dioxide system – absorption of carbon dioxide, carbon cycle; parameters of carbonate systems and their distribution in the ocean; role of biological processes in affecting oceanic carbonate system; precipitation and dissolution of calcium carbonate in seawater, lysocline and carbonate compensation depth; Ocean acidification

Learning Outcomes:

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

- Understand the basic principle of acid-base equibria in sea water **L1**
- Explain the concept of carbon cycle **L1**
- Lists the various biological process in affecting oceanic carbonate, pptn and dissolution **L1**
- Analyze the parameters of carbonate system in oceanic water **L3**

UNIT – III: Chemistry of marine natural products

Biomedical aspects; chemical and pharmacological properties of bioactive substances in marine organisms, carbohydrates and their derivatives in red and brown algae, aliphatic acids and their derivatives in marine organisms, steroids and their use as biomarkers, nitrogenous compounds in invertebrates, nucleosides from sponges, biopolymer

Learning Outcomes:

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

- Understand the chemical and pharmacological properties of bioactive substances in marine organism **L1**
- Explain the steroids and their use as biomarkers **L2**
- List the chemical properties in nitrogenous compounds in invertebrates **L1**

UNIT – IV: Micronutrients in seawater

Micro-nutrient elements (N, P, Si) in seawater, their forms, distribution and seasonal variation in the ocean. Stoichiometry of uptake and regeneration of nutrients elements and Apparent Oxygen Utilization (AOU)

Learning Outcomes:

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

- List the micro-nutrients in sea water **L1**
- Understand the stoichiometry of uptake and regeneration of nutrients **L1**
- Differentiate the distribution of micronutrients with seasonal variation in the ocean **L2**

UNIT – V: Estuarine chemistry

Behavior of dissolved and particulate material during estuarine mixing, interaction among them and speciation of dissolved elements in the estuary; physico-chemical characteristics of estuarine sediment, anoxic sediments and pore water; heavy metals in estuaries and the processes affecting their distribution

Learning Outcomes:

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

- Understand the behavior of dissolved and particulate matter in estuarine system **L1**
- Analyze the physicochemical characteristics of estuarine system **L3**
- Differentiate the effect of heavy metals in estuaries and affecting in distribution **L2**

Text Books:

1. Riley, J.P. and Chester, R., Introduction to Marine Chemistry, Academic Press, 1971.
2. Chester, R., Marine Geochemistry, Blackwell Science, 1990, 2000

Reference Books:

1. Riley, J.P., Skirrow, G, Chemical Oceanography (Vol.1,2, 3), Academic Press, 1975.
2. Horne, R.A, Marine Chemistry - The Structure of Water and the Chemistry of the Hydrosphere, 1969 Wiley- Interscience.
3. Seawater: Its composition, properties & behaviour, 2nd Edn, The Open University Team, 1989
4. Martin, D.F., Marcel Dekker, Marine Chemistry (Vol.2), 2nd Edition, Academic Press, NY, 1970.
5. Broecker and Peng, Tracers in the Sea, Lamont-Doherty Geological Observatory, 1982, NY.
6. Chemical Oceanography, 1992 – Millero, F. J. and Sohn, M.L., CRC Press
7. Burton et al., Dynamic processes in the chemistry of the upper ocean, Plenum Press, 1986.
8. Heinrich D Holland, The Chemistry of the Atmosphere and Oceans, John Wiley & sons Inc, 1978.

Course Outcomes:

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

- List the various dissolved gases in sea water and factors affecting their. **L1**
- Demonstrate knowledge of concepts and principles of ocean acidification. Analyse and evaluate biomedical aspects of marine natural products. **L2**
- Integrate and apply the knowledge of stoichiometry of uptake and regeneration of nutrients elements. **L3**
- Reflect on the influence heavy metals in estuaries. **L4**
- Evaluate total findings in marine chemistry to solve engineering problems **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE55a-AIR POLLUTION AND CONTROL

(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 teach the basics of air pollution
- To impart the behavior of air due to metrological influence
- To throw light on air quality management
- To teach the design of air pollution control methods

UNIT – I:

INTRODUCTION : Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources.

EFFECTS OF AIR POLLUTION : Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holesetc.

Learning Outcomes:

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

- Learn the basics of air pollutants.
- Estimate the impact of air pollution

UNIT – II:

THERMODYNAMIC OF AIR POLLUTION: Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like Sox, Nox, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion.

PLUME BEHAVIOUR : Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rosediagrams.

Learning Outcomes:

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

- Study properties of atmosphere
- Learn plume behavior in different environmental conditions
- Analyse and compute the parameters of air pollutants
- Evaluate procedures for control of pollution

UNIT – III:

POLLUTANT DISPERSION MODELS : Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

CONTROL OF PARTICULATES : Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control, Equipment"s – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

Learning Outcomes:

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

- Learn the design principles of particulate control.
- Learn and design pollutant dispersion models

UNIT – IV:

CONTROL OF GASEOUS POLLUTANTS : General Methods of Control of Nox and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Learning Outcomes:

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

- Learn the design principles of gaseous control.
- Develop environmental friendly fuels and study their properties.

UNIT – V:

AIR QUALITY MANAGEMENT : Air Quality Management – Monitoring of SPM, SO; NO and CO Emission Standards.

Learning Outcomes:

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

- Study the air quality management.
- Visualize emissions and their permissible standards

Text Books:

1. Air Quality by Thodgodish, Levis Publishers, Special India Edition, NewDelhi
2. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw HillCompany.
3. Air pollution by Wark and Warner.- Harper & Row, NewYork.

Reference Books:

1. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S.Publications
2. Air Pollution and Control by K.V.S.G.Murali Krishna, Kousal& Co. Publications, New Delhi.
3. Enivronmental meteorology by S.Padmanabhammurthy ,I.K.InternationalsPvtLtd,New Delhi

Course Outcomes:

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

- Evaluating the ambient air quality based on the analysis of air pollutants
- Design particulate and gaseous control measures for an industry
- Judge the plume behavior in a prevailing environmental condition
- Estimate carbon credits for various day to day activities

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE55b-GREEN BUILDINGS

(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

- Learn the principles of planning and orientation ofgreen buildings.
- Acquire knowledge on various aspects of green buildings

UNIT – I:

Introduction:ConceptofGreenBuilding,NeedforGreenBuilding,Benefitsof' Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing a Green Building, Important Sustainable features for Green Building,

Learning Outcomes:

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

- Understand need for green building
- Obtain knowledge on features of green building

UNIT – II:

Green Building Concepts and Practices: Indian Green Building Council,Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation;

Green **Building** Opportunities And **Benefits:** Opportunities of Green Building, Green BuildingFeatures,MaterialandResources,WaterEfficiency,OptimumEnergyEfficiency, Typical Energy Saving Approach in Buildings, LEED India Rating System and Energy Efficiency,

Learning Outcomes:

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

- Knowledge on benefits and energy efficiency of green buildings
- Knowledge on practices and concepts of green buildings

UNIT – III:

Green Building Design Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximise System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources. Ecofriendly captive power generation for factory, Building requirement,

Learning Outcomes:

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

- Learn steps in design of green buildings
- Learn how renewable energy resources are used in green buildings

UNIT – IV:

Air Conditioning Introduction, CII Godrej Green business centre, Design philosophy, Design interventions, Energy modeling, HVAC System design, Chiller selection,pump selection, Selection of cooling towers, Selection of air handing units, Precooling of fresh air, Interior lighting system, Key feature of the building. Eco- friendly captive power generation for factory, Building requirement.

Learning Outcomes:

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

- Learn designing of air conditioning in green building

UNIT – V:

Material Conservation Handling of non process waste, waste reduction during construction, materials with recycled content, local materials, material reuse, certified wood, Rapidly renewable building materials and furniture; Indoor Environment Quality And Occupational Health: Air conditioning, Indoor air quality, Sick building syndrome, Tobacco smoke control, Minimum fresh air requirements avoid use of asbestos in the building, improved fresh air ventilation, Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels

Learning Outcomes:

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

- Suggest materials and technologies to improve energy efficiency of building.

Text Books:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers,2009.
2. Green Building Hand Book by Tomwoolley and Samkimings,2009.

Reference Books:

1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009

Course Outcomes:

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

- Explain the principles of green buildings , its byelaws
- Understand the concepts of design of green buildings and material conversation in green buildings
- knowledge on rating systems of green buildings
- Suggest materials and technologies to improve energy efficiency of building.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE55c-BASICS OF CIVIL ENGINEERING MATERIALS AND CONSTRUCTION PRACTICE

(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 provide an insight and inculcate the essentials of Civil Engineering discipline to the students of all branches of Engineering
- to provide the students an illustration of the significance of the Civil Engineering Profession in satisfying the societal needs.

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

Learning Outcomes:

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

- learn different types of buildings as per NBC and their components and function
- learn how to select different type of buildings sites

UNIT – II:

Site plan, Orientation of a building, Open space requirements, Position of doors and windows, Size of rooms; Preparation of a scaled sketch of the plan of a single 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.

Learning Outcomes:

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

- .learn site plans and orientation of buildings.
- learn setting out a building and preparation of scaled sketch of building plans

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

Learning Outcomes:

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

- learn principles and objectives of surveying.
- learn instruments used in surveying and application in field

UNIT – IV:

Building materials: Bricks, cement blocks - Properties and specifications.Cement – OPC, properties, grades; other types of cement and its uses (in brief). Cement mortar – constituents, preparation. Concrete – PCC and RCC – grades. Steel - Use of steel in building construction, types and market forms.

Learning Outcomes:

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

- learn basic civil engineering materials (bricks, cement, cement mortar, cement concrete)
- learn about steel and use of steel in building construction

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).

Learning Outcomes:

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

- learn foundations, SBC and theirs functions.
- learn about brick masonry(header, stretcher bond and english bond).
- learn roofs, floors and their materials

Text Books:

1. Rangwala, S. C., Essentials of Civil Engineering, Charotar Publishing House
2. Rangwala, S. C. and Dalal, K. B., Engineering Materials, Charotar Publishing house
3. Rangwala, S. C. and Dalal, K. B., Building Construction, Charotar Publishing house
4. 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.

Reference Books:

Course Outcomes:

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

- Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
- Explain different types of buildings, building components, building materials and building construction
- Describe the importance, objectives and principles of surveying.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55a – INTRODUCTION TO HYBRID AND ELECTRICAL VEHICLES

(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

- Provide good foundation on hybrid and electrical vehicles.
- To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles.
- Familiarize energy storage systems for electrical and hybrid transportation.
- To design and develop basic schemes of electric vehicles and hybrid electric vehicles.

UNIT I: Electric Vehicle Propulsion And Energy Sources **12 hours**

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. Battery modeling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Lipolymer battery.

Learning Outcomes:

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

- Summaries the concepts of electrical vehicle propulsion and energy sources. **L2**
- Identify the types of power sources for electrical vehicles **L3**
- Demonstrate the design considerations for propulsion system. **L2**
- Solve the problems on tractive power and energy required. **L3**

UNIT II: Electric Vehicle Power Plant And Drives **10 hours**

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives- PWM, current control method. Switch reluctance machine drives - voltage control, current control.

Learning Outcomes:

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

- Choose a suitable drive scheme for developing electric vehicles depending on resources. **L1**
- List the various power electronic converters. **L1**
- Describe the working principle DC/DC converters and buck boost convertor. **L2**
- Explain about AC Drives. **L2**

UNIT III: Hybrid And Electric Drive Trains **10 hours**

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

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

- Identify the social importance of hybrid vehicles. **L3**
- Discus impact of modern drive trains in energy supplies. **L6**
- Compare hybrid and electric drive trains. **L2**
- Analyze the power flow control and energy efficiency. **L6**

UNIT IV: Electric And Hybrid Vehicles - Case Studies **8 hours**

Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study –Toyota Prius, Honda Insight, Chevrolet Volt. 42 V system for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy duty vehicles, fuel cell heavy duty vehicles

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

- List the various electric and hybrid vehicles in the present market. **L1**
- Discuss lightly hybridized vehicle and low voltage systems. **L6**
- Explain about hybrid electric heavy duty vehicles and fuel cell heavy duty vehicles. **L2**

UNIT V: Electric And Hybrid Vehicle Design **8 hours**

Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.

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

- Illustrate matching the electric machine and the internal combustion engine. **L2**
- Select the energy storage technology. **L3**
- Select the size of propulsion motor. **L3**
- Design and develop basic schemes of electric and hybrid electric vehicles. **L3**

Text Books:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, 2/e, CRC Press, 2003.
2. Amir Khajepour, M. Saber Fallah, Avesta Goodarzi, Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach, illustrated edition, John Wiley & Sons, 2014
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

Reference Books:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. John G. Hayes, G.Abas Goodarzi, Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles, 1/e, Wiley-Blackwell, 2018.

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

- Explain the working of hybrid and electric vehicles. **L2**
- Choose a suitable drive scheme for developing hybrid and electric vehicles depending on resources. **L3**
- Develop the electric propulsion unit and its control for application of electric vehicles. **L3**
- Choose proper energy storage systems for vehicle applications. **L3**
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles. **L3**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55b – RAPID PROTOTYPING

(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 techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.
- Train Various Pre – Processing, Processing and Post Processing errors in RP Processes

UNIT I **12 Hours**

Introduction: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

RP Software: Need for RP software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, SolidView, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

Learning Outcomes:

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

- Explain prototyping process. **L2**
- Classify different Rapid Prototyping Processes. **L2**
- Summarize RP software's and Represent a 3D model in STL format, other RP data formats. **L2**

UNIT II **10 Hours**

Solid and Liquid Based RP Systems: Stereolithography (SLA): Principle, Process, Materials, Advantages, Limitations and Applications. Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications. Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications. Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, 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. **L2**

UNIT III **8 Hours**

Powder Based RP Systems: 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.

Other RP Systems: Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballastic Particle Manufacturing (BPM): Principle, Process, Advantages, Limitations, Applications. Shape Deposition Manufacturing (SDM): Principle, Process, Advantages, Limitations, Applications.

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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**
- Understand the principles, advantages, limitations and applications of other Additive Manufacturing Systems such as 3D Printing, Ballistic Particle Manufacturing and Shape Deposition Modeling. **L2**

UNIT IV **8 hours**

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

Learning Outcomes:

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

- Classify Rapid Tooling methods. **L2**
- Explain the concepts of reverse engineering and scanning tools. **L2**

UNIT V **8 Hours**

Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS, etc.

RP Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Learning Outcomes:

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

- Identify various Pre – Processing, Processing and Post – Processing errors in RP processes. **L2**
- Apply of RP in engineering design analysis and medical applications. **L3**

Text Books:

1. Chua C.K., Leong K.F. and Lim C.S., Rapid Prototyping: Principles and Applications, 2/e Edition, World Scientific Publishers, 2003.
2. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1st Edition, Springer, 2010.
3. Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006.

Reference Books:

1. Liou W. Liou, Frank W., Liou, Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development, CRC Press, 2007.
2. Pham D.T. and Dimov S.S., Rapid Manufacturing; The Technologies and Application of RPT and Rapid tooling, Springer, London 2001.
3. Gebhardt A., Rapid prototyping, Hanser Gardener Publications, 2003.
4. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC Press, 2005.

Course Outcomes:

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

- Use techniques for processing of CAD models for rapid prototyping. **L3**
- Understand and apply fundamentals of rapid prototyping techniques. **L3**
- Use appropriate tooling for rapid prototyping process. **L3**
- Use rapid prototyping techniques for reverse engineering. **L3**
- Identify Various Pre – Processing, Processing and Post Processing errors in RP processes. **L3**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55c – DESIGN FOR MANUFACTURING AND ASSEMBLY

(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

- Discuss various factors influencing the manufacturability of components and use of tolerances in manufacturing
- Explain various considerations in casting, welding, forging and machining processes.
- Demonstrate on the design factors dependent on the assembly methods.
- Teach the principles and rules of design for assembly.
-

UNIT I: INTRODUCTION TO DFM **12 Hours**

Significance of design, qualities of a designer and Design factors, Systematic working plan, The engineering problem to be solved, The basic design, Factors influencing choice of materials and the factors influencing manufacturing Process Capability Mean, Median, Variance, Mode, Standard Deviation, Normal Distribution and Process capability metrics, Process Capability, Tolerances-symbols and definition, Tolerances relevant to manufacturing, assembly and material condition, Tolerance stack-effects on assembly with examples, Methods of eliminating tolerance stack with examples.

Learning Outcomes:

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

- Explain the desirable qualities of a designer. **L2**
- List various factors influencing the choice of materials. **L1**
- Recall the concepts of Mean, Median, Variance and Mode. **L1**
- Discuss the methods of eliminating tolerance stack with examples. **L2**

UNIT II: FORM DESIGN-CASTING AND WELDING **10 Hours**

Influence of loading, Materials, Production methods on form design, Casting considerations, Grey iron castings, Steel castings, Aluminum Casting Requirements and rules for casting, Form design of pressure die castings, Welding considerations welding Processes, Requirements and rules for welding, Redesign of components for casting-pattern-mould- Parting Line, Redesign of components for welding, Case studies in form design-simple problems in form design.

Learning Outcomes:

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

- Recall the function of various components (pattern, mould, parting line, etc) in casting **L1**
- Explain the various production methods on form design. **L2**
- Understand the requirements and rules for casting and welding. **L2**
- Make use of case studies to understand redesign of the components. **L3**

UNIT III: FORM DESIGN-FORGING AND MACHINING **8 Hours**

Forging considerations hammer forging drop forging, Requirements and rules for forging, Choice between casting, forging and welding, Machining considerations Drills, Milling-Keyways, Dwells and Dwelling Procedure Countersunk Head screws Requirements and rules for Machining considerations and Reduction of machined areas Redesign of components for Forging, Redesign of components for Machining, Simplification by separation and Simplification by amalgamation, Case studies.

Learning Outcomes:

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

- Choose the manufacturing process depending upon the shape and size of the product. **L3**

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- Classify various machining processes **L2**
- Discuss the rules and design considerations of forging **L2**
- Recall the redesign concepts of forging and machining. **L1**

UNIT IV: INTRODUCTION TO DFA **8 hours**

DFA, Introduction, Distinction between assembly methods and processes, Factors Determining assembly methods and processes, Success and failure-Causes of failure, Product Design factors independent of methods and processes , Introduction-Number of operations in the product, Assembly Precedence, Standardization, Design factors dependent on Assembly methods , Introduction-Single Station Assembly Line Assembly, Hybrid Systems, Manual Assembly lines, Flexible Assembly lines, Design factors dependent on Assembly processes, Factors Influencing Production rate to Facility Ratio- Parts Presentation, Manual Assembly, Dedicated Assembly, Transportation, Separation and Orientation-Flexible Assembly, Gripping, Transferring, Part Insertion, Failures and Error Recovery

Learning Outcomes:

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

- Illustrate manual assembly lines and flexible assembly lines. **L2**
- Explain the product design factors independent of methods and processes **L2**
- Discuss the importance of standardization in design for assembly. **L2**
- List the design factors that are dependent and independent on the Assembly processes. **L1**

UNIT V: DESIGN FOR ASSEMBLY METHODS **8 Hours**

Approaches to design for assembly and Introduction, Approaches based on design principles and rules, Example DFA method using Design Principles, DFA Systems employing Quantitative evaluation procedures, IPA Stuttgart Method, DFA Methods employing a Knowledge based approach, Knowledge representation Computer Aided DFA methods, Part model, Feature, Processing. Assembly measures like Qualitative and Quantitative measures, Boothroyd and Dewhurst DFA method. Redesign of a simple product , Small consumer product and Fastener solution redesign using symmetry, Case Studies Designing of a disposal valve, Design of a lever-arch file mechanism

Learning Outcomes:

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

- Explain various approaches to design for assembly. **L2**
- Demonstrate on DFA systems employing quantitative evaluation procedures. **L2**
- Discuss DFA methods employing a knowledge based approach. **L2**
- Understand the qualitative and quantitative measures in assembly. **L2**

Text Books:

1. Harry Peck., "Design for Manufacture", Pittman Publications, 1983.
2. Alan Redford and chal, "Design for Assembly-Principles and Procedures", McGraw Hill International Europe, London, 1994.

Reference Books:

1. Robert Matousek, "Engineering Design A Systematic Approach", Blackie &sons Ltd., 1963
2. James G.Bralla, "Hand Book of Product design for Manufacturing", McGraw Hill Co., 1986
3. Swift, K.G., "Knowledge Based Design for Manufacture", Kogan Page Ltd., 1987

Course Outcomes:

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

- Recall the importance of Design for Manufacturing and Assembly. **L1**
- Explain the form design factors with the help of Case study. **L2**
- Evaluate how the factor of redesign affects the product life cycle. **L5**
- Make use of DFA methods proposed by Boothroyd and Dewhurst. **L3**

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B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55d – POWER PLANT OPERATION AND CONTROL

(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 with various methods of power generation.
- Outline the working components of power plants.
- Expose the students measuring of various controllable and uncontrollable factors in power plants.
- Explain the concepts of boiler and turbine control.

UNIT I : OVERVIEW OF POWER GENERATION 12 Hours

Survey of methods of power generation: Hydro, thermal, nuclear, solar and wind power - Importance of instrumentation in power generation - Thermal power plant - Building blocks - Combined cycle systems - Combined heat and power system - sub critical and supercritical boilers.

Learning Outcomes:

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

- List the various types of power plants. **L1**
- Illustrate the importance of instrumentation in power generation. **L4**
- Compare subcritical and supercritical boilers. **L2**

UNIT II: MEASUREMENTS IN POWER PLANTS 10 Hours

Measurement of feed water flow, air flow, steam flow and coal flow – Drum level measurement – Steam pressure and temperature measurement – Turbine speed and vibration measurement – Flue gas analyzer – Fuel composition analyzer

Learning Outcomes:

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

- Describe turbine speed and vibration measurements. **L2**
- Determine the steam flow and coal flow in power plants. **L3**
- Appraise the importance of flue gas and fuel composition analyzer in power plants. **L5**
- Illustrate the various controllable and uncontrollable factors that can be measure in power plants. **L2**

UNIT III : BOILER CONTROL – I 8 Hours

Combustion of fuel and excess air – Firing rate demand – Steam temperature control – Control of deaerator– Drum level control – Single, two and three element control – Furnace draft control – implosion – flue gas dew point control – Trimming of combustion air – Soot blowing.

Learning Outcomes:

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

- List the various boiler control methods. **L1**
- Describe the steam temperature control and drum level control. **L2**
- Demonstrate furnace draft control and drum level control. **L2**

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UNIT IV : BOILER CONTROL – II **8 hours**

Burners for liquid and solid fuels – Burner management – Furnace safety interlocks – Coal pulverizer control – Combustion control for liquid and solid fuel fired boilers – air/fuel ratio control – fluidized bed boiler – Cyclone furnace.

Learning Outcomes:

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

- Identify the burners for liquid and solid fuels. **L3**
- Describe the working principle of coal pulverizer control. **L2**
- Explain combustion control for liquid and solid fuel fired boiler. **L2**

UNIT V :CONTROL OF TURBINE **8 Hours**

Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.

Learning Outcomes:

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

- List the various types of steam turbines. **L1**
- Compare impulse and reaction turbines. **L2**
- Describe turbine governing system for speed and load control. **L2**
- Explain about oil cooling system in turbine. **L2**

Text Books:

1. Sam Dukelow, Control of Boilers, Instrument Society of America, 1991.
2. Everett Woodruff , Herbert Lammers, Thomas Lammers, Steam Plant Operation,9th Edition McGraw Hill, 2012.
3. Rajput R.K. A Text book of Power plant Engineering. 5th Edition, Lakshmi Publications, 2013.

Reference Books:

1. Liptak B.G., Instrumentation in Process Industries, Chilton Book Company, 2005.
2. Jain R.K., Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
3. P.K.Nag, Powerplant Engineering, Tata McGraw-Hill Education, 3rd edition, 2007.
4. Tamilmani, Power plant instrumentation, Sams Publishers, 2011.
5. Krishnaswamy.K and Ponnibala.M., Power Plant Instrumentation, PHI Learning Pvt.Ltd., New Delhi, 2011.

Course Outcomes:

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

- Outline sources of energy for various power plants. **L2**
- Explain boiler and turbine control. **L2**
- Describe working components of a steam power plant. **L2**
- Illustrate the working mechanism of Diesel and Gas turbine power plants. **L2**
- Summarize types of measuring parameters for controlling the power plant. **L2**
- Demonstrate the working principle of nuclear power plants. **L4**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55e – 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 **12 Hours**

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 is intelligence. **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 **10 Hours**

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**
- Discuss Galfenol and Metglas materials. **L6**

UNIT III **8 Hours**

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. **L1**
- Identify the influence of stress on characteristic temperatures in SMA and EAP. **L3**

- Explain the concept of vibration control through shape memory alloys. **L2**
- Discuss design considerations of shape memory alloy. **L6**

UNIT IV: Smart actuators **8 hours**

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**
- Discuss the concepts of actuators based on HBLS and LBHS. **L6**

UNIT V: Smart sensors **8 Hours**

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**
- Discuss EPA based and SMA based sensors. **L6**
- Explain optical based sensing system. **L2**

Text Books:

- M.V. Gandhi, B.D. Thompson" Smart Materials and Structures" Springer Science & Business Media, 31-May-1992.

Reference Books:

1. Brian Culshaw, Smart Structures and Materials, Artech House, 2000.
2. Gauenzi, P., Smart Structures, Wiley, 2009.
3. Cady, W. G., Piezoelectricity, Dover Publication

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 piezoelectric materials. **L2**
- Identify the influence of stress on characteristic temperatures in SMA and EAP. **L3**
- Explain techniques of self sensing MEMS sensors. **L2**

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B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55f – SUPPLY CHAIN MANAGEMENT

(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

- Explain the basics of supply chain management.
- Familiarize inventory management techniques and models to ensure EOQ batch size under risk management.
- Demonstrate various distribution strategies for shipment of products.
- Focus on evaluating of strategic alliance partners and understanding of RDBMS.

UNIT I **12 Hours**

Understanding the supply chain: What is SCM? Why SCM? The Complexity, Key issues in SCM Logistics network - Introduction, Data Collection, Transportation, Ware house Management, Strategic location of ware houses, Demand forecasting, Role of aggregate planning, MRP, ERP, Managing variability, Key features of Network configuration.

Learning Outcomes:

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

- Explain the strategic importance of SCM and how operations relate to other business functions. **L2**
- Summarize working knowledge of the concepts and methods of SCM **L2**
- Apply concepts for continuous improvement for practical problems **L3**

UNIT II **8 Hours**

Inventory management: Concepts of Materials Management, Economic lot size model, Effect of Demand uncertainly, Fixed order costs, Variable lead frames, Inventory under certainly & uncertainty, Risk Management

Learning Outcomes:

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

- Explain why companies keep inventory and costs of inventory for inventory decisions. **L2**
- Outline the key elements and relationship with customer service. **L2**
- Determine the appropriate reorder point in a continuous inventory system based on a target service level. **L3**
- Apply the order quantity estimate for a periodic inventory system. **L3**

UNIT III **8 Hours**

Distribution strategies: Introduction, Centralized vs Decentralized control, Direct shipment, Cross Docking, Push based vs Pull based supply chain.

Learning Outcomes:

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

- Discuss outsourcing as a strategic decision. **L3**
- Classify the distribution strategies, systems and processes **L2**
- Analyze issues and trends in the supply chain **L4**

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UNIT IV **8 hours**

Strategic alliances: Third party Logistics (3PL), Retailer – supplier relationship issues, requirements, success & failures, Distributor integration Types & issues.

Learning Outcomes:

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

- Explain the third party logistics **L2**
- Develop retailer supplier relationship issues **L2**
- Compare distribution integration types and issues **L2**

UNIT V **10 hours**

MIS & SCM: Relational Data Base Management (RDBMS), System Architecture, Communications, and Implementation of ERP, Decision support systems for SCM: Analytical tools, Presentation tools, Smooth production flow Current issues & directing challenges for future, e-Commerce strategies and world class supply chain management.

Learning Outcomes:

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

- Interpret the basic modes of RDBMS for communication and ERP implementation. **L5**
- Identify support systems for supply chain management **L3**
- Explain the analytical and presentation tools **L2**
- Outline E-commerce strategies for world class SCM **L2**

Text Books:

1. Sunil Chopra, Peter Meindl, Supply Chain Management: Strategy, Planning, and Operation, 4/e, Pearson, 2010.
2. David N. Burt, Donald W. Dobler , World Class Supply Management: The Key to Supply Chain Management, 2/e, McGraw-Hill/Irwin, 2003

Reference Books:

1. John Joseph Coyle, Edward J. Bardi, C. John Langley, The Management of Business Logistics: A Supply Chain Perspective, South-Western/Thomson Learning, 2003.
2. Upendra Kachru, Logistics and Supply Chain Management, Excel Books, 2009.

Course Outcomes:

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

- Apply the concepts of supply chain management for demand forecasting. **L3**
- Make use of SCM and inventory management for procurement. **L3**
- Analyze the shipment activities and related issues. **L4**
- Build third party alliances. **L5**
- Adapt the RDBMS data for communications and analyzing future challenges and understand e-commerce strategies. **L6**

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B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC55a- FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING

(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 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 this 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 this unit, the student will be able to

- To learn the real time applications of semiconductor devices.(L1) **L1**
- To understand the basic concepts of operational amplifier and their applications.(L2) **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 this 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 this 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 this 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", Dhanpat Rai& 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 student 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**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC55b- TRANSDUCERS AND SENSORS

(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 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 this 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 this 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 this 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 this 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 this 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", Dhanpat Rai& 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 student 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

19AEC55c- PRINCIPLES OF COMMUNICATIONS

(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 understand the importance of modulation and Amplitude modulation.
- To know about the frequency modulation and phase modulation.
- To study different types of pulse analog modulation techniquesand multiple access techniques.
- To gain knowledge on pulse code modulation and different waveform coding techniques.
- To comprehend the wireless communication systems, their evolution and standards.

UNIT – I:

Analog communication-I: Elements of communication systems need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation(AM),Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier(DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband(SSB) transmission, VSB Modulation.

Learning Outcomes:

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

- Understand the basic elements of communication systems. **L2**
- Compare the performance of analog modulation schemes. **L2**

UNIT – II:

Analog communication-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, Pre-emphasis & De-emphasis, Illustrative Problems.

Learning Outcomes:

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

- Compare the performance of different frequency modulated schemes. **L2**
- Learn about the Pre-emphasis & De-emphasis circuits in frequency modulation. **L1**

UNIT – III:

Digital communications-I (Qualitative Approach only) :Pulse Analog Modulation Techniques : Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation

Multiple Access Techniques: Introduction to multiple access techniques, FDMA,TDMA, CDMA, SDMA: Advantages and applications

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

- Analyze the performance of different pulse modulation techniques. **L4**
- Understand the basic principles of Multiple Access Techniques. **L2**

UNIT – IV:

Digital communications-II (Qualitative Approach only) : Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M-PSK techniques.

Learning Outcomes:

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

- Understand the performance of different types of digital modulation schemes. **L2**
- Explain different types of waveform coding techniques and their applications. **L1**

UNIT – V:

Wireless communications (Qualitative Approach only) : Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3G cellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile(GSM),GSM services and features.

Learning Outcomes:

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

- Understand various types of wireless communication systems. **L1**
- Explain GSM services and features. **L2**

Text Books:

1. H Taub, D. Schilling and Gautam Sahe, "Principles of Communication Systems", TMH, 2007, 3rd Edition
2. George Kennedy and Bernard Davis, "Electronics & Communication System", 4th Edition, TMH 2009
3. Wayne Tomasi, "Electronic Communication System: Fundamentals Through Advanced",2nd editions,PHI,2001.

Reference Books:

1. Simon Haykin, "Principles of Communication Systems", John Wiley, 2nd Edition.
2. Sham Shanmugam," Digital and Analog communication Systems",Wiley-India edition,2006.
3. Theodore. S.Rapport, "Wireless Communications",Pearson Education,2nd Edition,2002.

Course Outcomes:

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

- Understand the importance of modulation and Amplitude modulation. **L2**
- Summarize the frequency modulation and phase modulation methods. **L2**
- Explain about different types of pulse analog modulation techniquesand multiple access techniques. **L3**
- Acquire knowledge on pulse code modulation and different waveform coding techniques. **L1**
- Comprehend the wireless communication systems, their evolution and standards. **L1**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACS55a- OOPS CONCEPTS THROUGH JAVA

Open Elective-1

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 **8hrs**

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. **L2**

UNIT – II: CLASSES **8hrs**

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. **L3**
- Extract scene with different clipping methods and its transformation to graphics display device. **L3**

UNIT – III: INHERITANCE **8hrs**

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. **L4**
- Render projected objects to naturalize the scene in 2D view and use of illumination models . **L4**

UNIT – IV: INTERFACES **7 Hrs**

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. **L3**
- Discuss various multimedia data structures. **L3**

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. **L5**
- 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

- 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.

III B.Tech I SEMESTER

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACS55b- INTRODUCTION TO INTERNET OF THINGS

Open Elective-I

L	T	P	C
3	0	0	3

Course Objectives:

- Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

UNIT – 1: INTRODUCTION

Introduction – Characteristics-Physical Design - Protocols – Logical Design – Enabling technologies – IoT Levels – Six Levels of IoT - Domain Specific IoTs.**Learning Outcomes:**

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

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

UNIT – II: M2M, IoT vs M2M

M2M, IoT vs M2M, SDN and NFV for IoT, IOT system Management with NETCONF-YANG.

. Learning Outcomes:

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

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

UNIT – III: IOT SYSTEM MANAGEMNT

IoT Systems Management – IoT Design Methodology – Specifications Integration and Application Development.

Learning Outcomes:

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

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

UNIT – IV: SENSORS

Sensors- Types of sensor nodes, Internet communications, IP addresses, MAC Address, TCP and UDP Ports, Application layer protocols

Learning Outcomes:

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

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

UNIT – V: IOT APPLICATIONS

IOT application for industry-Future factory concepts, Brownfield IoT, Smart objects, Smart applications, Study of existing IoT platforms/middleware, IoT- A, Hydra etc.

Learning Outcomes:

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

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A Hands-on Approach", Universities Press, 2015.

Reference Books:

1. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.
2. Marco Schwartz, "Internet of Things with the Arduino Yun", Pack Publishing, 2014.
3. *Simon Monk, "Programming the Raspberry Pi: Getting Started with Python",* McGraw-Hill, *2013.*
4. Charalampos Doukas, "Building Internet of Things With the Arduino", Second Edition, 2012.
5. Dr. John Bates, "Thingalytics: Smart Big Data Analytics for the Internet of Things", Software AG Publisher, 2015.

Course Outcomes:

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

Introduction to computer graphics

Able to understand the application areas of IOT · **L2**

Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

Able to understand building blocks of Internet of Things and characteristics **L4**

III B.Tech I SEMESTER

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACS55c- INTRODUCTION TO OPERATING SYSTEMS

Open Elective-1

L	T	P	C
3	0	0	3

Course Objectives:

- To make the students understand the basic operating system concepts such as processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection.
- To get acquaintance with the class of abstractions afford by general purpose operating systems that aid the development of user applications

UNIT – 1: OPERATING SYSTEMS OVERVIEW

Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security.

Operating System Structure: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs.

Learning Outcomes:

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

- Understand what makes a computer system function and the primary PC components. **L2**
- Understand past and current trends in computer technology. **L3**

UNIT – II: THREADS

Threads: overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit threading, Threading Issues.

CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling.

. Learning Outcomes:

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

- Understand past and current trends in computer technology. **L3**
- Use basic software applications. **L4**

UNIT – III: MEMORY MANAGEMENT

Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.

Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

Learning Outcomes:

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

- Use basic software applications. **L4**
- Add functionality to the exiting operating systems **L5**

UNIT – IV: MASS-STORAGE STRUCTURE

Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.

Learning Outcomes:

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

- Add functionality to the exiting operating systems **L5**
- Design new operating systems **L6**

UNIT – V: I/O systems

I/O systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests to Hardware operations.

Learning Outcomes:

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

- Add functionality to the exiting operating systems **L5**
- Design new operating systems **L6**

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Ninth Edition, 2012, Wiley.
2. Operating Systems: Internals and Design Principles, Stallings, Sixth Edition, 2009, Pearson Education.

Reference Books:

1. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.
2. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
3. Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.
4. Operating Systems, A.S.Godbole, Second Edition, TMH.
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, G.Nutt, N.Chaki and S.Neogy, Third Edition, Pearson Education.
7. Operating Systems, R.Elmasri, A,G.Carrick and D.Levine, Mc Graw Hill.

Course Outcomes:

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

- Understand what makes a computer system function and the primary PC components. **L2**
- Understand past and current trends in computer technology. **L3**
- Use basic software applications. **L4**
- Add functionality to the exiting operating systems **L5**
- Design new operating systems **L6**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS13-ENGLISH LANGUAGE SKILLS LAB

(Common to EEE, ECE & CSE)

L	T	P	C
0	0	3	1.5

Course Objectives:

- Students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL and GMAT etc.
- students will be trained to use language effectively to face interviews, group discussions, public speaking

UNIT – I: **12Hrs**

1. Phonetics for listening comprehension of various accents -2
2. Formal Presentations using PPT slides without Graphic Elements.
3. Paraphrasing.

Learning Outcomes:

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

- Understand different accents spoken by native speakers of English **L1**
- Make formal structured presentations on general topics using PPT slides without graphical elements **L2**

UNIT – II: **12Hrs**

1. Debate – 2 (Following Argument).
2. Listening to short speeches/ short stories for note-making and summarizing.
3. E-mail Writing.

Learning Outcomes:

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

- Participate in formal discussions and speak clearly on a specific topic using suitable discourse markers. **L1**
- Make formal structured presentations on academic topics using ppt slides with relevant graphical elements. **L2**

UNIT – III **12Hrs**

1. Listening for Discussions.
2. Group Discussions.
3. Writing Persuasive/argumentative essays on general topics.

Learning Outcomes:

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

- Participate in group discussions using appropriate conventions and language strategies. **L1**
- Produce logically coherent persuasive/argumentative essays. **L2**

UNIT – IV **12Hrs**

1. Reviewing film/book.
2. Group Discussions – reaching consensus in Group Work.
3. Resume Writing – Cover Letter – Applying for Internship.

Learning Outcomes:

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

- Express thoughts and ideas with acceptable accuracy and fluency with a view to reach consensus in group discussions **L1**
- Prepare a CV and write a cover letter to seek internship/job **L2**

1/10/21

UNIT – V **12Hrs**

1. Writing Project Reports.
2. Editing Short Texts.
3. Answering FAQs in Interviews.

Learning Outcomes:

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

- Collaborate with a partner to make effective presentations. **L1**
- Understand the structure and produce an effective project report. **L2**

Suggested Software

- Walden Infotech English Language Communication Skills.
- iTell- Orell Digital Language Lab.
- Digital Teacher.
- LES(Learn English Select) by British council.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.
- Lingua TOEFL CBT Insider, by Dreamtech.
- English Pronunciation in Use (Elementary, Intermediate, Advanced)CUP.
- Cambridge Advanced Learners' English Dictionary withCD.

Reference Books:

1. Meenakshi Raman &Sangeeta Sharma, "Technical Communication" O U Press2009.
2. Barron's Books on TOEFL/GRE/GMAT/CAT/IELTS /DELTA/Cambridge University Press.2012
3. Butterfield Jeff, "Soft Skills for Everyone", Cengage Publications,2011.
4. "Practice Psychometric Tests": How to familiarize yourself with genuine recruitment tests, 2012.
5. David A McMurrey & Joanne Buckely "Handbook for Technical Writing" CENGAGE Learning2008.
6. "A Textbook of English Phonetics for Indian Students", 2nd Edition, T.Balasubramanyam. (Macmillan),2012.
7. "A Handbook for English Laboratories", E. Suresh Kumar, P. Sreehari, Foundation Books, 2011.
8. Sambaiah.M. ***Technical English***, Wiley publishers India. New Delhi. 2014.

Course Outcomes:

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

- Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills. **L1**
- Apply communication skills through various language learning activities. **L2**
- Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. **L3**
- Evaluate and exhibit acceptable etiquette essential in social and professional settings **L4**
- Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English. **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE56- AC MACHINES LAB

L	T	P	C
0	0	2	1

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**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS17-RESEARCH METHODOLOGY

(Common to EEE, ECE & CSE)

L	T	P	C
3	0	0	0

Course Objectives:

- Students should understand a general definition of research design.
- Students should be able to identify the overall process of designing a research study from its inception to its report.

UNIT – 1:

Meaning of Research — Objectives of Research — Types of Research — Research Approaches — Guidelines for Selecting and Defining a Research Problem — research Design — Concepts related to Research Design — Basic Principles of Experimental Design.

Learning Outcomes:

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

- Understand the concept of research and its process. **L1**
- Explain various types of research. **L2**

UNIT – II:

Sampling Design — steps in Sampling Design —Characteristics of a Good Sample Design — Random Sampling Design. Measurement and Scaling Techniques-Errors in Measurement — Tests of Sound Measurement — Scaling and Scale Construction Techniques — Time Seri. Analysis — Interpolation and Extrapolation. Data Collection Methods — Primary Data — Secondary data — Questionnaire Survey and Interviews.

Learning Outcomes:

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

- Understand the concept of sampling and sampling design. **L1**
- Explain various techniques in measurement and scaling. **L2**

UNIT – III:

Correlation and Regression Analysis — Method of Least Squares — Regression on Correlation — Correlation on Determination — Types of Correlations and Their Applications.

Learning Outcomes:

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

- Know the association of two variables. **L1**
- Understand the importance of correlation and regression. **L2**

UNIT – IV:

Statistical Inference: Tests of Hypothesis — Hypothesis Testing Procedure — Sampling Theory — Sampling Distribution — Chi-square Test — Multi-variate Analysis.

Learning Outcomes:

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

- Know the statistical inference. **L1**
- Understand the hypothesis testing procedure. **L2**

UNIT – V:

Report Writing and Professional Ethics: Interpretation of Data — Report Writing — Layout of a Research Paper — Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars — Professional Ethics in Research.

Learning Outcomes:

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

- Learn about report writing. **L1**
- Understand how to write research paper. **L2**

Text Books:

1. C.R.Kothari, "Research Methodology: Methods and Techniques",2nd edition, New Age International Publishers.
2. A Step by Step Guide for Beginners, "Research Methodology":Ranjit Kumar, Sage Publications.

Reference Books:

1. P.Narayana Reddy and G.V.R.K.Acharyulu, "Research Methodology and Statistical Tools", 1st Edition, Excel Books, New Delhi.
2. Donald R. "Business Research Methods", Cooper & Pamela S Schindler, 9th edition.
3. S C Gupta, "Fundamentals of Statistics", 7th edition Himalaya Publications.
4. Dr. P.Satyanarayana, "a Companion to Literary Research", 1st edition 2020, HSRA publications.

Course Outcomes:

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

- Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling. **L1**
- Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project. **L2**
- Have basic knowledge on qualitative research techniques. **L3**
- Identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting. **L4**
- Have basic awareness of data analysis-and hypothesis testing procedures. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE61- POWER SYSTEM OPERATION AND CONTROL

L	T	P	C
3	1	0	4

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**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE62 – Analysis of Linear systems
(EEE)

III B.Tech – II Semester	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 using orthogo functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in comp functions, Exponential and sinusoidal signals, Concepts of Impulse function Unit step function, Sign 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 II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE63- 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

19AEE64a- ENERGY AUDIT, CONSERVATION & MANAGEMENT

(Professional Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- 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: ENERGY AUDITING **10 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

- Understand the energy audit basic principles **L1**
- Understand the classification of energy audit and energy representations **L2**

UNIT – II: LIGHTING **10 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

- Learn how to conserve energy with good lighting practices **L1**
- Learn about different light efficient equipments **L2**

UNIT – III: POWER FACTOR AND ENERGY AUDITING INSTUMENTS **10 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

- Learn the impact of power factor and its improvement **L1**
- Learn the importance of energy auditing instruments **L2**

UNIT – IV: HEATING AND COOLING **10 Hrs**

Space Heating and 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

- Learn the importance of natural resources **L1**

- Learn the importance of heating and cooling in energy utilization **L2**

UNIT – V: ECONOMIC ASPECTS AND ANALYSIS **10 Hrs**

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

- Learn the concepts of economic analysis **L1**
- Learn impact of economic analysis in energy auditing **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 hillpublishing company Ltd. New Delhi.
2. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
3. Energy management hand book by W.C.Turner, John wiley and sons.
4. Energy management and conservation –k v Sharma and pvenkataseshaiah-I KInternational Publishing House pvt.ltd,2011.
5. http://www.energymanagertraining.com/download/Gazette_of_IndiaPrtIISecI-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**
- Calculate life cycle costing analysis and return on investment on energy efficient technologies. **L5**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

ELECTRICAL AND ELECTRONICS ENGINEERING

III B.TECH II SEM

L	T	C
3	0	3

Digital Computer Platforms

(Professional Elective – II)

Course Objectives:

1. Architecture and designing of 8086 Microprocessor with Assembling languageprogramming and interfacing with various modules
2. Understand the Interfacing of 8086 with various advanced communication devices
3. Designing of 8051 Microcontroller with Assembling language programming andinterfacing with various modules
4. To know about Assembly Language Programs for the Digital Signal Processors andusage of Interrupts
5. To understand Xilinx programming and understanding of Spartan FPGA board

UNIT-I: INTRODUCTION TO MICROPROCESSORS

Historical background- Evolution of microprocessors up to 64-bit. Architecture of 8086 microprocessor, special function of general purpose registers. 8086 flag registers and functions of 8086 flags – Addressing modes of 8086 – Instruction set of 8086 – Assembler directives - Pin diagram 8086 – Minimum mode and maximum mode of operation - Timing diagrams - CISC and ARM Processors.

Learning Outcomes:

- To know about 8086 as one of digital compute platforms
- To know about Architecture and functions of 8086
- To understand about instruction set
- To know about pin and timing diagrams
- To know about processors CISC and ARM

UNIT II: ASSEMBLY LANGUAGE PROGRAMMING & I/O INTERFACE

Assembler directives – macros – simple programs involving logical – branch instructions – sorting – evaluating arithmetic expressions - string manipulations – 8255 PPI - various modesof operation - A/D - D/A converter interfacing, Memory interfacing to 8086 – interrupt structure of 8086 – vector interrupt table – interrupt service routine – interfacing interrupt controller 8259 - Need of DMA – serial communication standards – serial data transfer schemes.

Learning Outcomes:

- To understand the programming features of assembly language as one of digital compute platforms
- To know about evaluation of expressions, strings
- To understand about interfacing with A/D-D/A converters
- To understand about interrupt structures and various service routines in 8086
- To know about data transfer scheme

UNIT III: 8051 MICRO CONTROLLER PROGRAMMING AND APPLICATIONS

Introduction to micro controllers, Functional block diagram, Instruction sets and addressing modes, interrupt structure – Timer – I/O ports – serial communication. Data transfer, manipulation, Control and I/O instructions – simple programming exercises key board and display interface – Closed loop control of servo motor – stepper motor control.

Learning Outcomes:

- To understand about 8051 Microcontroller as one of the digital compute platforms
- To know about instruction sets of 8051
- To know about data transfer manipulations
- To understand and write programming using 8051
- To know about a few applications of 8051 like servo motor, stepper motor

UNIT IV: Introduction to the TMS320LF2407 DSP Controller

Basic architectural features - Physical Memory - Software Tools. Introduction to Interrupts - Interrupt Hierarchy - Interrupt Control Registers. C2xx DSP CPU and Instruction Set: Introduction & code Generation - Components of the C2xx DSP core - Mapping External Devices to the C2xx core - peripheral interface - system configuration registers - Memory - Memory Addressing Modes - Assembly Programming Using the C2xx DSP Instruction set.

Learning Outcomes:

- To know about features of DSP controller C2xx as one of the DCPs
- To know about various instruction sets, control registers of C2xx DSP core
- To know about mapping of external devices to the DSP core
- To know about assembly programming using the instruction sets of TMS320LF2407DSP controller

UNIT V: FPGA

Introduction to Field Programmable Gate Arrays – CPLD Vs FPGA – Types of FPGA – Xilinx, XC3000 series - Configurable logic Blocks (CLB) – Input / Output Block (IOB) – Programmable Interconnect Point (PIP) – Xilinx 4000 series – HDL programming – overviewof Spartan 3E and Virtex II pro FPGA boards- case study.

Learning Outcomes:

- To know about FPGA as one of the digital compute platforms
- To know about various types of FPGA
- To know about programmable inter connect points
- To understand about Xilinx-HDL programming
- To know about applications of FPGA with a case study

TEXT BOOKS

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications with8085, Penram Intl. Publishing, 6th Edition, 2013
2. Ray A. K., Bhurchandi K. M., Advanced Microprocessor and Peripherals, Tata McGraw-Hill Publications, 3rd Edition, 2013.

REFERENCE BOOKS

1. Microprocessor and Interfacing by Douglas V Hall, 2nd Edition, Tata McGraw hill, 1992
2. Microprocessor, Nilesh B Bahadure, PHI, 2010.

3. The 8051 Micro Controller Architecture, Programming and Applications by Kenneth JAyala, Pearson International publishing (India).
4. Hamid A. Tolyat, DSP Based Electro Mechanical Motion Control, CRC press, 2004.
5. Application Notes from the webpage of Texas Instruments.
6. XC 3000 series datasheets (version 3.1). Xilinx Inc., USA, 1998
7. XC 4000 series datasheets (version 1.6). Xilinx Inc., USA, 1999
8. Wayne Wolf, FPGA based system design, Prentice hall, 2004.

Course Outcomes:

1. Understand the basic architecture & pin diagram of 8086 microprocessor.
2. Assembly language programming to perform a given task, Interrupt service routinesfor all interrupt types
3. Microprocessor and Microcontroller designing for various applications.
4. Write Assembly Language Programs for the Digital Signal Processors and useInterrupts for real-time control applications
5. Write Xilinx programming and understanding of Spartan FPGA board

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE64c- APPLICATIONS OF POWER ELECTRONICS TO RENEWABLE ENERGY SOURCES

(Professional Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce certain areas for applications of Power Electronics in Renewable energy sources
- To understand about Power Quality issues and converters to be used in Renewable energy sources
- To introduce the concept of AC link Universal power converters
- To introduce high power electronic applications to Wind turbines
- To introduce the concept of electric air craft

UNIT – I: Basic Power Electronic Applications **10 Hrs**

Introduction, Impact of power electronics in energy systems, challenges in power electronics to renewable energy systems, power electronics in energy, solar energy utilization, power electronics in wind energy utilization, power electronics for electric aircraft, power electronics in high power drive systems, high power electronic motor stand drives

Learning Outcomes:

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

- To know about impact and challenges of Power Electronics to applications in Renewable Energy area **L1**
- To know about applications of Power Electronics in Solar Energy, Wind Energy, high power drive& Electric aircrafts **L2**

UNIT – II: Power Quality and Converters **10 Hrs**

AC-DC-AC Converters for Distributed Power Generation Systems & Power Quality problems. Overview of Power Electronics Converters, Bidirectional AC-DC-AC Topologies, Filters, PWM for AC-DC-AC topologies, Control of converters, selection and sizing of the Converters, Matrix converter, and Multilevel Converters, Power Quality and Electromagnetic conservation, Power Quality Issues, Matting Methods and EMC related Phenomena in Electrical Power systems.

Learning Outcomes:

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

- To know about AC-DC-AC converters for Distributed generation and Power Quality problems **L1**
- To understand about the selection and sizing of converters, EMC and multi level converters& Application **L2**

UNIT – III: AC link Universal Power Converters **10 Hrs**

Introduction, hard switching AC link universal power converter, soft switching AC link universal power converter, principle of operation of the soft switching AC link universal power converter, design procedure, analysis and applications

Learning Outcomes:

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

- To know about advanced topic of AC link universal power converters **L1**
- To know about principle of operation of soft&hard switching converter **L2**

UNIT – IV: High Power Electronics for Solar - Wind Systems **10 Hrs**

Power converters for wind turbines, power semiconductors for wind power converter, Power converters for Grid connected Wind Energy Conversion System and Grid connected Solar Energy Converter systems, Hybrid Systems, Types of Cogeneration processes.

Learning Outcomes:

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

- To understand about high power drives for wind turbines & solar systems **L1**
- To distinguish between grid connected and off-grid connected systems, hybrid drive systems& co-generation processes. **L2**

UNIT – V: Power Electronics For More Electric Aircraft **10 Hrs**

Introduction, electric aircraft, electric engine, electric power generation strategies, power electronics and power conversion, power distribution

Learning Outcomes:

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

- To get exposed to the concept of electric aircraft used in aerospace, electric engine, electric power generation strategies. **L1**
- To know about applications of power electronics in electric aircraft and power conversion, power distribution **L2**

Text Books:

1. Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications, Kamal Al-Haddad, Mariusz Malinowski, Haitham Abu-Rub, Wiley Publishers, 2014

Reference Books:

1. Ewald F. Fuchs, Mohammad A.S. Masoum, Power Conversion of Renewable Energy Systems, Springer, 2012
2. Mukund R. Patel, Wind and Solar Power Systems: Design, Analysis, and Operation, Second Edition, Taylor & Francis, 2006

Course Outcomes:

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

- To identify specific applications of Power Electronics in certain alternate sources **L1**
- To understand about Power Quality problems as applied to Power Systems and the converters to be used **L2**
- To learn about analysis of UPC and its design and application **L3**
- To be able to understand designing of high power drives for wind turbines **L4**
- To get exposed to principle of electric aircraft and applications of power converters **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS11-COMPETITIVE & SPOKEN ENGLISH

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To train students to use language effectively in everyday conversations and to participate in group discussions.
- To enable them to learn and practice competitive English and ready for competitive examinations.

UNIT – 1: Grammar

Sentences-Construction-Types-Affirmative-Interrogative-Nouns-Pronouns-Verbs-Models-Tenses-Adverb-Adjective-Speech-Voice-Articles-Prepositions-Conjunctions.

Learning Outcomes:

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

- Students will improve their speaking ability in English both in terms of fluency and comprehensibility by enlarging their vocabulary. **L1**
- Students will attain and enhance competence in the four modes of literacy: listening, speaking, reading and writing **L2**

UNIT – II: Vocabulary

Content of the Unit – II

Competitive Vocabulary List-Word Building Tips- Antonyms-Synonyms-One word Substitutes-Idioms and Phrases-Phrasal Verbs-Reading Comprehension-importance- tips- Cracking unknown passage.

Learning Outcomes:

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

- Understand the factors that influence use of grammar and vocabulary in speech and writing **L1**
- Comprehend the meaning of paragraphs and unknown passages **L2**

UNIT – III: Speaking Skills

Dynamics of Speaking-Communication Skills -Public Speaking- Significance to Professionals- establishing credibility & Confidence- Preparation of Speech-Audience-Analysis -Topic generation Techniques.

Learning Outcomes:

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

- Display competence in oral, written and visual communication **L1**
- Showan understanding of opportunities in the field of communication **L2**

UNIT – IV: Stage Dynamics

Organization of Speech- Platform Manners- Body language- Psychology of Persuasion- Speeches for Special Occasions-exercises-Recording and feedback sessions.

Learning Outcomes:

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

- Analyze your audience and design speeches to reflect your analysis. **L1**
- Evaluate speeches based on a variety of verbal and non-verbal criteria. **L2**

1/10/21

UNIT – V:Accent Neutralization

Realization of past tense and plural forms- Stress Rules– Intonation- Connected speech- weak forms-assimilation-elision- Linking and Intrusion-juncture-contractions.

Learning Outcomes:

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

- Able to identify which are stressed and unstressed words. **L1**
- Reproduce in speech, appropriate pattern of intonation and rhythm. **L2**

Reference Books:

1. Hari Mohan Prasad, ***Objective English for Competitive Examination***, Tata McGraw Hill, New Delhi, 2014.
2. V SASIKUMAR and PV DHAMIJA *: **SPOKEN ENGLISH A Self- Learning Guide to Conversation Practice***, 2nd Edition, TATA McGRAW-HILL'S SERIES.
3. M.Sambaiah, ***Technical English***, Wiley publishers India. New Delhi. 2014.
4. JK GANGAL, A PRCACTICAL COURSE IN EFFECTIVE ENGLISHSPEAKING SKILLS, PHI LEARNING Private Ltd. New Delhi. 2012
5. KRISHNA MOHAN and N.P. SINGH,***SPEAKING ENGLISH EFFECTIVELY***, 2nd Edition, Trinity Press, 2015.
6. Wren and Martin,***High School English Grammar and Composition***, S. Chand Publication, New Delhi, 2014.
7. Neetu Singh, ***English for General Competitions from Plinth To Paramount*** *(Volume-I&II),*Paramount Reader Publications, 2014.
8. Dale Carnegie,***The Quick And Easy Way To Effective Speaking***, Vermilion Publications, 1990.
9. E Suresh Kumar. ***Effective Publish Speaking***, Orient Longman, 2016.

Course Outcomes:

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

- Becoming active participants in the learning process and acquiring proficiency in spoken English of the students. **L1**
- Speaking with clarity and confidence thereby enhancing employability skills of the students. **L2**
- Participate in critical conversations and prepare, organize and deliver in public contexts **L3**
- Improving their speaking ability in English both in terms of fluency and comprehensibility **L4**
- Equipped with competitive proficiency in English for various competitive examinations at state, national and international level. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS23-INTEGRAL TRANSFORMS AND ITS APPLICATIONS

(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 integral transforms and its applications.
- The concepts of fractional calculus and its applications.

UNIT – 1: Basic concepts of integral transforms:: Fourier transforms: **9 Hrs**

Introduction, basic properties, applications to solutions of Ordinary Differential Equations (ODE), Partial Differential Equations (PDE) and Integral Equations.

Learning Outcomes:

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

- Solve ordinary differential equations and partial differential equations. **L3**
- Solve Integral equations. **L3**

UNIT – II: Laplace transforms:

Introduction, existence criteria, Convolution, differentiation, integration, inverse transform, Tauberian Theorems, Watson's Lemma, solutions to ODE, PDE including Initial Value Problems (IVP) and Boundary Value Problems (BVP).

Applications of joint Fourier-Laplace transform, definite integrals, summation of infinite series, transfer functions, impulse response function of linear systems.

Learning Outcomes:

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

- Solve initial and boundary value problems using Laplace transform technique. **L3**
- Apply the techniques of joint Fourier-Laplace transform techniques. **L4**

UNIT – III: Hankel Transforms & Hilbert Transforms

Hankel Transforms: Introduction, properties and applications to PDE Mellin transforms: Introduction, properties, applications; Generalized Mellin transforms.

Hilbert Transforms: Introduction, definition, basic properties, Hilbert transforms in complex plane, applications; asymptotic expansions of 1-sided Hilbert transforms.

Learning Outcomes:

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

- Solve PDE by using the concepts of Hankel transforms. **L4**
- Learn the concepts of Hilbert transforms. **L3**

UNIT – IV: Stieltjes Transform, Legendre transforms and Radon transforms

Stieltjes Transform:

Definition, properties, applications, inversion theorems, properties of generalized Stieltjestrans form.

Legendre transforms:

Introduction, definition, properties, applications.

Radon transforms:

Introduction, properties, derivatives, convolution theorem, applications, inverse radon transform.

Learning Outcomes:

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

- Analyzes the Stieltje's and Legender's transforms. **L4**
- Analyzes random transforms and focuses on thier applications. **L3**

UNIT – V: Fractional Calculus and its applications & Integral transforms in fractional equations

Fractional Calculus and its applications: Introduction, fractional derivatives, integrals, Laplace transform of fractional integrals and derivatives.

Integral transforms in fractional equations: fractional ODE, integral equations, IVP for fractional Differential Equations (DE), fractional PDE, green's function for fractional DE.

Learning Outcomes:

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

- Learn the basic concepts of fractional calculus. **L2**
- Applies the concepts of integral transforms in fractional calculus. **L4**

Text Books:

1. Advanced Topics in Applied Mathematics for Engg. & physical Science: Sudhakar Nair
2. Introduction to Applied Mathematics, Gilbert Strang

Reference Books:

1. Fractional Calculus Theory and Applications of Differentiation and Integration to Arbitrary Order: J. Spanier and K. B. Oldham
2. Handbook of Mathematical Functions: M. Abramowitz & I. Stegun

Course Outcomes:

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

- Use the basic concepts of integral transforms, Stieltjes Transform, Legendre transforms and Radon transforms etc., in real life problems. **L1**
- Use the concepts of Laplace transforms in solving the initial value and boundary value problems. **L2**
- Applies the concepts of Hankel Transforms & Hilbert Transforms while addressing the various problems related to engineering sciences. **L3**
- Analyze the problems in engineering and technology using various techniques of integral transforms and applications. **L4**
- Uses the ideas of fractional calculus and its applications in solve the real world problems. **L5**

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B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS24-NUMERICAL ANALYSIS

(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 of Algebraic and Transcendental equations & Solution to System of Nonlinear Equations and Spline Functions **9 Hrs**

Solution of Algebraic and Transcendental equations:

Ramanujan's method – Secant method – Muller's method – Graeffe's root-squaring method – Lin-Bairstow's method – Quotient-Difference method

Solution to System of Nonlinear Equations and Spline Functions:

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. – Matrix Eigen value problems – Eigen values of a symmetric tridiagonal matrix – Householder's method – QR method.

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: Numerical solution of ordinary differential equations:

Solution by Taylor's series, Picard's method,Euluer's method , Runge-Kutta methods, 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 Partial differential equations:

Learning Outcomes:

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

- Solve Laplace's equation using finite difference technique. **L3**
- Solve Heat equation and wave equation. **L4**

UNIT – V: Numerical solution of Integral equations:

Numerical methods for Fredholm equations: Method of degenerate Kernels – method of successive approximations – Quadrature methods – use of Chebyshev series – cubic Spline method – singular Kernels – method of invariant imbedding.

Learning Outcomes:

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

- Apply numerical methods for solving Fredholm equations. **L3**
- Analyzes cubic Spline method, singular Kernels – method of invariant imbedding etc. **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 initial and boundary value problems **L3**
- Emphasizes the numerical solutions of Integral equations. **L4**
- Analyze the problems in engineering and technology using various techniques of Numerical methods. **L5**

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B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS25-OPTIMIZATION TECHNIQUES

(Open Elective -II)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing the student

- With the basic concepts and several methods of optimization.
- With the concepts of geometric programming & constrained minimization problems.

UNIT – 1: Linear programming I : Simplex Method **9 Hrs**

Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method.

Learning Outcomes:

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

- Solve the problems related to linear programming. **L3**
- Lear the simplex method and two phase simplex method. **L3**

UNIT – II: Linear programming II : Duality in Linear Programming

Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem.

Learning Outcomes:

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

- Understand the dual relations and duality theorem **L2**
- Solve transportation problem and assignment problem. **L4**

UNIT – III: Non-linear programming: Unconstrained optimization techniques & Direct Search Methods

Non-linear programming: Unconstrained optimization techniques: Introduction: Classification of Unconstrained minimization methods

Direct Search Methods: Random Search Methods: Random jumping Method, Random Walk method. Grid Search Method.

Learning Outcomes:

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

- Classify Unconstrained minimization methods and direct search methods. **L2**
- Apply the unconstrained minimization methods and direct search methods **L3**

UNIT – IV: Non-linear programming: Constrained optimization techniques

Introduction , Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

Learning Outcomes:

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

- Understand the Constrained optimization techniques. **L2**
- Solve nonlinear programming problems. **L3**

UNIT – V: Geometric Programming & Constrained minimization Problems

Geometric Programming:

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

Constrained minimization Problems :

Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

Learning Outcomes:

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

- Solve unconstrained geometric programming using differential calculus and arithmetic-geometric inequality. **L3**
- Solve Solution of a constrained geometric programming problem, primal-dual programming. **L4**

Text Books:

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.

Reference Books:

1. Chong, E.K.P.and Zak, S. H.. An Introduction to Optimization, John Wiley & Sons, N.Y.
2. Peressimi A.L., Sullivan F.E., Vhl, J.J..Mathematics of Non-linear Programming, Springer – Verlag.

Course Outcomes:

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

- Remembers the concepts of linear programming problems. **L1**
- Understand various techniques of linear programming problems. **L2**
- Solve constrained and unconstrained linear programming problems. **L3**
- Analyzes geometric programming using differential calculus and arithmetic-geometric inequality. **L4**
- Analyze optimization problems that occur in real world in engineering and technology using various elegant optimization techniques. **L5**

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B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

19ABS33-FUNCTIONAL NANOMATERIALS FOR ENGINEERS

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To learn and understand the fundamental concepts of functional/smart nanomaterials.
- To understand the classification and important applications of functional materials
- To learn and understand the materials utilized for energy applications
- To learn and understand the principle and applications of nanosensors
- To understand the concept of self-assembling molecular layers and its applications

UNIT – I: INTRODUCTION TO FUNCTIONAL /SMART NANOMATERIALS **9 Hrs**

Introduction: Nanomaterials and their importance (in brief), Functional/ Smart Nanomaterials, – (Hydrogels, polymer brushes, Carbon nanotubes, Cellulose),Functionalization techniques, Properties of Smart materials (Sensing materials, Actuation materials, Control devices, Self-detection, self-diagnostics, Self-corrective, self-controlled, self-healing, Shock Absorbers, Damage arrest)-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 fictionalization of smart nanomaterials **L1**
- Explain the need of functional/smart nanomaterials for advanced technology **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**

Classification of smart materials (piezoelectric, electrostrictive, Magnetostrictive, Thermoresponsive, Electrochromic and Smart gels), Shape Memory Alloys and their working principle, Quantum Tunneling Composites and their working principle, Applications of smart materials in Aircrafts, Medicine, Robotics, Smart fabrics, Sporting goods and smart glass, Merits and demerits 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**
- Explain the working principle of Quantum Tunneling Composites **L2**
- Identify the Merits and demerits of smart materials in engineering field **L2**

UNIT – III: NANOSENSORS

Introduction, Sensor definition, Working principle of nanosensors, Types of nanosensors (Physical nanosensors – 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 MOLECULAR LAYERS **9Hrs**

Introduction, principles of self-assembly, monolayers, Characteristics of Self assembled monolayers (SAMs), Molecular SAMs, Types of SAMs, Factors influencing Monolayer order, methods of preparation (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

Introduction, **Solar Cells** (Silicon Solar Cells, Thin film Solar Cells, Organic Solar Cells - Dye Sensitized Solar Cells, Polymer solar cells) Working Principle, Efficiency estimation and advantages, **Hydrogen Fuel Cells** – Working Principle, Structure, 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**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

19ABS34-MATERIALS CHARACTERIZATION TECHNIQUES

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To learn and understand an exposure to evaluation of special characteristics of materials.
- To understand the principle and important applications of characterization techniques
- To learn and understand the materials structural characteristics
- To learn and understand the materials Mechanical & Thermal characteristics

UNIT – I: STRUCTURE ANALYSIS BY POWDER X-RAY DIFFRACTION **9 Hrs**

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams –factors affecting Diffraction Intensities - structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer and WH Methods, 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 Backscatter Electron), Advantages, limitations and applications 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**

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:

- Explain the basic principle and working principle of Transmission Electron Microscope
- Classify the different types of Transmission Electron Microscope modes used **L1**
- 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 **L2**
- Explain the basic principle and working principle of Transmission Electron Microscope **L3**

UNIT – IV:SPECTROSCOPY TECHNIQUES **9Hrs**

Principle, Experimental arrangement, Analysis and Advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

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 Fourier Transform infrared (FTIR) 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**
- Classify the solar cells based on manufacturing material **L2**
- 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 Banwell and Elaine 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**
- Apply the various characterization techniques for materials characterization. **L3**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS44-Green Chemistry and Catalysis for sustainable Environment

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products

Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

UNIT – 1: Principles and concepts of green chemistry **9 Hrs**

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic reactions: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

Learning Outcomes:

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

- Apply the Green chemistry Principles for day to day life as well as synthesis L3
- Describe the sustainable development and green chemistry L2
- Explain economic and un-economic reactions L2
- Demonstrate Polymer recycling L2

UNIT – II: : Catalysis and green chemistry **10Hrs**

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal ion Catalysis, Organo-catalysis, Greener Lewis Acids, Asymmetric Catalysis, Phase transfer catalysis: Hazard Reduction, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples

Learning Outcomes:

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

- Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries L2
- Differentiate Homogeneous and Heterogeneous catalysis L2
- Identify the importance of Bio and Photo Catalysis L3
- Discuss Transition metal and Phase transfer Catalysis L3

UNIT – III: Organic solvents: environmentally benign solutions **7 Hrs**

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbon dioxide, super critical water and water as a reaction solvent: water based coatings, Ionic liquids as catalysts and solvents

Learning Outcomes:

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

- Demonstrate Organic solvents and importance of solvent free systems L3
- Discuss Super critical carbondioxide L2
- Explain Super critical water and water as a reaction solvent L2
- Interpret Ionic Liquids as Catalyst and Solvent L2

UNIT – IV: Emerging greener technologies and alternative energy sources **8 Hrs**

Biomass as renewable resource, solar power, other forms of renewable energy, introduction and applications of Fuel Cells, Chemicals from Renewable feedstocks: Chemicals from Fatty Acids, Polymers from Renewable Resources. The Syngas Economy, The Bio-refinery, Design for energy efficiency: Photochemical Reactions and Examples, advantages and Challenges.

Microwave-assisted Reactions-examples and applications, sono-chemical reactions- examples and applications.

Learning Outcomes:

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

- Describe importance of Biomass and Solar Power L2
- Illustrate Sonochemistry and Green Chemistry L2
- Apply Green Chemistry for Sustainable Development L3
- Discuss the importance of Renewable resources L3

UNIT – V: Green processes for green nanoscience **8 Hrs**

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing nanoscience. Green Synthesis of nanophase inorganic materials and metal oxide nanoparticles: microwave-assisted synthesis, green synthesis of metal and metal oxide nanoparticles, green chemistry applications of inorganic nanomaterials

Learning Outcomes:

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

- Discuss green Chemistry Principles for practicing Green nano synthesis L3
- Illustrate Microwave Assisted Synthesis L2
- Differentiate Hydrothermal and Reflux synthesis L2
- Demonstrate Green Chemistry applications of Inorganic nanomaterials L2

Text Books:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA, 1997.

Reference Books:

1. Sanjay K. Sharma and AckmezMudhoo, Green Chemistry for Environmental Sustainability, First Edition, , CRC Press, 2010.
2. AlvisePerosa and Maurizio Selva, Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2013

Course Outcomes:

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

- Apply the Green chemistry Principles for day to day life as well as synthesis for sustainable development. L3
- Differentiate Homogeneous and Heterogeneous catalysis L2
- Demonstrate Organic solvents and importance of solvent free systems L2
- Describe importance of Biomass and Solar Power for green environment. L2
- Discuss green Chemistry Principles for practicing Green nano synthesis using Microwave Assisted technique. L3

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS45-Chemistry of Nanomaterials and applications

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To understand synthetic principles of Nanomaterials by various methods
- And also characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering

UNIT – 1: Introduction to nanoscience **8 Hrs**

Introduction, importance of nanomaterials, nanoscience in nature, classification of nanostructured materials, properties, scope of nanoscience and nanotechnology& applications.

Learning Outcomes:

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

- Classify the nanostructure materials **L2**
- Describe scope of nanoscience and technology **L2**
- Explain different synthetic methods of nanomaterials **L2**
- Identify the synthetic methods of nanomaterial which is suitable for preparation of particular material **L3**

UNIT – II: : Synthesis of nanomaterials **10 Hrs**

Bottom-Up approach:- Sol-gel synthesis, micro emulsions 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, electro deposition 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 nanomaterials **7 Hrs**

Techniques for characterization: Dynamic light scattering for particle size determination, Diffraction technique, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis

Learning Outcomes:

At the end of this unit, 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:

At the end of this unit, 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 **7 Hrs**

Engineering, medicine, aerospace applications of nanomaterials

Learning Outcomes:

At the end of this unit, 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**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS46-Environmental Management and Audit

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To make the student understand evolution of LCA, stages in product LCA, procedure and applications for LCA.
- To understand the EMS core elements, benefits, certification, ISO 14000 series, evolution, principles, structure.
- To impart knowledge on environmental monitoring, modelling, technology assessment, risk assessment.
- Understand necessity of environmental design, principles, benefits, strategies.
- To understand types of audit, general audit methodology, audit process and apply the various domestic, industrial activities.

UNIT – 1: Life Cycle Assessment (LCA): **8 Hrs**

Evolution, stages, a code of good conduct for LCA, procedure for LCA-goal and scope, analyzing the inventory, assessing the environmental impact, evaluating environmental profiles, applications in government & private Sector

Learning Outcomes:

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

- Illustrate code of good conduct for LCA **L2**
- Discuss scope, analyzing the inventory and assessing the environmental impact **L3**
- List evolution and stages of LCA **L1**
- Describe the applications in government & private Sector **L2**

UNIT – II: Environmental Management System Standards: **8 Hrs**

Environmental Management Systems – Core Elements, benefits, certification and documentation, EMS Standards – ISO 14000 series – evolution, principles, structure, supporting systems, specification standards, implementation and benefits of Implementing

Learning Outcomes:

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

- Explain Environmental Management Systems **L3**
- Describe EMS Standards – ISO 14000 series **L2**
- Apply Environmental Management Systems for certification and documentation **L3**

UNIT – III: Environmental Monitoring, Modeling& Risk Assessment **8 Hrs**

Forecasting & Growth modeling, sensitivity Analysis, Applications of remote sensing and GIS, Environmental technology Assessment, Environmental risk assessment in industry, ecosystem approach to risk assessment, Eco-Mapping, Environmental Education

Learning Outcomes:

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

- Illustrate Applications of remote sensing and GIS in Environmental assessment **L2**
- Discuss environmental risk assessment in industry **L3**
- List ecosystem approach to risk assessment, Eco-Mapping, Environmental Education **L1**

UNIT – IV: Environmental Design & Economics **10 Hrs**

Principles, Benefits, Motivation, ED for manufactured products- Considerations in product life stages, Tools for products, Eco-labelling, ED for Building – Principles and Strategies for green building construction, ED for development and planning.

Economics and Environment -environmental cost, benefits, taxes, accounting, environmental Valuation – categorization and valuation techniques.

Learning Outcomes:

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

- Describe principles, benefits and motivation of environmental Design for manufactured products **L2**
- Explain principles and Strategies for green building construction **L2**
- Differentiate ED for Building cost, benefits and taxes **L2**
- Discuss about categorization and valuation techniques w.r.t economics and environment **L3**

UNIT – V: Environmental Auditing **8 Hrs**

Objectives, Scope, types, Basic structure and steps of EA, Elements of Audit process – What, Who, Why, How, Waste audits, EA in industrial projects, Liability audit and site assessment.

Learning Outcomes:

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

- Illustrate Basic structure and steps of environmental auditing **L2**
- Discuss environmental auditing in industrial projects in terms of liability audit and site assessment **L3**
- List Scope and types environmental auditing **L1**

Text Books:

1. Environmental Management, Vijay Kulkarni & T. V. Ramachandra, Capital Publishing Company, New Delhi, 2006.
2. Concepts of Environmental Management for Sustainable Development, M.C. Dash, Wiley Publications, 2019.

Reference Books:

1. Ajith Sankar, Environmental Management, OXFORD publications, 2015
2. Ni Bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, Tata McGraw-Hill Publications, 2006.
3. Gary Skinner, Ken Crafer, Environmental Management, , Cambridge, IGCSE, 2017

Course Outcomes:

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

- Classify the stages in LCA with goal and procedures **L2**
- Describe the structure of EMS, Explain benefits of EMS, Differentiate core elements of EMS, Discuss about certification of ISO 14000 series. **L2**
- Discuss Forecasting & Growth modeling and Ecosystem Approach to Risk Assessment and Environmental Education. **L3**
- Explain Principles and Strategies for green building construction. **L2**
- Illustrate Objectives, Scope of Environmental auditing, elements of Audit process, liability audit and site assessment. **L2**

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19ACE65a-REMOTE SENSING AND GIS

(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

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Teach various types of satellite sensors and platforms
- Impart concepts of visual and digital image analyses
- Teach concepts of principles of spatial analysis
- Teach about the application of RS and GIS in Civil engineering

UNIT – I:

Introduction to photogrammetry: Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducially points, parallax measurement using fiducially line.

Learning Outcomes:

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

- Understand concepts of photogrammetry
- Estimate heights and distances.

UNIT – II:

Remote sensing: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

Learning Outcomes:

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

- Understand advantages of remote sensing
- Demonstrate concepts of remote sensing.

UNIT – III:

Geographic information system: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

Learning Outcomes:

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

- Understand concepts of GIS.
- Explain data collection and data interpretation
- Develop terrain characteristics using Mapping

UNIT – IV:

GIS spatial analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

Learning Outcomes:

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

- Know applications of GIS and data interpretation.

UNIT – V:

Water resources applications: Land use/Land cover in water resources, Surface water mapping and inventory -Watershed management for sustainable development and Watershed characteristics - Reservoir sedimentation, Fluvial Geomorphology - Ground Water Targeting, Identification of sites for artificial Recharge structures - Inland water quality survey and management, water depth estimation and bathymetry.

Learning Outcomes:

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

- Know applications of RS & GIS in water resources applications.
- Study technological problems like reservoir sedimentation ground water identification

Text Books:

1. Remote Sensing and GIS by B.Bhatta, Oxford University Press,NewDelhi
2. Advanced surveying : Total station GIS and remote sensing – Satheesh Gopi – Pearson publication.

Reference Books:

1. Fundamentals of remote sensing by gorge Joseph , Universities press, Hyderabad.
2. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall(India) Publications
3. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications
4. Remote sensing and GIS by M.Anjireddy , B.S.Pubiliications, NewDelhi
5. Remote Sensing and its applications by LRA Narayana University Press1999
6. GIS by Kang – tsungchang, TMH Publications &Co
7. Principals of Geo physical Information Systems – Peter A Burragh and Rachael Mc Donnell Oxford Publishers2004

Course Outcomes:

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

- Comparing with ground, air and satellite based sensor platforms.
- Interpret the aerial photographs and satellite imageries.
- Create and input spatial data for GIS application.
- Apply RS and GIS concepts in water resources engineering.
- Applications of various satellite data.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE65b-ENVIRONMENTAL IMPACT ASSESTMENT & 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 impart knowledge on different concepts of Environmental Impact Assessment
- To teach procedures of risk assessment
- To teach the EIA methodologies and the criterion for selection of EIA methods
- To teach the procedures for environmental clearances and 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.

Learning Outcomes:

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

- Understand the elements of EIA

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.

Learning Outcomes:

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

- Explain the criteria for selection of EIA methodology

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.

Learning Outcomes:

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

- Study the factors causing impact of development activities
- Decide mitigation measures of pollution on environment

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

Learning Outcomes:

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

- Understand effect of development activities on environment.
- Know the design procedures for assessment of environmental risk

- Learn about the process of environmental auditing.
- Understand procedures for preparation of environmental 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.), and Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Learning Outcomes:

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

- Understand the importance of environmental protection acts
- Explain acts and notifications in Environmental legislation

Text Books:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

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

- Understand the concept of Environmental impact
- Understand the methodologies related to EIA
- Appreciate various laws related to environmental protection
- Prepare the environmental impact assessment statement and to evaluate it.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE65c-DISASTER MANAGEMENT AND MITIGATION

(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

- Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities
- Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ
- Understand the 'relief system' and the 'disaster victim.'
- Describe the three planning strategies useful in mitigation.
- Identify the regulatory controls used in hazard management.
- Describe public awareness and economic incentive possibilities.
- Understand the tools of post-disaster management

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

Learning Outcomes:

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

- To know about the natural hazards and its management
- To understand about the global warming, cyclones and tsunamis

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

Learning Outcomes:

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

- Differentiate different types of hazards
- Understand different consequences of 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

Learning Outcomes:

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

- understand about earthquakes and volacanicerruptions
- Understand effects of earthquakes and mitigation measures

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 ofdroughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters

Learning Outcomes:

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

- Obtain knowledge on exogenous hazards and causes
- Obtain knowledge on mitigation measures of cyclones, droughts etc.,

UNIT – V:

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.

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage(preparedness)-HVRA Atlas
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

Learning Outcomes:

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

- Knowledge on soil erosion and its effects
- education related to risk reduction in communities in post and pre stage

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

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65a- AUTOMOBILE ELECTRONICS, SENSORS AND DRIVES

(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

- Explain the use of electronics in the automobile.
- Explain the importance of various types of sensors and actuators in automotive electronics.
- Demonstrate the various control elements in Engine Management system.
- Familiarize with Vehicle management systems.
- Identify various electronic and the instrumentation systems used in automobile.

UNIT – 1: Introduction to microcomputer: **10 Hrs**

Microcomputer: Buses, memory, timing, CPU registers; Microprocessor architecture: Initialization, operation codes, program counter, branch and jump instructions, subroutine. Analog to digital converters and Digital to analog converters, sampling, polling and interrupts, digital filters, lookup table.

Learning Outcomes:

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

- Draw the architecture of microprocessor. **L3**
- Explain the importance of subroutines, branch and jump instructions in Microprocessor. **L3**
- Compare Analog to Digital Converters and Digital to Analog Converters. **L4**
- Identify the various components of Microcomputer. **L1**

UNIT – II: Sensors and actuators **10 Hrs**

Speed sensors, Pressure sensors: Manifold Absolute Pressure sensor, knock sensor, Temperature sensors: Coolant and Exhaust gas temperature, Exhaust Oxygen level sensor, Position sensors: Throttle position sensor, accelerator pedal position sensor and crankshaft position sensor, Air mass flow sensor. Solenoids, stepper motors and relays.

Learning Outcomes:

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

- Recall the working principles of various types of sensors used in automotive electronics. **L1**
- Identify the practical applications of sensors and actuators. **L2**
- Apply the concept of sensors and actuators in real world applications **L3**

UNIT – III: Electronic engine management system **10Hrs**

Electronic engine control: Input, output and control strategies, electronic fuel control system, fuel control modes: open loop and closed loop control at various modes, EGR control, Electronic ignition systems – Spark advance correction schemes, fuel injection timing control.

Learning Outcomes:

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

- Compare open loop and closed loop control systems. **L4**
- Identify the various elements in Engine Management System. **L2**
- Recall the concepts of electronic ignition system. **L1**

UNIT – IV: Electronic vehicle management system **8 Hrs**

Cruise control system, Antilock braking system, electronic suspension system, electronic steering control, traction control system, Transmission control, Safety: Airbags, collision avoiding system, low tire pressure warning system.

Learning Outcomes:

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

- Understand the importance of cruise control system. **L2**
- Outline working of the safety systems. **L1**
- Demonstrate the control of electronic steering and traction. **L2**

UNIT – V: Automotive instrumentation system: **8 Hrs**

Input and output signal conversion, multiplexing, fuel quantity measurement, coolant temperature and oil pressure measurement, display devices- LED, LCD, VFD and CRT, Onboard diagnostics(OBD), OBD-II, off board diagnostics.

Learning Outcomes:

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

- Explain the method of measurement of fuel quality. **L2**
- Compare onboard diagnostics and off board diagnostics. **L4**
- Discuss various types of display devices. **L2**

Text Books:

1. Understanding Automotive Electronics, William B Ribbens, Newne Butterworth-Heinermann, 6th edition 2003.
2. Crouse W H, Automobile Elctrical Equipment, McGraw Hill Book Co.Inc, Newyork 2005.

Reference Books:

1. Bechhold "Understanding Automotive Electronics", SAE, 1998.
2. Robert Bosch "Automotive Hand Book", SAE (5th Edition), 2000.
3. Tom Denton,"Automobile Electrical and Electronic Systems" 3rd edition- Edward Arnold, London - 2004.
4. Eric Chowanietz - 'Automotive Electronics' - SAE International USA – 1995.

Course Outcomes:

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

- Obtain an overview of automotive components, like sensors, actuators, communication protocols and safety systems employed in today's automotive industry. **L1**
- Interface automotive sensors and actuators with microcontrollers. **L3**
- Know, the various display devices that are used in automobiles. **L2**
- Identify the elements in the engine management and vehicle management system. **L2**

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B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65b- PROGRAMMING OF ROBOT AND ITS 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 – 1: 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: **10 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. **L2**

UNIT – III: Robot Programming **10Hrs**

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 **L2**
- Explain the requirements and features of programming **L2**

UNIT – IV: Control of Manipulators: **8 Hrs**

Open- 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. **L2**
- Use the force control strategies to determine the forces in robot. **L3**
- Explain the force control and torque control techniques. **L2**

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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 — Mc Graw Hill, 1986.
2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003..

Reference Books:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2nd Edition, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1st Edition Wiley- Interscience, 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**

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B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65c- SENSORS FOR INTELLIGENT MANUFACTURING

(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 the sensors used in intelligent manufacturing.
- Illustrate sensors used in precision manufacturing and CNC machine tools.
- Explain sensors for monitoring of manufacturing systems.
- Outline advanced sensors used in intelligent manufacturing.

UNIT – 1: Introduction 12 Hrs

Principles, classifications and characteristics of sensors – Electrical, magnetic, optical, acoustic, pneumatic, magnetic, electro-optical and vision sensors, role of sensors in intelligent manufacturing.

Learning Outcomes:

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

- List out various types of sensors used in manufacturing. **L1**
- Explain the characteristics of different sensors. **L3**
- Explain optical, magnetic, pneumatic and acoustic sensors. **L3**
- Describe the role of sensors in intelligent manufacturing. **L4**

UNIT – II: Sensors and control in CIM and FMS: 10 Hrs

Design of CIM, decision support system for CIM, analysis of CIM, development of CIM strategy with sensors and control. FMS-Robot control with machine vision sensors-Architecture of robotic vision system, image processing, image acquisition, enhancement, segmentation, transformation, industrial application of robot vision, multi Sensor controlled robots, measurement of robot density, robot programming.

Learning Outcomes:

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

- Identify various types of inbellisort manufacturing systems. **L2**
- List the various types of sensors in CIM. **L2**
- Explain machine sensors. **L3**
- Describe architecture of robotic design systems. **L4**

UNIT – III: Sensors in Precision Manufacturing: 8Hrs

Testing of manufacturing components, principles and applications of digital Encoders, opto-electronic colour sensors, control applications in robotics. Sensors for CNC machine tools– linear, position and velocity sensors. Automatic identification techniques for shop floor control.

Learning Outcomes:

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

- List out different types of sensors in precision manufacturing. **L1**
- Describe the principle behind opto-electronic color sensors **L2**
- Select sensors for CNC machine tools. **L3**
- Explain automatic identification techniques for shop floor control. **L3**

UNIT – IV: Control of Manipulators: **8 Hrs**

Sensors for Monitoring of Manufacturing Systems: Principles – sensors for monitoring temperature, force, vibration and noise. Sensors to detect machinery faults. Selection of sensors and monitoring techniques.

Learning Outcomes:

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

- Identify various types of machine failures in manufacturing systems. **L2**
- Select sensors for monitoring of force, vibration and noise. **L3**
- Explain monitoring techniques for machinery faults. **L3**
- Name sensors used for temperature. **L3**

UNIT – V: Smart / Intelligent sensors: **8 Hrs**

Integrated sensors, micro sensors, nano sensors. Manufacturing of semi conductor sensors. Fibre optic sensors – Fibre optic parameters, configurations, photoelectric sensor for long distance, sensor alignment techniques.

Learning Outcomes:

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

- List out advance sensors in intelligent manufacturing. **L1**
- Explain about semiconductor and integrated sensors. **L3**
- Describe micro and nano sensors. **L3**
- Discuss principles of fibre optic sensors. **L3**

Text Books:

1. Sabrie Soloman, Sensors and Control systems in Manufacturing, McGraw-Hill, 2/e, 2010.
2. H.K Tonshoff and I.Inasaki, Sensor Applications Vol 1: Sensors in Manufacturing, Wiley-VCH Publications, 2001.

Reference Books:

1. Sabrie soloman, Sensors Handbook, McGraw Hill, 2/e, 20210
2. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G.Odrey, Industrial Robotics, Tata McGraw-Hill, 2008.

Course Outcomes:

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

- Classify various sensors used in intelligent manufacturing. **L2**
- Describe sensors used in computer integrated manufacturing and machine sensors. **L3**
- Discuss sensors used in precision manufacturing. **L3**
- Identify reasons behind machinery faults. **L3**
- Discuss advanced sensors in intelligent manufacturing. **L3**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65d- 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 – 1: Principles Of Solar Radiation: **10 Hrs**

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: **10 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 **10Hrs**

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**
- Discuss the principles of Bio-conversion. **L6**
- Explain combustion characterizes of bio-gas. **L2**

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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**
- Discuss OTEC and principles utilization. **L6**
- Explain mini-hydel power plants and their economics. **L2**

UNIT – V: Direct Energy Conversion **10 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, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. 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. Renewable energy resources, Tiwari and Ghosal, Narosa.
2. Non-Conventional Energy Sources, G.D. Rai.

Reference Books:

1. Renewable Energy Sources, Twidell& Weir.
2. Solar Energy, Sukhatme
3. Solar Power Engineering, B.S.Magal Frank Kreith & J.F.Kreith.
4. Non-Conventional Energy, Ashok V Desai, Wiley Eastern
5. Principles of Solar Energy, Frank Krieth & John F Kreider.
6. Non-Conventional Energy Systems, K Mittal , Wheeler.

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**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65e- NEMS & MEMS

(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 the basics of MEMS and NEMS
- Focus on the available tools and procedures to analyze and design micro/nano-scale engineering systems
- Demonstrate main issues stemming from operating in micro and nano length scale.
- Train MEMS and NEMS devices and their applications
- Impart fabrication and modeling aspects of MEMS and NEMS devices
- Enable a systematic design approach to engineering projects

UNIT – I: INTRODUCTION: **10 Hrs**

New trends in Engineering and Science: Micro and Nano scale systems, Overview of Nano and Micro Electromechanical Systems, Micro electromechanical systems devices and structures, Nanotechnology and (N+1) Problem, Physical and Technological limitation of miniaturization;Nanoscale Structures / Nanoparticles: Adhesion, Nanotubes, Nanowires, Quantum Dots, Multilayered structures, Nanocluster Composites Crystals: Lattices, Nanocrystals and nanoparticles.

Learning Outcomes:

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

- Explain the concepts, nanostructures and nanotechnology. **L2**
- Identify the principles of processing, manufacturing and characterization of nanomaterials and nanoscale systems. **L3**
- Apply electronic microscopy, and nano indentation techniques to characterize nano materials and nanostructures. **L3**

UNIT – II: MODELING OF MEMS AND NEMS: **10 Hrs**

Introduction to modeling, analysis and simulation, Scaling laws for length and time and its effect on modeling, Grain size effect on materials properties (mechanical, electrical, magnetic, etc.), basic electro-magnetic with application to MEMS and NEMS, Modeling developments of micro-and nano actuators using electromagnetic fields, Lumped-parameter mathematical models of MEMS, Energy conversion in NEMS and MEMS.

Learning Outcomes:

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

- Explain the operation of micro devices, micro systems and their applications. **L1**
- Model MEMS devices and structures. **L3**
- Develop micro devices, micro systems using the MEMS fabrication process. **L3**

UNIT – III: MANUFACTURING TECHNIQUES AND PROCESSES: **10Hrs**

Cleanroom and Fab Procedures, Vacuum: Vacuum Systems, Pumps and Gauges; Materials for MEMS: Silicon, silicon compounds, polymers, metals; Microfabrication Technologies: Beam Machining – Ion-Beam, E-Beam and LASER processing techniques; Lithographic Patterning – Bulk μMachining, Surface μMachining, SU-8 Lithography & Surface forming, LIGA Process: X-Ray Lithography &UV LIGA; Precision Machining – Precision Milling and turning, μEDM, Micromolding & Embossing, Precision Bonding, Thin Films: Processes, Evaporation, Dry and Wet Etching, Sputtering Deposition; Characterization: Optical Techniques/Microscope, SEM, Optical and Electrical, Properties, Auger and Thin Film Analysis, AFM.

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Learning Outcomes:

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

- Outline computer-aided design, fabrication, analysis and characterization of nano-structured materials, micro- and nano-scale devices. **L2**
- Develop micro/nanosystems for photonics and optical applications. **L2**
- Explain manufacturing processes based on diffusion, deposition and patterning of surfaces. **L4**

UNIT – IV: MICRO SENSORS AND MICRO ACTUATORS: 8 Hrs

MEMS Sensors: Piezoresistive pressure sensor, Acoustic wave sensors, Resonant Microsensor, Peizoelectric Rate gyroscope, Capacitive Accelerometer; etc. Nanosensors & Nano biosensors; Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps; Nanomotor, Molecular Motor, etc.

Learning Outcomes:

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

- Outline basic approaches for various actuator design. **L2**
- Distinguish between various MEMS sensors. **L4**
- Explain the operation principles of advanced micro- and nanosystems. **L4**

UNIT – V: CONTROL OF MICROELECTROMECHANICAL SYSTEMS 10 Hrs

Introduction to Microelectromechanical Systems Control, Control of Microelectromechanical Systems, Intelligent Control of MEMS; Synthesis, Analysis, Fabrication, and Computer-Aided Design of MEMS, Case studies: Design and Fabrication Analysis of Translational Microtransducers, Single-Phase and three phase Reluctance Micromotors, Modeling, Analysis, and Control of Micromirror Actuators; Application of Nanomotor in Bio-medical applications, Nano robots, Electronics based on CNT - Molecular Electronics.

Learning Outcomes:

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

- Identify micro electro mechanical system control for a given application. **L3**
- Synthesis intelligent control of MEMS/NEMS. **L4**
- Evaluate MEMS/NEMS for various applications. **L4**

Text Books:

1. Marc Madou, Fundamentals of Micro fabrication, CRC press 1997.
2. Stephen D. Senturia, Micro system Design, Kluwer Academic Publishers,2001
3. J. A. Pelesko and D. H. Bernstein, Modeling of MEMS and NEMS, Chapman & Hall/CRC, 2003.
4. Sergey Edward Lyshevski, Lyshevski Edward Lyshevski, MEMS and NEMS: Systems, Devices and Structures, CRC Press, 2005.

Reference Books:

1. Tai Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata Mcraw Hill, 2002.
2. Chang Liu, Foundations of MEMS, Pearson education India limited, 2006
3. Mahalik N P, MEMS, Tata McGraw-Hill Education, 2008.
4. Gianfranco Cerofolini, Nanoscience and Technology: Nanoscale Devices, Springer, 2009.

Course Outcomes:

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

- Identify processing and characterization of nanomaterials. **L3**
- Plan operation of micro devices, micro systems and their applications. **L3**
- Describe the implementation of MEMS into products. **L4**
- Explain the operation principles of advanced micro- and nanosystems. **L4**
- Apprise the technology implemented in advanced micro- and nanosystem. **L5**
- Design the micro devices, micro systems using the MEMS fabrication process. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65f – OPTIMIZATION TECHNIQUES THROUGH MATLAB

(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

- Introduce basics of MATLAB
- Familiarize the fundamentals of optimization
- Explain single variable optimization using various methods
- Implement multi variable optimization using various methods
- Train various evolutionary algorithms.

UNIT – 1: Introduction to MAT LAB: **10 Hrs**

Overview, MATLAB Preliminaries, Basics of MATLAB, Beyond the Basics of MATLAB, Popular Functions and Commands, Plotting using MATLAB, Optimization with MATLAB.

Learning Outcomes:

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

- Write simple codes in MATLAB. **L3**
- Plot the data using MATLAB. **L3**
- Implement optimization models in MATLAB. **L3**

UNIT – II: Introduction to Optimization: **10 Hrs**

Statement of an optimization problem, Classifications of optimization Problems: Single variable optimization, Multi variable optimization with no constraints, Multi variable optimization with equality constraints, Multi variable optimization with inequality constraints, Convex and Concave programming.

Learning Outcomes:

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

- Build optimization problem. **L1**
- Solve various optimization problems **L3**
- Compare convex and concave programming **L4**

UNIT – III: Single Variable Optimization: **10Hrs**

Finite difference method, Central difference method, Runge-Kutta method, interval halving method, golden section method with MATLAB code.

Learning Outcomes:

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

- Understand various methods involving single variable optimization. **L2**
- Develop codes in MATLAB for different methods. **L3**
- Identify methods for solving a single variable optimization problem. **L3**

UNIT – IV: Multi Variable Optimization: **8 Hrs**

Conjugate gradient method, Newton's method, Powell's method, Flectcher- Reeves method, Hooke and Jeeves method, interior penalty function with MATLAB code.

Learning Outcomes:

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

- Apply various methods involving multi variable optimization. **L2**
- Develop codes in MATLAB for solving various multi variable optimization problems. **L3**
- Choose methods for solving a multi variable optimization problem. **L3**

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UNIT – V: Evolutionary Algorithms: **8 Hrs**

Overview, Genetic Algorithms: Basics of Genetic Algorithms, Options in MATLAB, Multi Objective Optimization using Genetic Algorithms, Ant Colony Optimization, Simulated Annealing, Particle Swarm Optimization.

Learning Outcomes:

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

- Apply different types of genetic algorithms. **L3**
- Model optimization problems using genetic algorithms in MATLAB. **L3**
- Compare different genetic algorithms for performance. **L5**

Text Books:

1. Rao V.Dukkipati, MATLAB: An Introduction with Applications, Anshan, 2010.
2. Achille Messac, Optimization in practice with MATLAB, Cambridge University Press, 2015.
3. Jasbir S Arora, Introduction to optimum design, 2/e. Elsevier, 2004.

Reference Books:

1. Cesar Perez Lopez, MATLAB Optimization Techniques, Academic press, Springer publications, 2014.
2. Steven C.Chapra, Applied Numerical Methods with MATLAB for Engineers and scientists, 4/e, McGraw-Hill Education, 2018.

Course Outcomes:

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

- Use optimization terminology and concepts, and understand how to classify an optimization problem. **L4**
- Apply optimization methods to engineering problems. **L3**
- Implement optimization algorithms. **L3**
- Compare different genetic algorithms. **L5**
- Solve multivariable optimization problems. **L4**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC65a-INTRODUCTION TO MICROCONTROLLER AND APPLICATIONS

(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 the basic concepts and architecture of 8051.
- To learn various instructions and addressing modes used in 8051
- To be able to write programs in assembly language for 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.

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 this 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.

Learning Outcomes:

At the end of this 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:

Programs: Arithmetic operations, Biggest Number / Smallest Number, Ascending order / Descending order, BCD to HEX Conversion, HEX to BCD Conversion, Odd Parity Generator Even Parity Generator, Time delay routines

I/O: Bit addresses for I/O and RAM, I/O programming, I/O bit manipulation programming.

Learning Outcomes:

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

- Write assembly language program in 8051 for simple operations. **L6**
- Gain knowledge about different mappings used in 8051 microcontroller. **L1**

UNIT – IV:

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 this 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 – V:

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 this 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**

Text Books:

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin 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

Course Outcomes:

At the end of this Course the student 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**
- Write programs in assembly language for 8051 **L6**
- Program 8051 Timers and implement serial communication for a given application. **L6**
- Interface memory, I/O devices and use Interrupts. **L4**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC65b-PRINCIPLES OF DIGITAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

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

- To understand the frequency domain analysis of discrete time signals.
- To learn the properties of discrete fourier series 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 this 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 this 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 this 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 this 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 this 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 and Dimitris 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.

Reference Books:

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 student will be able to

- Articulate the frequency domain analysis of discrete time signals. **L3**
- Understand the properties of discrete fourier series 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

19AEC65c-INTRODUCTION TO IMAGE PROCESSING

(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 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 – neighborhood, 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 this 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 this 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 this 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 Haar Transform.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 this 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 this unit, the student will bc ablc 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.

Reference Books:

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 student 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**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACS65b- INTRODUCTION TO COMPUTER NETWORKS

Open Elective-II

L	T	P	C
3	0	0	3

Course Objectives:

This course is designed to:

- Introduce the basic concepts of Computer Networks.
- Familiarize with the layered approach and different layers of computer networks.
- Familiarize with the design issues of different layers.
- Explain the working of different protocols of a computer network..

UNIT – I: INTRODUCTION **8hrs**

Introduction: Uses of computer networks, network hardware, Protocol Hierarchies, Design Issues for the layers, Connection oriented vs Connectionless Service. **The physical layer:** The theoretical basis for data communication, Guided transmission media, wireless transmission, communication satellites.

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: THE DATA LINK LAYER **8hrs**

The data link layer: Data link layer design issues, error detection and correction, elementary data link protocols, sliding window protocols

The medium access control: The channel allocation problem, multiple access protocols, Ethernet.

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: THE NETWORK LAYER **8hrs**

The network layer: Network layer design issues, Flooding, Distance Vector Routing, Link state Routing.

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: IP VERSION 4 PROTOCOL **7 Hrs**

The IP version 4 Protocol, IP Addresses, IP version 6, Internet control protocols, OSPF, BGP, Internet multicasting.

The transport layer: Elements of transport protocols, congestion control, The internet transport protocols: UDP and TCP.

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: THE APPLICATION LAYER

The application layer: DNS- The Domain Name System, Electronic Mail, WWW Architectural Overview, Static Web pages, Dynamic web pages and web applications.

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. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.

Course Outcomes:

Students will be able to:

- Recognize the method of using layered approach for design of computer networks. **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 III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACS65c- WEB DESIGN AND MANAGEMENT

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 **8hrs**

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 **8hrs**

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 **8hrs**

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 **7 Hrs**

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 III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS14a-MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Humanities Elective-I)(Common to EEE, ECE & CSE)

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 – 1

Introduction to Managerial Economics:

Definition of Managerial Economics, Nature and Scope – Managerial Economics and its relation with other subjects- Basic economic tools in Managerial Economics.

Demand Analysis & Elasticity of Demand: Meaning- Demand distinctions- Demand determinants- Law of Demand and its exceptions, Types of Elasticity of demand - Measurement of price elasticity of demand, Significance of Elasticity of Demand.

Demand Forecasting: Meaning - Factors governing demand forecasting - Methods of demand forecasting - Forecasting demand for new products.

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**

11/10/21

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**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS14b-ENTERPRENUARSHIP AND INNOVATION MANAGEMENT

(Humanities Elective-I)(Common to EEE, ECE & CSE)

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**

11/10/21

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 III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE66- 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

19AEE67- ELECTRICAL MEASUREMENTS LAB

L	T	P	C
0	0	2	1

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

19AHS16-ORGANIZATIONAL BEHAVIOR

(Common to EEE, ECE & CSE)

L	T	P	C
3	0	0	0

Course Objectives:

- To make the student understand about the organizational behavior
- To enable them to develop self motivation, leadership and management.

UNIT – 1:

Organizational Behavior - Introduction to OB - Meaning and definition, scope - Organizing Process – Making organizing effective - Understanding Individual, Behavior – Attitude - Perception - Learning - Personality Types.

Learning Outcomes:

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

- Understand the concept of Organizational Behavior. **L1**
- Evaluate personality types. **L2**

UNIT – II:

Individual Behavior – Diversity – Biographical Characteristics Ability – Implementing Diversity Management – Strategies – Attitudes & Job Satisfaction - Personality – Theories of Personality – Perception – Process of Perception – Perception & Individual Decision Making – Motivation from concepts to Applications.

Learning Outcomes:

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

- Understand the concept of Organizational Behavior. **L1**
- Contrast and compare Individual Behavior and attitude. **L2**

UNIT – III:

Group Behavior – Foundations of Group Behaviour – Defining and Classifying Groups – Stages of Group Development – Group Properties – Roles – Norms – Status, Size and Cohesiveness – Group Decision Making – Understanding Work Teams – Types of Teams – Creating Effective Teams.

Learning Outcomes:

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

- Know the concept of Group Dynamics. **L1**
- Contrast and compare Group behavior and group development. **L2**

UNIT – IV:

Leadership and Motivational Theories: Leadership Theories – Characteristic of effective leader – Finding and Creating Effective Leaders – Power & Polities. Introduction to motivation, Maslow's Hierarchy of Needs, Two- factor theory of Motivation, Mcdregers theory of motivational Model.

Learning Outcomes:

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

- Contrast and compare Traits theory and Managerial Grid. **L1**
- Know the difference between Transactional and Transformational Leadership. **L2**

UNIT – V:

Foundation of Organizational Structure: Conflicts & Negotiations – Organization Structure – Organization Change & Stress Management – Self Management – Managing Careers.

Learning Outcomes:

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

- Know the importance of organizational change and development. **L1**
- Apply change management in the organization. **L2**

Text Books:

1. Stephen P. Robbins, Timothy: Organizational Behaviour, Pearson 14th Edition, 2012.
2. Dr. Anjali Ghanekar, Organizational Behaviour Concepts & Cases, Everest, 19th Edition, 2013.

Reference Books:

1. Mirza S Saiyadain, Cases in Organizational Behavior , TMH,2011.
2. Gerard H.Seijts, Cases in Organizational Behavior, Sage,2008.
3. Nelson, Quick and Khandelwala, ORGB, 2/e, Cengage, 2012.
4. P.G. Aquinas: Organizational Behaviour Concepts, Realities, Application & Challenges, 2nd Edition, Excel Books 2012.

Course Outcomes:

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

- To bring about the through understanding of entrepreneurship and constraints for the growth of entrepreneurial culture. **L1**
- To demondtrate knowledge in entrepreneurship development. **L2**
- To understand the concept of entrepreneushiptaining and various entrepreneurship training institutes in India. **L3**
- To be able to demontrate progressive learning in the project report and ownership structures. **L4**
- To be able to demontrate progressive learning in the project report and ownership structures. **L5**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

College of Engineering Pulivendula

B.Tech (EEE)– IV-I Sem

L	T	P	C
3	0	0	3

DIGITAL ELECTRONICS AND LOGIC DESIGN

Course Objectives:

- 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 introduce programmable logic devices.

Unit I

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.

Unit Outcomes:

- Summarize advantages of using different number systems. (L2)
- Explain usefulness of different coding schemes and functionality of logic gates. (L2)
- Apply basic laws and De Morgan's theorems to simplify Booleanexpressions. (L3)
- Compare K- Map and Q-M methods of minimizing logic functions. (L5)

Unit II

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.

Unit Outcomes:

- Apply Boolean algebra for describing combinational digital circuits. (L2)
- Analyze standard combinational circuits such as adders, subtractors, multipliers, comparators etc. (L4)
- Design various Combinational logic circuits. (L4)
- Implement logic functions with decoders and multiplexers. (L5)

Unit III

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.

Unit Outcomes:

- Describe behaviour of Flip-Flops and Latches.(L2)
- Compare Moore and Mealy machine models.(L5)
- Design synchronous sequential circuits using flip flops and construct digital systems using components such as registers and counters (L4)
- Utilize concepts of state and state transition for analysis and design of sequential circuits (L3)

Unit IV

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.

Unit Outcomes:

- Define RAM, ROM, PROM, EPROM and PLDs. (L1)
- Describe functional differences between different types of RAM & ROM. (L2)
- Compare different types of Programmable Logic Devices. (L5)
- Design simple digital systems using PLDs. (L4)

Unit V

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.

Unit Outcomes:

- Summarize significance of various TTL , I^2L, ECL and CMOS subfamilies. (L2)
- Examine Interface aspects of TTL & CMOS logic families. (L5)
- Explain characteristics of digital ICs such as speed, power dissipation, figure of merit, fan-out, noise immunity etc. (L2)
- Compare bipolar and MOS logic families. (L5)

Course Outcomes:

After completion of the course, student will be able to

CO1: Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits. (L1)

CO2: Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Also describe the various performance metrics for logic families. (L2)

CO3: Design combinational and sequential logic circuits. (L4)

CO4: Compare different types of Programmable logic devices and logic families. (L5)

TEXTBOOKS:

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 4th Edition Pearson Education, 2013.
2. Z. Kohavi and N. K. Jha, "Switching and Finite Automata Theory", Third Edition, Tata McGraw Hill, 2010.
3. R. P. Jain, "Modern Digital Electronics", 4th edition, McGraw Hill Education , India Private Limited, 2012.

REFERENCES:

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.

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE72- POWER SEMICONDUCTOR DRIVES

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

19AEE74a- SWITCHED MODE POWER CONVERTERS

(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

- Understand basic concepts of DC-DC converters
- Understand the concepts of resonant converters and their classification, various types of multilevel inverters, power conditioners, UPS and filters.
- Apply various modulation and harmonic elimination techniques over the converters.
- Analyze the state space modeling of various types of converters.
- Design inductor and transformer for various power electronic applications.

UNIT – I: DC-DC Converters **10 Hrs**

Principles of step down and step up converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters – Numerical Examples

Learning Outcomes:

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

- Understand state space modeling of DC-DC converters. **L1**
- Distinguish between step down and step up converters. **L2**

UNIT – II: Switching Mode Power Converters **10 Hrs**

Analysis and state space modeling of fly back, Forward, Luo, Half bridge and full bridge converters-control circuits and PWM techniques – Numerical Examples

Learning Outcomes:

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

- Know about state space modelling of converters **L1**
- Understand about various control circuits & PWM techniques **L2**

UNIT – III: Resonant Converters **10 Hrs**

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control – Numerical Examples

Learning Outcomes:

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

- Classification of resonant converters. **L1**
- Distinguish between series and parallel resonant converters. **L2**

UNIT – IV: DC-AC Converters **10 Hrs**

Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

Learning Outcomes:

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

- Understand and analyze different single phase and three phase inverters –modulation& harmonic elimination techniques. **L1**
- Understand various types of multilevel inverters with waveforms and their applications **L2**

UNIT – V: Power Conditioners, UPS & FILTERS **10 Hrs**

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

Learning Outcomes:

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

- Understand different types of power line disturbances, power conditioners, in detail working of UPS and its applications. **L1**
- Understand various types of filters with and without capacitors & inductor and transformer for various power electronic applications. **L2**

Text Books:

1. L. Umanand, "Power Electronics: Essentials and Applications", Wiley, 2009
2. M.H. Rashid, " Power Electronics handbook", Elsevier Publication, 2001.
3. V Ramanarayanan, "Course material on Switched Mode Power Conversion" Dept. of Electrical Engg. IISc. Bangalore.

Reference Books:

1. Philip T. Krein, "Elements of Power Electronics", Oxford University Press, 2012
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, "Power Electronics converters, Applications and design", 3rd Edition, John Wiley and Sons,2006
3. M.H. Rashid, "Power Electronics circuits, devices and applications", 3rd Edition Prentice Hall of India New Delhi, 2007

Course Outcomes:

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

- To be able to solve the problems and to design of various DC-DC converters **L1**
- To be able to understand advanced converters of SMPCs **L2**
- To understand the performance of resonant converters **L3**
- To understand various types and performance characteristics of 1-ϕ and 3-ϕ inverters with single/multi levels **L4**
- To understand about power conditioners, UPS and filters&PE applications **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE74b- POWER QUALITY

(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

- 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

19AEE74c- INSTRUMENTATION

(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

- 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

19AEE76a- HVDC AND FLEXIBLE AC TRANSMISSION SYSTEMS

(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

- 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

19AEE76b- SMART GRID TECHNOLOGIES

(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 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

19AEE76c- HYBRID ELECTRIC VEHICLES

(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

- 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**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE75a-ARCHITECTURE AND TOWN PLANNING

(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 know the western architecture and Indian architecture and also to gain knowledge on the principles of architectural design and historical background of town planning.

A) ARCHITECTURE:

UNIT – I:

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

History of Architecture:

a) Western Architecture: Egyptian, Greek, Roman Architectures; influences- Comparative Analysis Orders

b) Indian Architecture: Vedic age - Indus Valley civilization - Buddhist period; stambas, Slenstas. Roranas, Chaityans, Viharas with one example for each Hindu temples - Evaluation of Dravidian and Indo Aryan Styles - Principle factors. Temple of Aibole, Mahabalipuram, Madurai, Deograph, Bhuvaneshwar, Mount Abu.

c) Indo - Sarsanic Architecture; Mosque - Place- FortTomb

Learning Outcomes:

Understand the different architectures of Indian and western countries

Understand the various principle factors of architecture

UNIT – II:

Architectural Design:

a) Principle of designing : Composition of plan Relationship between plan and elevation elements, form, surface Mass, Texture, Color,Tone.

b) Principle of Compositions: Unity, contrast, proportion, scale, Bab Rhuthm, character. Principles of Planning a Residence; Site Orientation prospect, Grouping, circulation, privacy, services and otherfactors

Learning Outcomes:

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

- Understand the design pricnciples and compositions of architecture

UNIT – III:

Introduction of Post-classic Architecture and contribution of eminent architects to modern period.Brief summary of post - classic architecture - Indian and Western Architectural contribution of Edward Lutyens, Le Corbusier), Frank Lloyd Wrigt, Walter Groping, Vender Rohe, Caarihan, Nervi, Oscar Niemyer, Edward Durell stone

Learning Outcomes:

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

- Obtain the knowledge of contribution of different architects in architecture

B) TOWNPLANNING:

UNIT – IV:

Historical Back Ground: Town planning in India - town plans of Magad - town plans of ancient Indian towns; Mourya, Pataliputravijayanagara, Delhi.Town planning in the West-town plans of Acropolis, Rome, Paris, London

Learning Outcomes:

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

- Understand the need of town planning
- Knowledge on planning of different towns in India and other countries

UNIT – V:

Components of Planning;

a) Zoning
b) Roads and road Traffic.
c) Housing-Slums, Parks, Playgrounds.
d) Public Utility Services.
e) Surveys and maps for planning.
f) Neighbourhood Planning

Planning New town, planning standards, National and regional Planning, town planning and legislation.Garden cities and satellite town

Learning Outcomes:

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

- Understand the different components of town planning
- Knowledge on national standards in country and town planning

Text Books:

Reference Books:

A) ARCHITECTURE

1. Indian Architecture – Vol:- I and II by Percy Brown, Taraporevala Publications, Bombay.
2. Planning and 'Design of Building -Section of Architecture byY.S.Sane.
3. Modern Architecture and Design by Nikolans,Pevshar.
4. Modern Ideal Hol11nes for India byR.S.Deshpande.

B) TOWNPLANNING

1. Town and Country .Planning - A.J.Brown andH.M.Sherrard.
2. Town Design .-FederikGibbard, Architectural press,London.
3. National Building Code ofIndia.
4. Town Planning in India - Town and Country Planning Organisation, New Delhi1962.
5. Regional Planning - Misra R.P., Mysore University.
6. Urban and Regional Planning; Principles and case studies by K.S.Rama Gouda, Mysore University Publications.
7. Town and Country Planning - P. Abercrombe, Oxford University press.

Course Outcomes:

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

- Learn the importance of architecture and its principles in designing
- The different architectures till date and the contribution of different architects
- The necessity of town planning and different components of planning

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE75b-EXPERIMENTAL STRESS ANALYSIS

(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 bring awareness on experimental method of finding the response of the structure to different types of load
- Demonstrates principles of experimental approach
- Teaches regarding the working principles of various strain gauges
- Throws knowledge on strain rosettes and principles of non destructive testing of concrete
- Gives an insight into the principles of photo elasticity

UNIT – I:

PRINCIPLES OF EXPERIMENTAL APPROACH: - Merits of Experimental Analysis Introduction, uses of experimental stress analysis advantages of experimental stress analysis, Different methods –Simplification of problems

Learning Outcomes:

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

- Demonstrate the merits and principles of experimental approach
- Give an insight into the uses and advantages of experimental stress analysis

UNIT – II:

STRAIN MEASUREMENT USING STRAIN GAUGES:-

Definition of strain and its relation of experimental Determinations Properties of Strain Gauge Systems-Types of Strain Gauges – Mechanical, Acoustic and Optical Strain Gauges. Introduction to Electrical strain gauges - Inductance strain gauges – LVDT – Resistance strain gauges – various types –Gauge factor – Materials of adhesion base.

Learning Outcomes:

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

- Introduce various strain gauge systems and their properties
- Give information regarding the gauge factor and materials of adhesion bases

UNIT – III:

STRAIN ROSSETTES AND NON – DESTRUCTIVE TESTING OF CONCRETE:- Introduction – the three elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge. Ultrasonic Pulse Velocity method –Application to Concrete. Hammer Test – Application to Concrete.

Learning Outcomes:

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

- Introduces various strain rosettes and corrections for strain gauges
- Gives an insight into the destructive and non destructive testing of concrete

UNIT – IV:

THEORY OF PHOTOELASTICITY: - Introduction –Temporary Double refraction – The stress Optic Law –Effects of stressed model in a polariscope for various arrangements – Fringe Sharpening. Brewster"s Stress Optic law.

Learning Outcomes:

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

- Introduces stress optic laws.
- Gives the arrangements and working principles of polariscope

UNIT – V:

TWO DIMENSIONAL PHOTOELASTICITY: - Introduction – Iso-chromatic Fringe patternsIsoclinic Fringe patterns passage of light through plane Polariscope and Circular polariscope Isoclinic Fringe patterns – Compensation techniques – Calibration methods – Separation methods – Scaling Model to prototype Stresses – Materials for photo – Elasticity Properties of Photoelastic Materials

Learning Outcomes:

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

- Introduces the understanding of different fringe patterns.
- Introduces model analysis and properties of photo elastic materials

Text Books:

1. J.W.Dally and W.F.Riley, "Experimental stress analysis College House Enterprises"
2. Dr.Sadhu Singh, "Experimental stress analysis", khanna Publishers

Reference Books:

1. U.C.Jindal, "Experimental Stress analysis", Pearson Publications.
2. L.S.Srinath, "Experimental Stress Analysis", MC.Graw Hill Company Publishers.

Course Outcomes:

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

- The student will be able to understand different methods of experimental stress analysis
- The student will be able to understand the use of strain gauges for measurement of strain
- The student will be exposed to different Non destructive methods of concrete
- The student will be able to understand the theory of photo elasticity and its applications in analysis of structures

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE75c-FINITE ELEMENT ANALYSIS

(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

- Familiarize basic principles of finite element analysis procedure.
- Explain theory and characteristics of finite elements that represent engineering structures.
- Apply finite element solutions to structural, thermal, dynamic problem
- Learn to model complex geometry problems and solution techniques

UNIT – I:

INTRODUCTION: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation.

PRINCIPLES OF ELASTICITY: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading.

Learning Outcomes:

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

- Understand the concept of nodes and elements.(L2)
- Understand the general steps of finite element methods.(l2)
- Understand the role and significance of shape functions in finite element formulations (l2)

UNIT – II:

ONE DIMENSIONAL & TWO DIMENSIONAL ELEMENTS: Stiffness matrix for bar element – shape functions for one dimensional elements – one dimensional problems .Two Dimensional Elements - Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates

Learning Outcomes:

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

- Explain the formulation of one dimensional and two – dimensional elements (L2)
- Apply the formulation techniques to solveone dimensional two – dimensional problems (L2)
- Formulate and solve axisymmetric problems.(L6)

UNIT – III:

GENERATION OF ELEMENT : Generation of element stiffness and nodal load matrices for 3-node triangular element and four noded rectangular elements.

Learning Outcomes:

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

Apply the formulation techniques to solve problems using triangle and quadrilateral elements. (L3)

UNIT – IV:

ISOPARAMETRIC FORMULATION : Concepts of, isoparametric elements for 2D analysis – formulation of CST element, 4 –Noded and 8-noded iso-parametric quadrilateral elements – Lagrangian and Serendipity elements. **AXI-SYMMETRIC ANALYSIS:** Basic principles-Formulation of 4-noded iso-parametric axi-symmetric element

Learning Outcomes:

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

- Understand concepts of isoparametric elements(L1)
- Formulate and solve axisymmetric problems.(L6)

UNIT – V:

SOLUTION TECHNIQUES: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads

Learning Outcomes:

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

Text Books:

1. Finite Element Analysis for Engineering and Technology, Tirupathi R Chandraputla, Universities Press Pvt Ltd, Hyderabad.2003.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers

Reference Books:

1. Finite element analysis and procedures in engineering by H.V.Lakshminaryana, 3rd edition, universities press,Hyderabad
2. Finite element analysis in Engineering Design by S.Rajasekharan, S.Chand Publications, NewDelhi
3. Finite element analysis by S.S. Bhavakatti-New age internationalpublishers

Course Outcomes:

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

- Demonstrate the differential equilibrium equations and theirrelationship
- Apply numerical methods tofem
- Demonstrate the displacement models and loadvectors
- Compute the stiffness matrix for isoperimetricelements
- Analyze plane stress and plane strainproblems

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE75a- ELECTRICAL ENGINEERING MATERIALS

(Open Elective-III)

L	T	P	C
2	0	0	2

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

- Classification of materials.
- Properties of materials and its applications.
- Domestic wiring and earthling
- Concept of polarization and dipolar polarization
- Classification of materials.

UNIT – I: Conducting Materials **10 Hrs**

Introduction – classification of materials – Metals and Non metals, physical, thermal, mechanical and electrical properties of materials–classification of electrical materials–concept of atom – electron configuration of atom, conductors, general properties of conductors, factors effecting resistivity of electrical materials–electrical / mechanical / thermal properties of copper, aluminum, iron, steel, lead, tin and their alloys–applications.

Learning Outcomes:

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

1. Understand the classification of conducting materials. **L1**
2. Analyze the properties of different conducting materials **L2**

UNIT – II: Dielectric and High Resistivity Materials **10 Hrs**

Introduction–solid, liquid and gaseous di electrics, leakage current, permittivity, dielectric constant, dielectric loss –loss angle –loss constant, Breakdown voltage and di electric strength of –solid, liquid and gaseous dielectrics, effect of break down–electrical and thermal effects, Polarization – electric, ionic and dipolar polarization. Effect of temperature and Frequency on dielectric constant of polar dielectrics. High Resistivity materials – electrical / thermal /mechanical properties of Manganin, Constantan, Nichrome, Tungsten, Carbon and Graphite and their applications in electrical equipment.

Learning Outcomes:

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

- Understand the classification of di electric and high resistivity materials. **L1**
- Analyze the properties of di electric and high resistivity materials **L2**

UNIT – III: Solid Insulating Materials **10 Hrs**

Introduction–characteristics of a good electrical insulating materials–classification of insulating materials – electrical, thermal, chemical and mechanical properties of solid insulating materials-Asbestos, Bakelite, rubber, plastics, thermoplastics. Resins, polystyrene, PVC, porcelain, glass, cotton and paper.

Learning Outcomes:

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

- Understand about various characteristics of solid insulating materials **L1**
- Understand the classification of solid insulating materials. **L2**

UNIT – IV: Liquid & Gas Insulating Materials **10 Hrs**

Liquid insulating materials – Mineral oils, synthetic liquids, fluorinated liquids– Electrical, thermal and chemical properties – transformer oil – properties – effect of moisture on insulation properties Gaseous insulators– classification based on dielectric strength – dielectric loss, chemical stability properties and their applications.

Learning Outcomes:

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

- Understand the classification of liquid insulating materials. **L1**
- Analyze the properties of liquid insulating materials **L2**

UNIT – V: Domestic Wiring **10 Hrs**

Wiring materials and accessories–Types of wiring–Types of Switches-Specification of Wiring–Staircase wiring- Fluorescent lamp wiring-God own wiring–Basics of earthling–single phase wiring layout for residential building.

Learning Outcomes:

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

- Understand about wiring materials and accessories. **L1**
- Understand about earthing and wiring layout of domestic buildings **L2**

Text Books:

1. Electrical Engineering Materials by G.K. Mithal, Khanna publishers, 2nd edition,1991.
2. Acourse in Electrical Engineering Materials by R.K. Rajput, Laxmi publications,2009.

Reference Books:

1. An Introduction to Electrical Engineering Materials by C.S.Indulkar and S.Thiruvengadam, SChand&Company,2008.
2. Electrical engineering Materials by Technical Teachers Training Institute, Madras, McGraw Hill Education,1st Edition,2004.
3. A course in Electrical Engineering Materials Physics Properties & Applications by S P.Seth, Dhanapat Rai & Sons Publications,2018.

Course Outcomes:

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

- Understand the classification of materials, domestic wiring materials and earthing. **L1**
- Analyze the properties of different electrical materials **L2**
- Apply where the materials are applicable based on properties of materials **L3**
- Design and develop Residential wiring, go down wiring and earthing. **L4**
- `Understand the characteristics of materials **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE75b- DIGITAL SIGNAL PROCESSORS AND APPLICATIONS

(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

- Provide the basic knowledge of different DSP Processors.
- Interfacing Memory and I/O Peripherals to different Programmable DSP Devices
- Operation of the ADC and programming modes
- Introduction to Field Programmable Gate Arrays
- Provide the basic knowledge of different DSP Processors.

UNIT – I: **10 Hrs**

Introduction to the TMSLF2407 DSP Controller: Brief Introduction to Peripherals - Types of Physical Memory - Software Tools

C2XX DSP CPU and instruction set: Introduction to the C2xx DSP Core and Code Generation - The Components of the C2xx DSP Core - Mapping External Devices to the C2xx Core and the Peripheral Interface -System Configuration Registers –Memory - Memory Addressing Modes - Assembly Programming Using the C2xx DSP Instruction Set

Learning Outcomes:

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

- Able to understand the basic concepts of DSP controller **L1**
- Able to understand the Assembly language programming **L2**

UNIT – II: **10 Hrs**

Parallel and Serial Data Transfer: Pin Multiplexing (MUX) and General Purpose I/O Overview - Multiplexing and General Purpose I/O Control Registers - Using the General Purpose I/O Ports, Serial Communication

Learning Outcomes:

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

- Understand the Pin Multiplexing and GPIO pins **L1**
- Analyze the serial Communication concepts **L2**
- Understand the concept of control Registers **L3**

UNIT – III: **10 Hrs**

Interrupt system of TMS320LF2407: Introduction to Interrupts - Interrupt Hierarchy - Interrupt Control Registers - Initializing and Servicing Interrupts in Software, real time control with interrupts

The analog-to-digital converter (ADC): ADC Overview - Operation of the ADC and programming modes

Learning Outcomes:

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

- Understand the concept of Interrupts **L1**
- Analyze the concept of Analog to digital converter **L2**

UNIT – IV: **10 Hrs**

Event Managers (EVA, EVB): Overview of the Event Manager (EV) - Event Manager Interrupts - General Purpose (GP) Timers- Compare Units - Capture Units and Quadrature Encoded Pulse (QEP) Circuitry - General Event Manager Information – PWM Signal Generation with Event Managers and interrupts, Measurement of speed with Capture Units, Implementation of Space Vector Modulation with DSP TMSLF2407A

Learning Outcomes:

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

- Understand the concept of Event Manager and Interrupts **L1**
- Apply the concept of Space Vector Modulation with processor **L2**

UNIT – V: **10 Hrs**

Field Programmable Gate Arrays: Introduction to Field Programmable Gate Arrays – CPLD Vs FPGA – Types of FPGA , Configurable logic Blocks (CLB), Input/Output Block (IOB) – Programmable Interconnect Point (PIP)- HDL programming –overview of Spartan 6 & ISE Design Suite, Implementation of PWM technique with SPARTAN-6 FPGA

Learning Outcomes:

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

- Understand the concept of Field Programmable Gate Arrays. **L1**
- Apply the concept of HDL programming and PWM technique implementation **L2**

Text Books:

1. Hamid A. Tolyat, "DSP based Electromechanical Motion Control"-CRC press, 2004
2. Wayne Wolf,„FPGA based system design", Prentice hall, 2004

Reference Books:

1. Application Notes from the website of Texas Instruments
2. Spartan-6 FPGA Configurable Logic Block, 2010
3. Xilinx Spartan 6 Data sheets

Course Outcomes:

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

- Write Assembly Language Programs for the Digital Signal Processors **L1**
- Configure and use Digital Input / Output lines and ADCs **L2**
- Configure and use Interrupts and Event Managers for PWM generation **L3**
- Employ DSPs & **L4**
- FPGAs for the real time control of Power Electronic Controllers **L5**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE75c- 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**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75a – SPECIAL TYPE OF VEHICLES

(Open Elective-III)

L	T	P	C
2	0	0	2

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

- Introduce the various types of special vehicles.
- Familiarize with the function of graders.
- Identify the applications of haulage vehicles and lift truck
- Understand the functions of scarifiers and scrapers
- Discuss the specifications of special purpose vehicles

UNIT – I: TRACTORS & CRANES AND EXCAVATORS 8 Hrs

TRACTORS : General description, specification and functions, light, medium and heavy wheeled tractors, crawler tracks mounted / wheeled - Bull dozers, tilt dozers and angle dozers, front end loaders, factors affecting efficiency of output of tractors, simple problems, merits and demerits.

CRANES AND EXCAVATORS: General description, specifications and functions, excavator mounted cranes, mobile cranes with strut and cantilever type jibs, tractor towed and tractor mounted cranes. General description, specification and functions, classification based on attachments, face shovel, drag shovel, hoe, drag-line and grab or clam shell, advantages and limitations.

Learning Outcomes:

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

- Classify various types of tractors **L1**
- Calculate the efficiency of output of tractors **L4**
- Discuss the functions of cranes and excavators **L2**
- Recall the advantages and limitations of cranes and excavators **L2**

UNIT – II: GRADERS 6Hrs

Description, specification of tractor towed graders and motor graders, classification and functions of graders, functional details of spreading, mixing, ditching, bank sloping, snow removal, stripping, scarifying, and finishing, elementary details of transmission system (coupling, clutches, gear box, driving axles, propeller shafts), running gear and operating equipment air braking system; hydraulic system and its components, steering system of lights, medium and heavy graders, merits and limitations of graders.

Learning Outcomes:

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

- Understand the terms spreading, mixing, ditching, back sloping, scarifying. **L2**
- Discuss elementary details of transmission system **L2**
- Demonstrate the hydraulic system and its components. **L3**
- List the merits and limitations of graders. **L2**

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UNIT – III: HAULAGE VEHICLES AND LIFT TRUCKS **6Hrs**

General description, specification and functions, self-propelled and tractor towed haulage vehicles and pneumatic – tires, dumpers – front tipping; trucks – rear tipping, tractor towed semi-trailers and trailers (rear and side tipping, bottom dumping). General description, specification and functions, fork lift trucks, alternative front end equipment (attachments) – Jib arm, shovel bucket, squeeze clamp, boom, fork extensions, barrel forks. Scissors lift trucks - Applications in industry, advantages and disadvantages.

Learning Outcomes:

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

- Understand the importance of haulage vehicles and trucks in industries. **L2**
- Select haulage vehicles for a given application **L6**
- Illustrate the function of fork lift trucks. **L3**

UNIT – IV: Rooters, Scarifiers And Scrapers **6 Hrs**

General description, specification and functions, tractor towed rooters and scarifiers - Heavy duty, light duty. General description, specification and functions, tractor towed and motorized scrapers, scraper work in cutting, cambering, side hill cutting, spreading on embankments, compaction of fill merits and demerits.

Learning Outcomes:

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

- Describe the specifications of rooters **L2**
- Categorize Heavy duty and light duty scarifiers **L4**
- Recall the merits and demerits of scrapers. **L1**

UNIT – V: Compaction Vehicles And Other Special Purpose Vehicles **6Hrs**

General description, specification and functions, smooth wheeled rollers, pneumatic tired rollers, agricultural Rollers, sheep's foot rollers, vibrating compactors. General description, specification and functions, Ambulance, oil tankers, surveillance vehicle, television recording mobile UNIT, reefer vehicle, double decker bus, vestibule bus, fire fighting vehicle.

Learning Outcomes:

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

- List various types of special purpose vehicles. **L1**
- Choose the rollers for a given application. **L1**
- Discuss the function of compactors. **L2**
- Explain the importance of special purpose vehicles in the society. **L2**

Text Books:

1. Peurifoy R L "Construction Planning, Equipment and Methods", Tata McGraw-Hill, NewDelhi, 2002.
2. Ian Graham, "Off-Road vehicles", Heinemann Library, 2008.

Reference Books:

1. Wong J "Terramechanics and Off-Road Vehicle Engineering", Butterworth-Heinemann, 2009.
2. Roninson E G, "Motor Graders", MIR Publications, Moscow, 1985.
3. Rodhiev and Rodhiev, "Tractors and Automobiles", MIR Publishers, Moscow, 1984.
4. Greenwich and Soreking, "Tractors", MIR Publishers, Moscow, 1967.

Course Outcomes:

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

- Classify excavators based on attachments. **L2**
- Understand the importance of graders. **L2**
- Identify the various types of fork lift attachments. **L2**
- Recall the advantages and disadvantages of special purpose vehicles. **L1**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75b - SIX SIGMA AND LEAN MANUFACTURING

(Open Elective-III)

L	T	P	C
2	0	0	2

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

- Introduce the students, the basic concepts of six sigma and lean manufacturing.
- Expose with various quality issues in Inspection.
- Gain Knowledge on quality control and its applications to real time.
- Know the extent of cellular manufacturing and 5S.
- Understand the importance of Quality standards in manufacturing.

UNIT – 1: Introduction to Six-Sigma **8 Hrs**

Probabilistic models-Six Sigma measures-Yield-DPMO-Quality level-Reliability function using Six-Sigma-MTTF using Six Sigma-Maintenance free operating period- Availability using Six-Sigma-Point availability-Achieved availability-Operational Availability-Examples.

Learning Outcomes:

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

- Explain the concepts of probabilistic models **L2**
- Determine the reliability function using six-sigma **L3**
- Explain about MTTF using six sigma concepts **L2**
- Illustrate the examples of availability using sigma **L2**

UNIT – II: The Elements of Six Sigma and their Determination **6Hrs**

The Quality Measurement Techniques: SQC, Six Sigma, Cp and Cpk- The Statistical quality control (SQC) methods-The relationship of control charts and six sigma-The process capability index (Cp)-Six sigma approach-Six sigma and the 1.5 σ shift-The Cpk Approach Versus Six Sigma-Cpk and process average shift- Negative Cpk-Choosing six sigma or Cpk-Setting the process capability index-Examples.

Learning Outcomes:

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

- List the quality measurement techniques **L1**
- Discuss the process capability index (Cp).
- Compare the Cpk Approach and Six Sigma
- Explain about different statistical quality control methods
- State the relationship of control charts and six sigma **L2**

UNIT – III: Introduction To Lean Manufacturing **6Hrs**

Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

Learning Outcomes:

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

- Illustrate the basic elements of lean manufacturing **L2**
- List the various lean manufacturing tools. **L1**
- Describe the principles of lean manufacturing **L2**
- Compare conventional manufacturing and lean manufacturing system **L2**

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UNIT – IV: Cellular Manufacturing, JIT, TPM **6 Hrs**

Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

Learning Outcomes:

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

- Explain the concept of cellular manufacturing **L2**
- Indentify the types of layouts. **L3**
- Describe the concepts of JIT and TPM **L2**
- Demonstrate the pillars of TPM **L2**
- Create the cell layout. **L6**

UNIT – V: Set Up Time Reduction, TQM, 5S, VSM 10 **6Hrs**

Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

Learning Outcomes:

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

- Define set up time reduction. **L1**
- Illustrate the principles and implementation of 5S techniques. **L2**
- Discuss procedure and principles of value stream mapping **L6**
- List the various reduction approaches **L1**

Text Books:

1. U Dinesh Kumar, Crocker, Chitra and Harithe Saranga, Reliability and Six Sigma, Springer Publishers.
2. Sung H. Park, Six Sigma for Quality and Productivity Promotion, Asian Productivity Organization

Reference Books:

1. Sammy G. Shina, Six Sigma for Electronics Design and Manufacturing, McGraw-Hill.
2. Design and Analysis of Lean Production Systems, Ronald G. Askin & Jeffrey B. Goldberg, John Wiley & Sons, 2003.
3. Mikell P. Groover (2002) _Automation, Production Systems and CIM.
4. Rother M. and Shook J, 1999 _Learning to See: Value Stream Mapping to Add Value and Eliminate Muda' , Lean Enterprise Institute, Brookline, MA.

Course Outcomes:

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

- Summarize various techniques that are related to the six-sigma and lean manufacturing **L2**
- Outline the concepts of cellular manufacturing, JIT and TPM **L2**
- Illustrate the principles and implementation of 5S techniques **L2**
- Discuss procedure and principles of value stream mapping **L6**
- Determine the reliability function using six-sigma. **L3**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75c – REVERSE ENGINEERING

(Open Elective-III)

L	T	P	C
2	0	0	2

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

- Introduce the concepts of reverse engineering
- Familiarize with the tools and techniques for reverse engineering
- Teach the principles of various rapid prototyping methods
- Discuss the legal aspects of reverse engineering.

UNIT – 1: Introduction **8 Hrs**

Scope and tasks of RE, Process of duplicating, Definition and use of Reverse Engineering, Reverse Engineering as a Generic Process

Learning Outcomes:

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

- Recall the definition and use of reverse engineering. **L1**
- Identify reverse engineering as a generic process. **L2**
- List various tasks of reverse engineering. **L1**

UNIT – II: Tools and Techniques for RE **6Hrs**

Object scanning: contact scanners, noncontact scanners, destructive method, coordinate measuring machine, Point Data Processing: pre processing and post processing of captured data, geometric model development, construction of surface model, solid model, noise reduction, feature identification, model verification

Learning Outcomes:

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

- Summarize various techniques in reverse engineering. **L2**
- Compare preprocessing and post processing of captured data. **L4**
- Explain noise reduction, feature identification and model verification. **L2**

UNIT – III: Rapid Prototyping **6Hrs**

Introduction, current RP techniques and materials, Stereo Lithography, Selective Laser Sintering, Fused Deposition Modelling, Three-dimensional Printing, Laminated Object Manufacturing, Multi – jet Modelling, Laser-engineered Net Shaping, Rapid Prototyping, Rapid Tooling, Rapid Manufacturing

Learning Outcomes:

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

- Identify the developments in the rapid prototyping techniques **L2**
- Classify rapid prototyping techniques. **L2**
- List the advantages and disadvantages of rapid prototyping methods. **L1**

UNIT – IV: Integration **6 Hrs**

Cognitive approach to RE, Integration of formal and structured methods in reverse engineering, Integration of reverse engineering and reuse.

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

- Explain the cognitive approach to reverse engineering. **L2**
- Discuss the integration of formal and structured methods in reverse engineering. **L2**

UNIT – V: Legal Aspects of Reverse Engineering **6Hrs**

Legal Aspects of Reverse Engineering: Introduction, Copyright Law.

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

- Identify the legal aspects of reverse engineering **L2**
- Understand the concepts of copyright law. **L2**

Text Books:

1. Biggerstaff T. J., "Design Recovery for Maintenance and Reuse", IEEE Corporation, 1991.
2. Katheryn, A. Ingle, "Reverse Engineering", McGraw-Hill, 1994.

Reference Books:

1. Aiken Peter, "Data Reverse Engineering", McGraw-Hill, 1996.
2. Linda Wills,"Reverse Engineering" ,Kluiver Academic Publishers, 1996.
3. Donald R. Honsa , "Co-ordinate Measurement and reverse engineering", American Gear Manufacturers Association, 1996.

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

- Understand the importance of reverse engineering. **L2**
- Make use of tools and techniques of reverse engineering. **L3**
- Identify the applications of rapid prototyping techniques. **L2**

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19AME75d – ENERGY AUDITING

(Open Elective-III)

L	T	P	C
2	0	0	2

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

- Introduce the concepts of energy scenario and need for energy policy for industries in India.
- Familiarize with the Energy Audit concepts and its approaches.
- Teach the principles and objectives of the Energy management.

UNIT – I: General Aspects **8 Hrs**

Review of energy scenario in India, General Philosophy and need of Energy Audit and Management, Basic elements and measurements - Mass and energy balances – Scope of energy auditing industries - Evaluation of energy conserving opportunities, Energy performance contracts, Fuel and Energy substitution, Need for Energy Policy for Industries, National & State level energy Policies.

Learning Outcomes:

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

- Explain the fundamental aspects of energy scenario in India. **L2**
- List the various national and state level energy policy. **L1**
- Identify the basic elements and measurements of energy audit. **L3**
- Summarize the evaluation of energy conserving balances **L2**

UNIT – II: Energy Audit Concepts **6Hrs**

Need of Energy audit - Types of energy audit – Energy management (audit) approach - understanding energy costs - Bench marking – Energy performance - Matching energy use to requirement - Maximizing system efficiencies -Optimizing the input energy requirements - Duties and responsibilities of energy auditors- Energy audit instruments - Procedures and Techniques.

Learning Outcomes:

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

- Summarize various concepts of energy audit. **L2**
- Compare various energy management approaches. **L4**
- Explain Bench marking and energy performance in energy auditing. **L2**

UNIT – III: Principles and Objectives of Energy Management **6Hrs**

Design of Energy Management Programmes - Development of energy management systems – Importance - Indian need of Energy Management - Duties of Energy Manager - Preparation and presentation of energy audit reports - Monitoring and targeting, some case study and potential energy savings.

Learning Outcomes:

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

- Identify the developments of energy management systems **L2**
- Explain the importance of energy management **L2**
- List the various duties of energy manager **L1**

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UNIT – IV: Thermal Energy Management **6 Hrs**

Energy conservation in boilers - steam turbines and industrial heating systems - Application of FBC - Cogeneration and waste heat recovery -Thermal insulation - Heat exchangers and heat pumps – HVC industries-Building Energy Management.

Learning Outcomes:

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

- Explain the concepts of energy conservation in boilers **L2**
- Identify the thermal energy components **L3**
- Illustrate the applications of FBC boilers **L2**

UNIT – V: Electrical Energy Management **6Hrs**

Supply side Methods to minimize supply-demand gap- Renovation and modernization of power plants - Reactive power management – HVDC- FACTS - Demand side - Conservation in motors - Pumps and fan systems – Energy efficient motors.

Learning Outcomes:

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

- Explain the concepts of supply side methods to minimize supply. **L2**
- Explain the reactive power management. **L2**
- Identify the energy conservation methods in motors, pumps and fan systems. **L3**
- List the energy efficient motors. **L2**

Text Books:

1. Murphy, W. R., Energy Management, Elsevier, 2007.
2. Smith, C. B., Energy Management Principles, Pergamum, 2007
3. Handbook of Energy Audit, Sonal Desai, Mcgraw Hill Education Private Ltd.,

Reference Books:

1. Turner, W. C., Doty, S. and Truner, W. C., Energy Management Hand book, 7th edition, Fairmont Press, 2009.
2. De, B. K., Energy Management audit & Conservation, 2nd Edition, Vrinda Publication, 2010.
3. Energy Management Handbook – W.C. Turner (John Wiley and Sons, A Wiley a. Interscience publication)
4. Industrial Energy Management and Utilisation –L.C. Witte, P.S. Schmidt, D.R. Brown (Hemisphere Publication, Washington, 1988)
5. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982
6. Energy Conservation guide book Patrick/Patrick/Fardo (Prentice hall1993)

Course Outcomes:

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

- Understand the basic concepts of energy audit and energy management **L2**
- Explain different types of energy audit, maximizing and optimizing system efficiency. **L3**
- Summarize energy management systems, prepare and present energy audit report **L5**
- Identify energy saving potential of thermal and electrical systems **L3**
- Discuss Energy audit instruments, Procedures and Techniques. **L2**

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19AME75e – INTRODUCTION TO COMPOSITE MATERIALS

(Open Elective-III)

L	T	P	C
2	0	0	2

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 **8 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 **6Hrs**

Polymers - Polymer matrix materials – PMC processes - hand layup process – spray up process – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMC's.

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 **6Hrs**

Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMC's.

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**

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UNIT – IV: Ceramic matrix composites **6 Hrs**

Ceramic matrix materials – properties – processing of CMCs – Sintering - Hot pressing – Infiltration – Lanxide process – In-situ chemical reaction techniques – sol-gel 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 **L2**
- Contrast between cold and hot isostatic pressing. **L2**
- Examine the properties and applications of CCMs. **L3**

UNIT – V: Advances in composites **6Hrs**

Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications.

Characterization of composite materials - Mechanical Properties, Thermal Properties.

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, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bioplastics & Bio-composites for Engineering applications, John Wiley publications.

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**

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Mechanical Engineering Department,
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PULIVENDULA - 516 390.

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75f – CUSTOMER RELATIONSHIP MANAGEMENT

(Open Elective-III)

L	T	P	C
2	0	0	2

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 – 1: CRM concepts **8 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 **6Hrs**

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 **6Hrs**

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).

Learning Outcomes:

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

- Explain the concept of CRM links in e-Business. **L2**
- 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 **6 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**
- 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 **6Hrs**

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 Rela Tionship 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 Rela Tionship Management.
3. V. Kumar & Werner J., Customer Rela Tionship 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**
- Discus 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**

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B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC75a-EMBEDDED SYSTEMS & IOT

(Open Elective-III)

L	T	P	C
2	0	0	2

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

- To understand the basics of Embedded Systems and IOT.
- To learn the architecture and programming of ARM Microcontroller.
- To be able to work with Raspberry Pi using Python Programming.
- To know about the IOT standards, communication technologies and protocols.
- To implement real time projects using the tools and techniques of IOT Platform.

UNIT – I:

Introduction to Embedded Systems and Internet of Things (IOT): Architecture of Embedded Systems, Embedded Systems Development process, Architecture of Internet of Things, Applications of Embedded Systems and IOT, Design Methodology for IOT Products

Learning Outcomes:

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

- Gain knowledge on basics of embedded systems and IOT Architectures. **L1**
- Understand the design methodology and applications of embedded systems and IOT. **L2**

UNIT – II:

ARM Microcontrollers Architecture and Programming: Architecture, Instruction set, Programming ports, Timer/Counter, Serial communication, interrupts in C, Introduction ARM mBed platform.

Learning Outcomes:

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

- Understand the architecture and programming of ARM Microcontrollers. **L2**
- Work with ARM Microcontrollers in implementing real time projects. **L6**

UNIT – III:

Fundamentals of Python Programming & Raspberry Pi: Introduction to python programming, Working with functions, classes, REST full, Web Services, Client Libraries, Introduction & programming Raspberry Pi3, Integrating Input Output devices with Raspberry Pi3.

Learning Outcomes:

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

- Write programs using Python to implement the given task. **L6**
- Use Raspberry Pi3 for integrating Input & Output devices. **L3**

UNIT – IV:

IOT Technologies, Standards and Tools: Fundamental characteristics and high level requirements of IOT, IOT Reference models; Introduction to Communication Technologies & Protocols of IOT: BLE, Wi-Fi, LORA, 3G/4G Technologies and HTTP, MQTT, COAP protocols; Relevant Practicals on above technologies.

Learning Outcomes:

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

- Understand the characteristics and high level requirements to design new IoT devices. **L2**
- Summarize different Communication Technologies & Protocols of IoT. **L2**

UNIT – V:

IOT Platform, Cloud Computing Platforms for IoT Development: IOT Platform Architecture (IBM Internet of Things & Watson Platforms); API Endpoints for Platform Services; Devices Creation and Data Transmission; Introduction to NODE-RED and Application deployment.

Learning Outcomes:

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

- Learn how to use API Endpoints for Platform Services, Devices Creation and Data Transmission. **L1**
- To implement real time projects using the tools and techniques of IoT Platform. **L6**

Text Books:

1. ArsheepBahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach", 1st Edition, VPT, 2014.
2. K.V.K.K.Prasad, "Embedded Real Time Systems: Concepts, Design and Programming", 1st Edition, Dreamtech Publication, 2014.
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley Publications, 2013

Reference Books:

1. Jonathan W Valvano, "Embedded Microcomputer Systems: Real-Time Interfacing", 3rd Edition, Thomson Engineering, 2012.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key applications and Protocols", 2nd Edition, Wiley Publications, 2012.

Course Outcomes:

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

- Understand the basics of Embedded Systems and IOT. **L2**
- Correlate the architecture and programming of ARM Microcontroller. **L4**
- Work with Raspberry Pi using Python Programming. **L6**
- Summarize IOT standards, communication technologies and protocols. **L2**
- Implement real time projects using the tools and techniques of IOT Platform. **L6**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC75b-ELECTRONIC INSTRUMENTATION

(Open Elective-III)

L	T	P	C
2	0	0	2

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

- To know about the performance characteristics of instruments and measurement of electrical quantities.
- To understand the construction, working and applications of different types of CRO"s.
- To analyze the working of different types of bridges.
- To study the working of signal & function generators.
- To analyze the working of transducers in measuring physical parameters

UNIT – I:

Measuring Instruments: Introduction, Errors in Measurement, Accuracy, Precision, Resolution and Significant figures. Basic PMMC Meter- construction and working, DC and AC Voltmeters-Multirange, Range extension, DC Ammeter, Multimeter for Voltage, Current and resistance measurements.

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multimeters, Digital frequency meters, Digital measurement of time.

Learning Outcomes:

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

- Learn about the performance characteristics of the instruments. **L1**
- Understand the working of different types of ammeters, voltmeters and multimeters. **L2**

UNIT – II:

Oscilloscopes: Introduction, Block diagram of CRO, Basic principle of CRT, CRT Construction and features, vertical amplifiers, horizontal dPeflection system- sweep, trigger pulse, delay line, sync selector circuits. Dual beam and dual trace CROs, Sampling and Digital storage oscilloscopes.

Learning Outcomes:

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

- Grasp the construction and working of different types of oscilloscopes. **L1**
- Use CRO to measure the amplitude, frequency, phase and time period of given signals. **L3**

UNIT – III:

Bridges: DC Bridges for Measurement of resistance - Wheat stone bridge, Kelvin's Bridge, AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge, Measurement of capacitance - Schearing Bridge, Wien Bridge, Errors and precautions in using bridges.

Learning Outcomes:

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

- Understand the construction and working of different types of bridges. **L2**
- Measure parameters like resistance, capacitance, and inductance using bridges. **L3**

UNIT – IV:

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.

Learning Outcomes:

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

- Understand the working and applications of signal generators. **L2**
- Gain knowledge on the working and applications of function generators. **L1**

UNIT – V:

Transducers: Introduction, Types of Transducers, Electrical transducers, Selecting a transducer, Resistive transducer, Strain gauges, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Temperature transducers-RTD, LVDT.

Learning Outcomes:

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

- Understand the basic working principle and applications of transducers. **L2**
- Measure physical parameters using different types transducers. **L3**

Text Books:

1. H.S.Kalsi, "Electronic Instrumentation", Third edition, Tata McGraw Hill, 2010.
2. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 6th Edition, 2010.

Reference Books:

1. A.K. Sawhney, Dhanpat Rai & Co., "A course in Electrical and Electronic Measurements and Instrumentation", 9th Edition, 2010.
2. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2006.

Course Outcomes:

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

- Know about the performance characteristics of instruments and measurement of electrical quantities. **L1**
- Understand the construction, working and applications of different types of CRO"s. **L2**
- Compare the working of different types of bridges. **L2**
- Learn the working of signal & function generators. **L1**
- Analyze the working of transducers in measuring physical parameters. **L4**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC75c-BASICS OF VLSI DESIGN

(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 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 this unit, the student will be able to

- Understand different steps involved in the fabrication of ICs and electrical properties of MOS devices. **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 this 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 this 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, and grey to binary code converter.

Learning Outcomes:

At the end of this 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 this 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**

Text Books:

1. Kamran Eshraghian. Douglas, A. Pucknell and Sholeh Eshraghian, "Essentials of LSI Circuits and Systems", Prentice Hall of India Private Limited, 2005 Edition.
2. Neil H.E.WESTE, David Harris andAyan Banerjee, "CMOS VLSI Design A Circuits and systems perspective", Pearson Education, 2006 Third Edition

Reference Books:

1. Richa Jain and Amrita Rai, "Principles of VLSI and CMOS Integrated Circuits", S.Chand and Company Limited. First edition.2012.
2. Wayne Wolf, "Modern VLSI Design", Pearson Education, 3rd Edition.

Course Outcomes:

At the end of this Course the student 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**

IV B.Tech I SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS75a-MOBILE APPLICATION DEVELOPMENT
Open Elective-III

L	T	P	C
2	0	0	2

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 – 1: **8 Hrs**

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: **8 Hrs**

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: **8 Hrs**

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: **7 Hrs**

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

1. demonstrate their skills of using Android software development tools **L4**
2. demonstrate their ability to develop software with reasonable complexity on mobile platform **L5**

UNIT – V: **08Hrs**

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

1. demonstrate their understanding of the fundamentals of Android operating systems **L3**
2. demonstrate their skills of using Android software development tools **L4**
3. demonstrate their ability to develop software with reasonable complexity on mobile platform **L5**

IV B.Tech I SEMESTER

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACS75b-REAL TIME OPERATING SYSTEMS AND APPLICATIONS

Open Elective-III

L	T	P	C
2	0	0	2

Course Objectives:

COURSE OBJECTIVES:

The objective of this course is to

- develop an understanding of various Real Time systems Application
- obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems
- get in-depth hands-on experience in designing and developing a real operational system.

UNIT – 1: Introduction **8 Hrs**

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Dead-lines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

Learning Outcomes:

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

- List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects. **L1**
- Distinguish characterstics of structural testing methods **L2**

UNIT – II: Real Time Scheduling **8 Hrs**

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling A periodic and Sporadic jobs in Priority Driven and Clock Driven Systems..

Learning Outcomes:

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

- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L3**
- Discuss about the functional and system testing methods **L3**

UNIT – III: Resources Sharing **8 Hrs**

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Module Resources, Controlling Concurrent Accesses to Data Objects.

Learning Outcomes:

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

- Discuss about the functional and system testing methods. **L4**
- Demonstrate various issues for object oriented testing. **L4**
-

UNIT – IV: Real Time Communication **7 Hrs**

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols..

Learning Outcomes:

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

- Distinguish characterstics of structural testing methods. **L5**
- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L4**

UNIT – V:Real Time Operating Systems and Databases **08Hrs**

Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Con-currency Control, Overview of Commercial Real Time databases..

Learning Outcomes:

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

- Discuss about the functional and system testing methods. **L5**
- Demonstrate various issues for object oriented testing. **L5**

Text Books:

1. Real Time Systems – Jane W. S. Liu, Pearson Education Publication.

Reference Books:

1. . Real Time Systems – Mall Rajib, Pearson Education.
2. Real-Time Systems: Scheduling, Analysis, and Verification – Albert M. K. Cheng, Wiley.

Course Outcomes:

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

- List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects. **L3**
- Distinguish characterstics of structural testing methods. **L4**
- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L5**
- Discuss about the functional and system testing methods. **L5**

IV B.Tech I SEMESTER

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACS75c-FUNDAMENTALS OF BLOCKCHAIN AND APPLICATIONS

Open Elective-III

L	T	P	C
2	0	0	2

Course Objectives:

1. To study fundamental concepts in software testing.
2. To discuss various software testing issues and solutions in software unit test, integration and system testing.
3. To expose the advanced software testing topics, such as object--oriented software testing methods.

UNIT – 1: Introduction **8 Hrs**

Grasping ,Blockchain Fundamentals, Tracing Blockchain's Origin,The shortcomings of current transaction systems, The emergence of bitcoin , 5 The birth of blockchain, Revolutionizing the Traditional Business, Network Exploring a blockchain application, Recognizing the key business benefits, Building trust with blockchain.

Learning Outcomes:

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

- List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects. **L1**
- Distinguish characterstics of structural testing methods. **L2**

UNIT – II: Blokchain working **8 Hrs**

Taking a Look at How Blockchain Works,Why It's Called "Blockchain", What Makes a Blockchain Suitable for Business, Shared ledger, Permissions Consensus, Smart contracts, Identifying Participants and Their Roles, Fundamentals of Blockchain.

Learning Outcomes:

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

- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible **L3**
- Discuss about the functional and system testing methods **L3**

UNIT – III: Business with Blockchain **8 Hrs**

Propelling Business with Blockchains, Recognizing Types of Market Friction, Information frictions, Interaction frictions, Innovation frictions, Moving Closer to Friction-Free Business, Networks Reducing information friction, Easing interaction friction, Easing innovation friction, Transforming Ecosystems through Increased Visibility.

Learning Outcomes:

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

- Discuss about the functional and system testing methods. **L4**
- Demonstrate various issues for object oriented testing. **L4**

UNIT – IV: Blockchain in Action **7 Hrs**

Blockchain in Action: Use Cases, Financial Services, Commercial financing, Trade finance, Cross-border transactions, Insurance, Government Supply Chain Management Healthcare, Electronic medical records, Healthcare payments pre-authorization, The Internet of Things (IoT).

Learning Outcomes:

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

- Distinguish characterstics of structural testing methods. **L5**

- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L4**

UNIT – V:Hyperledger **10 Hrs**

Hyperledger, a Linux Foundation Project, Hyperledger Vision, Hyperledger Fabric, How Can IBM Help Developers Innovate With Blockchain?, Offering an easily accessible cloud and development platform, Individualized attention and industry expertise.

Learning Outcomes:

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

- Discuss about the functional and system testing methods. **L5**
- Demonstrate various issues for object oriented testing. **L5**

Text Books:

1. Fundamentals of Blockchain., RavindharVadapalli

Reference Books:

1. Block chain Technology Concepts and Applications, Kumar Saurabh, Ashutosh Saxena

Course Outcomes:

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

- List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects. **L3**
- Distinguish characterstics of structural testing methods. **L4**
- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L5**
- Discuss about the functional and system testing methods. **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS15a-MANAGEMENT SCIENCE

(Humanities Elective-II)(Common to EEE , ECE & CSE)

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 – I

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 Organization - 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**

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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**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS15b-BUSINESS ENVIRONMENT

(Humanities Elective-II)(Common to EEE, ECE & CSE)

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 – I: 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 III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE77- 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**