JNTUA CEA Curriculum

B. Tech Course Structure (R19)

ELECTRICAL & ELECTRONICS ENGINEERING

Semester - 0 (Theory - 8, Lab -7) Common for All Branches of Engineering for 3 weeks				
S.No	**Course No**	**Course Name**	**Category**	**L-T-P-C**
1		Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-12-0
2		Career Counseling	MC	4-0-4-0
3		Orientation to all branches -- career options, tools, etc.	MC	6-0-0-0
4		Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	4-0-6-0
5		Proficiency Modules & Productivity Tools	ES	4-2-4-0
6		Assessment on basic aptitude and mathematical skills	MC	4-0-6-0
7		Remedial Training in Foundation Courses	MC	4-2-4-0
8		Human Values & Professional Ethics	MC	6-0-0-0
9		Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	4-2-4-0
10		Concepts of Programming	ES	4-0-4-0
Total				40-6-44-0

Semester - 1					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	**19A15101**	Linear Algebra and Calculus	BS	3-1-0	4
2.	**19A15201**	Applied Physics	BS	2-1-0	3
3.	**19A10501**	Problem Solving & Programming	ES	3-1-0	4
4.	**19A15501**	Communicative English-I	HS	2-0-0	2
5.	**19A12401**	Electrical & Electronics Engineering Workshop	LC	0-0-2	1
6.	**19A15202**	Applied Physics Lab	BS	0-0-3	1.5
7.	**19A10506**	Problem Solving & Programming Lab	ES	0-0-3	1.5
8.	**19A15502**	Communicative English Lab-I	HS	0-0-2	1
				Total	**18**

Semester - 2					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	**19A10201**	Electrical Circuits-I	PC	2-1-0	3
2	**19A10202**	Electrical Power Generating Systems	PC	3-0-0	3
3	**19A15102**	Differential Equations and Vector Calculus	BS	3-0-0	3
4	**19A15303**	Chemistry	BS	2-1-0	3
5	**19A10503**	Data Structures	ES	2-1-0	3
6	**19A10303**	Engineering Workshop	LC	0-0-2	1
7	**19A10304**	Engineering Graphics	ES	1-0-3	2.5
8	**19A15304**	Chemistry Lab	BS	0-0-3	1.5
9	**19A10507**	Data Structures Lab	ES	0-0-3	1.5
				Total	**21.5**

JNTUA COLLEGE OF ENGINEERING ANANTAPUR
ELECTRICAL & ELECTRONICS ENGINEERING
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Proposed Course Structure from 2nd Year to 4th Years

Semester – 3 (Theory - 6, Lab –3)					
S.No.	**Course No.**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	**19A20604**	Complex Variables & Transforms	BSC	2-1-0	3
2.	**19A20201**	Electrical Circuits-II	PCC	2-1-0	3
3.	**19A24201**	Signals and Systems	PCC	2-1-0	3
4.	**19A20202**	DC Machines & Transformers	PCC	2-1-0	3
5.	**19A20203**	Engineering Electromagnetics	PCC	2-1-0	3
6.	**19A24202**	Semiconductor Devices and Circuits	PCC	1-1-0	2
7.	**19A20901**	Universal Human Values	HE	2-0-0	2
8.	**19A20204**	DC Machines & Transformers Lab	PCC	0-0-3	1.5
9.	**19A24203**	Semiconductor Devices and Circuits Lab	PCC	0-0-3	1.5
10.	**19A20205**	Electrical Circuits and Simulation Lab	PCC	0-0-3	1.5
11.	**19A28801**	Biology for Engineers	MC	3-0-0	0
				Total	**23.5**

0

Semester –4 (Theory - 6, Lab –2)					
S.No.	**Course No.**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	**19A20206**	Transmission System Analysis And Design	PCC	2-1-0	3
2.	**19A20207**	Power Electronics	PCC	2-1-0	3
3.	**19A20208**	AC Machines	PCC	2-1-0	3
4.	**19A20209**	Control Systems	PCC	2-1-0	3
5.	**19A24204**	Digital Electronic Circuits and Logic Design	PCC	2-1-0	3
6.	**19A25501**	Fundamentals of Python Programming	ESC	2-0-0	2
7.	**19A20210**	Control Systems and Simulation lab	PCC	0-0-3	1.5
8.	**19A20211**	Power Electronics and Simulation lab	PCC	0-0-3	1.5
9.	**19A25502**	Fundamentals of Python Programming Lab	ESC	0-0-2	1
10.	**19A10804**	Environmental Science	MC	3-0-0	0
				Total	**21**

Semester –5 (Theory - 6, Lab –3)					
S.No.	**Course No.**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	**19A50201**	Micro Processor and Micro Controllers	PCC	3-0-0	3
2.	**19A50202**	Electrical and Electronic Measurements	PCC	3-0-0	3
3.	**19A50203**	Analog Electronic Circuits	PCC	2-0-0	2
4.	**19A50204** **19A50205** **19A50206**	• Electrical Distribution System Analysis and Automation • DC Drives • Advanced Control Systems	PEC-I	3-0-0	3
5.	**19A50207**	• Energy Storage Systems	OEC-I	3-0-0	3
	19A50208	• Electrical Engineering Materials		3-0-0	3
	19A50209	• Illumination Technology		3-0-0	3
	19A50513	• Introduction to Application Development Through JAVA		2-0-2	3
6.	**19A55501**	English Language Skills	HSMC	3-0-0	3
7.	**19A50210**	AC Machines Lab	PCC	0-0-3	1.5
8.	**19A55402**	English Language Skills Lab	HSMC	0-0-3	1.5
9.	**19A50211**	Electronic circuits Lab	PCC	0-0-2	1
10.	**19A50212**	Socially Relevant Project	PR	0-0-1	0.5
11.	**19A55404**	Constitution of India	MC	3-0-0	0
				Total	**21.5**

Semester –6 (Theory - 6, Lab –2)					
S.No.	**Course No.**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	**19A60201**	Power System Analysis	PCC	3-0-0	3
2.	**19A60202**	Digital Signal Processing	PCC	3-0-0	3
3.	**19A60203**	Power System Protection	PCC	3-0-0	3
4.	**19A60204** **19A60205** **19A60206**	• Analog and Digital IC Applications • Programmable Logic Controllers • Introduction to Embedded System Design	PEC-II	3-0-0	3
5.	**19A60207** **19A60208** **19A60209**	• Renewable Energy Sources • Instrumentation • Industrial Electrical Systems	OEC-II (MOOC)	3-0-0	3
6.	**19A65401** **19A65402** **19A65403**	Humanities Elective-I • Managerial Economics and Financial Analysis • Entrepreneurship and Incubation • Business Ethics and Corporate Governance	HSMC	3-0-0	3
7.	**19A60210**	Electrical & Electronic Measurements Lab	PCC	0-0-3	1.5
8.	**19A60211**	Micro Processor and Micro Controllers Lab	PCC	0-0-3	1.5
9.	**19A60212**	Socially Relevant Project	PR	0-0-1	0.5
10.	**19A55401**	Research Methodology	MC	3-0-0	0
				Total	**21.5**

Semester –7 (Theory - 5, Labs -2 &Project–1)					
S.No.	**Course No.**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	**19A70201**	Power System Operation & Control	PCC	3-0-0	3
2.	**19A70202**	Utilization of Electrical Energy	PCC	3-0-0	3
3.	**19A70203** **19A70204** **19A70205**	• HVDC and FACTS • AC Drives • Digital Control Systems	PEC-III	3-0-0	3
4.	**19A70206** **19A70207** **19A70208**	• System Reliability Concepts • Electric Vehicle Engineering • Design of Photovoltaic Systems	OEC-III	3-0-0	3
5.	**19A75401** **19A75402** **19A75403**	Humanities Elective-II • Management Science • Organizational Behavior • Business Environment	HSMC	3-0-0	3
6.	**19A70209**	Power Systems & Simulation Lab	PCC	0-0-3	1.5
7.	**19A70210**	Digital Signal Processing Lab	PCC	0-0-3	1.5
8.	**19A70211**	Project (Stage-I)	PR	0-0-3	1.5
9.	**19A70212**	Seminar		0-0-1	0.5
10.	**19A70213**	Industrial Training/Skill Development/Research Project*	PR	-------	02
				Total	**22**

*** Marks shall be awarded in 7th semester, but started at end of 6th semester and complete before beginning of 7th semester.**

Semester –8 (Theory - 2, Project–1)					
S.No.	**Course No.**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	**19A80201** **19A80202** **19A80203**	• Power Quality • Switched Mode Power Converters • Intelligent Control Techniques	PEC-IV	3-0-0	3
2.	**19A80204** **19A80205** **19A80206**	• Introduction to Hybrid & Electric Vehicles • Battery Management systems • Smart Electric Grid	OEC-IV	3-0-0	3
3.	**19A80207**	Project (Stage-II)	PR	0-0-14	7
				Total	**13**

- **Minor degree for 20 credits including Labs and Project**
- **Hon's degree for additional 20 credits**

UNIVERSITY ANANTAPUR ELECTRICAL & ELECTRONICS ENGINEERING

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Socially Relevant Projects

1. Energy Auditing
2. Solar Water Pumping Systems
3. Automatic Traffic Light Control Systems
4. Building Electrical Safety Measures
5. Electrical Protection Systems in Agricultural Fields

Note: Similar such projects as listed above can be chosen.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

College of Engineering Autonomous Anantapur

ELECTRICAL & ELECTRONICS ENGINEERING

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Minor Degree in Electrical Engineering

S.No.	Course No.	Course Name	L	T	P	Credits
1.		Fundamentals of Electrical Circuits	3	0	0	3
2.		AC Machines	3	0	0	3
3.		Control Systems (Other than ECE branch)/Power Electronics(for ECE branch)	3	0	0	3
4.		Transmission system Analysis and Design	3	0	0	3
5.		Electrical & Electronic Measurements	3	0	0	3
6.		Minor Discipline Project	-	-	-	5
Total						20

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College of Engineering Autonomous Anantapur

ELECTRICAL & ELECTRONICS ENGINEERING

*****

Honors Degree in Electrical Engineering

S.No.	Course No.	Course Name	L	T	P	Credits
1.		Adaptive Control Systems	3	0	0	3
2.		Applications of Power Electronics to Power Systems	3	0	0	3
3.		DC Micro Grid	3	0	0	3
4.		Power System Wide Area Monitoring and Control	3	0	0	3
5.		Restructured Power Systems	3	0	0	3
		Mini Project				5
Total						20

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
****** DEPARTMENT OF MATHEMATICS ******
I B.TECH – I SEMESTER
(All Branches)

Subject Code	Title of the Subject	L	T	P	C
19A15101	**Linear Algebra and Calculus**	3	1		4

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools to develop the confidence and ability to handle various real world problems and their applications.

Course Outcomes:

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

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- Utilize mean value theorems to real life problems (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems (L5)
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

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

Unit 1:Matrices **10 hrs**

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

Learning Outcomes:

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

- solving systems of linear equations, using technology to facilitate row reduction determine the rank, eigenvalues and eigenvectors, diagonal form and different factorizations of a matrix; (L3)

- identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (L3)

Unit 2: Mean Value Theorems **6 hrs**

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

Learning Outcomes:

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

- Translate the given function as series of Taylor's and Maclaurin's with remainders (L3)
- analyze the behaviour of functions by using mean value theorems (L3)

Unit 3: Multivariable calculus **8 hrs**

Partial derivatives, total derivatives, chain rule, Euler's theorem, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

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

- Find partial derivatives and use them to analyze and interpret the way a function varies. (L3)
- Acquire the Knowledge maxima and minima of functions of several variable (L1)
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)

Unit 4:Multiple Integrals **10hrs**

Double integrals, changing to polar coordinates, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves. Evaluation of triple integrals in Cartesian, cylindrical and spherical polar co-ordinates.

Learning Outcomes:

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

- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates (L5)
- Apply double integration techniques in evaluating areas bounded by region (L4)
- Apply multiple integrals to find volume, surface area (L5)

Unit 5:Special Functions **6 hrs**

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Learning Outcomes:

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

- understand beta and gamma functions and its relations (L2)
- use of special functions in evaluating definite integrals (L4)

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.
4. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
5. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
6. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
7. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
8. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
9. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
10. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
****** DEPARTMENT OF PHYSICS ******
I B.TECH – I SEMESTER
(ECE, CSE, EEE Branches)

Subject Code	Title of the Subject	L	T	P	C
19A15201	APPLIED PHYSICS	2	1		3

	COURSE OBJECTIVES
1	To make a bridge between the physics in school and engineering courses.
2	To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3	To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibres along with engineering applications.
4	To 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.
5	To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
6.	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** the applications of interference in engineering (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 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	**3**	**3**		**1**								
CO2	**3**	**3**	**1**									
CO3	**3**	**2**	**1**	**2**								
CO4	**3**	**3**	**1**	**2**	**1**				**1**		**1**	**1**
CO5	**3**	**2**	**2**		**1**				**2**		**1**	**1**

Unit-I: Physical Optics

Interference-Principle of superposition –Interference of light – Conditions for sustained interference-Colors in thin films- Newton's Rings: determination of wavelength and refractive index.

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

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-Critical angle of propagation-Acceptance Angle-Numerical Aperture-Classification of fibers based on refractive index profile – Propagation of electromagnetic wave through optical fibers – Modes -Importance of V-number – Applications - Block diagram of fiber optic communication with detailed explanation of source and detector – Applications.

Unit III: Quantum Mechanics, Free Electron Theory and Semiconductors

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

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

Semiconductors: Introduction - Direct and Indirect band gap semiconductors- Drift and Diffusion currents- Einstein's relation - Continuity equation -Hall effect- Hall coefficient - Applications of Hall effect - Applications of semiconductors in electronics.

Unit-IV: Dielectric and Magnetic Materials

Dielectric Materials-Introduction-Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic and Ionic, 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 -Classification of magnetic materials-Weiss theory of ferromagnetism (qualitative)- Hysteresis - soft and hard magnetic materials-Applications.

Unit – V: Superconductors and Nanomaterials

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

Nanomaterials: Introduction – Surface area 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. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. K Thyagarajan " Engineering Physics", Mc Graw Hill Publishing Company Ltd., 2016
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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
****** DEPARTMENT ELECTRICAL AND ELECTRONICS ENGINEERING ******
I B.TECH – I SEMESTER(R-19)

Subject Code	Title of the Subject	L	T	P	C
19A10501	**Problem Solving and Programming**	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

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)

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

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.Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Unit 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 2:

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

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

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

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:

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.

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

Reference Books:

1. P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications
2. RS Bichkar " Programming with C", 2012, Universities Press.
3. Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
****** DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES ******
I B.TECH – I SEMESTER(R-19)

Subject Code	Title of the Subject	L	T	P	C
19A15501	**Communicative English I**	2	0	0	2

Introduction

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

Course Objectives

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

Course Outcomes

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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
CO1	-	-	-	3	-	-	-	-	3	3	-	-	-	-	-
CO2	-	-	-	3	-	-	-	3	-	3	-	-	-	-	-

CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-

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: Innovation: Muhammad Yunus

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:

Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

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 (AUTONOMOUS):: ANANTAPURAMU
****** DEPARTMENT ELECTRICAL AND ELECTRONICS ENGINEERING ******
I B.TECH – I SEMESTER(R-19)

Subject Code	Title of the Subject	L	T	P	C
19A12401	**Electrical & Electronics Engineering Workshop**	0	0	2	1

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

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

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.

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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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
****** DEPARTMENT OF PHYSICS ******
I B.TECH – I SEMESTER
(ECE, CSE, EEE Branches)

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	PSO1	PSO2	PSO3
CO1	**3**			**2**											
CO2	**3**	**2**		**2**								**1**			
CO3	**3**	**1**		**2**											
CO4	**3**	**3**		**3**	**2**						**1**	**1**			

List of Physics Experiments

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 various colours of mercury spectrum using diffraction grating in normal incidence method
4. Determination of dispersive power of the prism
5. Determination of dielectric constant and Curie temperature of a ferroelectric material
6. B-H curve
7. Determination of numerical aperture of an optical fiber
8. Laser: Determination of wavelength using diffraction grating
9. Laser: Determination of particle size
10. To determine the resistivity of semiconductor by four probe method
11. Energy gap of a material using p-n junction diode
12. Magnetic field along the axis of a current carrying coil – Stewart-Gee's Method
13. Hall effect : Determination of mobility of charge carriers in semiconductor
14. Measurement of resistance of a semiconductor with varying temperature
15. To determine the self inductance of the coil (L) using Anderson's bridge

Note: Out of twelve experiments, two experiments will be performed using virtual laboratory.

Data Books Required: Nil

References:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING
I B. Tech - II SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A10506	**Problem Solving and Programming Laboratory**	0	0	3	1.5

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.

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

Laboratory Experiments#

1. Basic DOS Commands/Unix Commands
2. Familiarize with windows/Linux Environment.
3. Familiarize with development environment of C Language
4. Design a C program which reverses the number
5. Design a C program which finds the second maximum number among the given list of numbers.
6. Construct a program which finds the kth smallest number among the given list of numbers.
7. Design an algorithm and implement using C language the following exchanges

   a ← b ← c ← 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.

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.
3. P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications

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COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

I B. Tech - II SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A15502	Communicative English Lab I	0	0	2	1

Course Objectives

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

Course Outcomes

- CO1: Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- CO2: Apply communication skills through various language learning activities
- CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- CO4: Evaluate and exhibit acceptable etiquette essential in social and professional settings
- CO5: Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

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

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):: ANANTAPURAMU
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	PSO1	PSO 2	PSO 3
CO1	3	3	3	2	2							2	2	3	3
CO2	3	3	3	2	3							2	2	3	3
CO3	3	3	3	2	3							2	2	3	3
CO4	3	3	3	2	2							2	2	3	3

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.

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

I YEAR II SEM

Subject Code	Title of the Subject	L	T	P	C
	ELECTRICAL POWER GENERATING SYSTEMS	3	0	0	3

Course Objectives:

1.	To understand the principle and operation of various power generations.
2.	To Investigate the line diagram and components of various power generations
3.	To enable the process involved in solar, wind energy generation and their characteristics
4.	To enable the process involved in biogas, geothermal and ocean energy generation

Course Outcomes:

CO1	Understand the principles of power generation. Analyze the construction, working and operating principle, and essential components of Thermal power generating station with their relative merits and demerits.
CO2	Analyze the construction, working and operating principle, and essential components of Hydro and Nuclear power generating stations.
CO3	Analyze the different methods and characteristics of solar and wind power generating systems.
CO4	Analyze the different methods and operation of Biogas, Geothermal and Ocean power generating systems.

Mapping of Course outcomes with Program outcomes:

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

Syllabus:

UNIT-I THERMAL POWER GENERATING SYSTEMS

Block Diagram of Thermal Power Station (TPS) showing paths of Coal, Steam, Water, Air, Ash and Flue Gasses - Brief Description of TPS Components: Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimney and Cooling Towers, Cogeneration, Auxiliaries-for boiler, for generators.

UNIT OUTCOMES: After completion of unit, student will be able to understand the principle and operation of TPS and its components.

UNIT-II HYDRO & NUCLEAR POWER GENERATING SYSTEMS

Hydro Power: Selection of Site, Classification, Layout, Principle of operation, Description of Main Components.
Nuclear Power: Nuclear Fission and Chain Reaction- Nuclear Fuels.- Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors and Brief Description of PWR, BWR and FBR.

UNIT OUTCOMES: After completion of unit, student will be able to understand the principle and operation of Hydro and Nuclear Power Plants and its components.

UNIT -III SOLAR PV SYSTEMS

Role and Potential of Solar Energy Options, Principles of Solar Radiation, Flat Plate and Concentrating Solar Energy Collectors, PV Cell, V-I Characteristics, P-V characteristics, Equivalent circuit, Concepts of MPPT, Different methods of Energy storage, Applications of PV in street lighting, water pumping.

UNIT OUTCOMES: After completion of unit, student will be able to understand the principle and operation of Solar Power Generation and their characteristics.

UNIT-IV WIND POWER GENERATING SYSTEMS

Role and potential of Wind Energy Option, Horizontal and Vertical Axis Wind Mills- Performance Characteristics- Power- Speed & Torque- Speed Characteristics, Betz's law, Wind turbine controls (Pitch, Yaw and Stroll).

UNIT OUTCOMES: After completion of unit, student will be able to understand the principle and operation of Wind Power Generation and their characteristics.

UNIT-V BIOGAS, GEOTHERMAL AND OCEAN POWER GENERATING SYSTEMS

Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters – Characteristics of Bio-Gas- Utilization- Economic and Environmental Aspects.
Geothermal Power Generation: Principle of Geothermal Energy, Methods of Harnessing.
Ocean Power Generation: Principle of Ocean Energy-Tidal and Wave Energy- Mini Hydel Plants.

UNIT OUTCOMES: After completion of unit, student will be able to understand the principle and operation of Biogas, Geothermal and Ocean Power Generations and their operation.

TEXT BOOKS:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, DhanpatRai& 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.
5. NPTEL resources
6. Solar Photovoltaics: Fundamentals, Technologies and Applications by Chetan Singh Solanki, PHI, Third Edition, 2015.
7. Solar Energy: Principles of Thermal Collections and Storage by S.P. Sukhatme and J.K. Nayak, Tata McGraw Hill, Third Edition, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
DEPARTMENT OF MATHEMATICS
I B.TECH – II SEMESTER
(Common to all branches of Engineering except CSE)

(THEORY)

Subject Code	Title of the Subject	L	T	P	C
19A53201	**Differential Equations and Vector Calculus**	2	0	-	3

Course Objectives:

1) To enlighten the students in the techniques to solve differential equations.
2) To enable the students to use differential equations in various real world applications of engineering.

Course Outcomes:

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

- solve the differential equations related to various engineering fields (L6)
- Identify solution methods for partial differential equations that model physical processes (L3)
- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L6)

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

UNIT 1: Linear differential equations of higher order 8hrs

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

Learning Outcomes:

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

- identify the essential characteristics of linear differential equations with constant coefficients (L3)
- solve the linear differential equations with constant coefficients by appropriate method (L3)

UNIT 2: Applications of Linear Differential Equations 8hrs

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications to L-C-R Circuit problems and Mass spring system.

Learning Outcomes:

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

- classify and interpret the solutions of linear differential equations (L3)
- formulate and solve the higher order differential equation by analyzing physical situations (L3)

UNIT 3: Partial Differential Equations 8 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.

Learning Outcomes:

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

- apply a range of techniques to find solutions of standard PDEs (L3)
- outline the basic properties of standard PDEs (L2)

UNIT4: Vector differentiation 8hrs

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

Learning Outcomes:

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

- apply del to Scalar and vector point functions (L3)
- illustrate the physical interpretation of Gradient, Divergence and Curl (L3)

UNIT 5: Vector integration 8hrs

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

Learning Outcomes:

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

- find the work done in moving a particle along the path over a force field (L4)
- evaluate the rates of fluid flow along and across curves (L4)
- apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (L3)

Textbooks:

3. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

4. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B.Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
6. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
7. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
8. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
9. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
10. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
11. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
12. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
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	2	1	-	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	PSO1	PSO 2	PSO 3
CO1	2	2	2												
CO2	2	2	2			3									
CO3	2	3	2												
CO4	2	2	3												
CO5	2	2	3												

SYLLABUS

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

Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2 , applications to hydrogen, 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 fuel cells – working of the cells.

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, urea-formaldehyde, Nylon-6,6, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.

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

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

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

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, 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

(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 SS Dhara, S. Chand Publications, New Delhi

2. Engineering Chemistry by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Pubblications India Pvt Limited.
3. Concepts of Engineering Chemistry- Ashima Srivastavaf and N.N. Janhavi
4. Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu
5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu
6. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

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COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

I YEAR II SEM

Subject Code	Title of the Subject	L	T	P	C
	Data Structures	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

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. Analyse the Algorithms (L4)
5. Develop Algorithm for Sorting large files of data (L3)

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

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)
4.

Unit – 3 :Trees

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, AVL 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

6. Recognize the importance of Graphs in solving real world problems (L2)
7. Apply various graph traversal methods to applications (L3)
8. Design a minimum cost solution for a problem using spanning trees (L6)
9. Select the appropriate hashing technique for a given application (L5)
10. Design a hashing technique (L6)

Unit – 5: Files and Advanced sorting

File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization.

Advanced sorting: 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 and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2007.
2. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.

Reference Text Books:

1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016
3. Richard F.Gilberg, Behrouz A.Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.

I B.TECH – II SEMESTER(R-19)

SubjectCode	TitleoftheSubject	L	T	P	C
19A10303	**Engineering Workshop**	3	0	0	3

Course Objective:

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

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

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

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) Wheel balancing, tubeless tyre puncture and change of two wheelertyre.

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

Note:* Students exercise. Remaining all for demonstration.

Course Outcomes:

After completion of this labthe student will be able to

1. Apply wood working skills in real world applications.
2. Build different parts with metal sheets in real world applications.
3. Apply fitting operations in various applications.
4. Apply different types of basic electric circuit connections.
5. Demonstrate soldering and brazing.
6.Understanding the principle of automobile wheel balancing and alignment.

I B.TECH – II SEMESTER(R-19)

SubjectCode	TitleoftheSubject	L	T	P	C
19A10304	**Engineering Graphics**	1	0	3	2.5

UNIT-I

Introduction to EngineeringDrawing, Principles of Engineering Graphics and their significance.
Curves used in practice:
Conic sections – Ellipse, Parabola, Hyperbola & Rectangular Hyperbola(general method)
Cycloid, Epicycloid and Hypocycloid – Normal and Tangent
Involutes – Normal and Tangents

UNIT –II

Principles of orthographic projections – First and Third angle projections Projection of points. Projections of lines inclined to one plane and inclined to both planes – True length, true angles of projected lines- Projection of regular planes inclined to one plane and both planes.

UNIT –III

Projection of solids inclined to one plane and inclined to both planes by rotational method – Prism, Cylinder, Pyramid, Cone.

UNIT –IV

Sections of solids: Sections and Sectional views of Regular solids – Prism, Cylinder, Pyramid, Cone – True shapes. Development of Regular solids- Prism, Cylinder, Pyramid, Cone.

UNIT –V

Orthographic projections: Conversion of Pictorial views to orthographic views – Conventions.

Isometric projection: Isometric views of lines, plane figures, simple solids – orthographic views into isometric views.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, K.L. Narayana & P. Kannaih, Scitech Publishers, Chennai.

REFERENCES:

3. Engineering Drawing, Johle, Tata McGraw-Hill Publishers.
4. Engineering Drawing, Shah and Rana,2/e, Pearson Education
5. Engineering Drawing and Graphics, Venugopal/New age Publishers
6. Engineering Graphics, John&john.

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

Subject Code	Title of the Lab	L	T	P	C
19A53202	Chemistry lab	-	-	4	2

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	PSO1	PSO 2	PSO 3
CO1	3	2	2												
CO2	3	2	3			3									
CO3	3	2	2												
CO4	3	2	2												
CO5	1		2												

LIST OF EXPERIMENTS

1. Conductometrictitration of strong acid vs strong base
2. Conductometrictitration of weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
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 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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

I YEAR II SEM

Subject Code	Title of the Subject	L	T	P	C
	Data Structures Lab	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.

Course Outcome: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)

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

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 person 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.

JAWAHARLAL TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

II B. Tech - I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A20604	**Complex variables and Transforms**	2	1	0	3

Course Objective:

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

Course Outcomes:

After the completion of course, students will be able to

1. understand the analyticity of complex functions and conformal mappings.
2. apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
3. understand the usage of Laplace Transforms, Fourier Transforms and Z transforms.
4. evaluate the Fourier series expansion of periodic functions.

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

Unit-I: Laplace Transforms

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

Learning Outcomes:

Studentswill be able to

1. understand the concept of Laplace transforms and find the Laplace transforms of elementary functions.
2. find the Laplace transforms of general functions using its properties.
3. understand Laplace transforms of special functions(Unit step function, Unit Impulse & Periodic).
4. apply Laplace transforms to solve Differential Equations.

Unit-II: Fourier series

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

Learning Outcomes:

Students will be able to

1. understand finding Fourier series expression of the given function.
2. determine Fourier coefficients (Euler's) and identify existence of fourier series of the given function.
3. expand the given function in Fourier series given in Half range interval.
4. apply Fourier series to establish Identities among Euler coefficients.
5. find Fourier series of wave forms.

Unit-III: Fourier transforms& Z Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem .

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

Learning Outcomes:

Students will be able to

1. find Fourier Sine and cosine integrals.
2. understand Fourier transforms.
3. apply properties of Fourier transforms.
4. understand Z transforms.
5. apply properties of Z transforms.
6. apply Z transforms to solve difference equations.

Unit-IV:Complex Variable – Differentiation:

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions(exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations(sin z, e^z, cos z, z^2) Mobius transformations (bilinear) and their properties.

Learning Outcomes:

Students will be able to

1. understand functions of Complex variable and its properties.
2. find derivatives of complex functions.
3. understand the analyticity of complex functions .
4. understand the conformal mappings of complex functions.

Unit-V: Complex Variable – Integration:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof);power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi circle with f(z) not having poles on real axis).

Learning Outcomes:

Students will be able to

1. understand the integration of complex functions.
2. apply Cauchy's integral theorem and Cauchy's integral formula.
3. understand singularities of complex functions.
4. evaluate improper integrals of complex functions using Residue theorem.

Text Books:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

Reference Books:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

II B. Tech - I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A20201	**ELECTRICAL CIRCUITS- II**	2	1	0	3

Course Objectives:

1	To know the analysis of three phase balanced and unbalanced circuits and to measure active and reactive powers in three phase circuits
2	How to determine the transient response of R-L, R-C, R-L-C series circuits for d.c and a.c excitations
3	To know the applications of Fourier transforms to electrical circuits excited by non-sinusoidal sources
4	Study of Different types of filters, equalizers and PSPICE for Circuit Analysis

Course Outcomes:

CO1	Understand the analysis of three phase balanced and unbalanced circuits and to measure active and reactive powers in three phase circuits
CO2	To get knowledge about how to determine the transient response of R-L, R-C, R-L-C series circuits for d.c and a.c excitations
CO3	Applications of Fourier transforms to electrical circuits excited by non-sinusoidal sources are known
CO4	Design of filters, equalizers and PSPICE programs for Circuit Analysis

Mapping of Course outcomes with Program outcomes:

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

Syllabus:

Unit-I: TRANSIENT ANALYSIS

D.C Transient Analysis: Initial Conditions in network - Initial Conditions in elements -Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation - Solution Method Using Differential Equation and Laplace Transforms - Response of R-L & R-C Networks to Pulse Excitation.

A.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations - Solution Method Using Differential Equations and Laplace Transforms.

Learning Outcomes:

- Able to understand Concepts of transient response of series circuits in both DC and Ac excitations .

- Able to analyse the differential equations and Laplace transforms of RLC circuits.

Unit-II: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 - Application of Millman's Theorem - Star Delta Transformation Technique – for balanced and unbalanced circuits – Advantages of Three Phase System.

Learning Outcomes:

- Able to understand Concepts of three phase circuits for balanced and unbalanced conditions.
- Able to analyzethe active power and reactive power for balanced and unbalanced conditions.

Unit-III: FOURIER TRANSFORMS

Fourier Theorem - Trigonometric Form and Exponential Form of Fourier series – Conditions of Symmetry - Line Spectra and Phase Angle Spectra - Analysis of Electrical Circuits to Non Sinusoidal Periodic Waveforms. Fourier Integrals and Fourier Transforms – Properties of Fourier Transforms and Application to Electrical Circuits.

Learning Outcomes:

- Able to understand concepts of Fourier transforms, properties,line spectra and phase plane analysis.
- Able to analyze Electrical Circuits to Non Sinusoidal Periodic Waveforms.

Unit-IV: TWO PORT NETWORKS

Two Port Network Parameters – Impedance – Admittance - Transmission and Hybrid Parameters and their Relations. Concept of Transformed Network - Two Port Network Parameters Using Transformed Variables.

Learning Outcomes:

- Able to understand concepts of two port network parameters.
- Able to calculate impedance, admittance, transmission and hybrid parameters.

Unit-V:FILTERS & PSPICE FOR CIRCUITS

Filters – Low Pass – High Pass and Band Pass – RC, RL filters– derived filters and composite filters design – Attenuators – Principle of Equalizers – Series and Shunt Equalizers – L Type - T type and Bridged – T and Lattice Equalizers.

PSPICE for Circuit Analysis – Description of Circuit elements - nodes and sources - Input and Output variables – Modeling of the above elements – Types of DC analysis.

Learning Outcomes:

- Able to understand concepts of filters, equalizers.
- Able to design filters and attenuators.
- Able to analyze the circuits in PSPICE.
- Able to modeling of circuits in PSPICE.

TEXT BOOKS:

4. "Engineering circuit analysis" by William Hayt and Jack E.Kemmerly, Mc Graw Hill Company,8th Edition(4 August 2013).
5. "Network Analysis" by M.E Van Valkenberg, Prentice Hall (India), Revised 3rd Edition (15 April 2019).

REFERENCE BOOKS:

1. "Circuit Theory (Analysis & Synthesis)" by A. Chakrabarti, Dhanpat Rai & Sons, Seventh - Revised edition (2018).
2. "Fundamentals of Electric Circuits" by Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill, 5th edition (1 July 2013).
3. "Electrical Engineering Fundamentals" by V. Del Toro, Prentice – Hall International, 2nd edition (1989).
4. "Electric Circuits" by N.Sreenivasulu, REEM Publications(2012).
5. "Electric Circuits"- Schuam Series,5th edition (1 July 2017).
6. "Electrical Circuit Theory and Technology" by John Bird, Routledge, Taylor &Fransis, 6th Edition, March 3, 2017.
7. "Circuits & Networks" by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill, 5thedition (1 July 2017).

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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A24201	**Signals and Systems**	2	1	0	3

Course Objectives:

1	To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domains.
2	To present Fourier tools through the analogy between vectors and signals.
3	To teach concept of sampling and reconstruction of signals.
4	To analyze characteristics of linear systems in time and frequency domains.
5	To understand Laplace and z-transforms as mathematical tool to analyze continuous and discrete-time signals and systems.

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

CO1	Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Also understand the concepts of various transform techniques. (L1)
CO2	Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L2)
CO3	Analyze the frequency spectra of various continuous-time and discrete-time signals using different transform methods. (L3)
CO4	Classify the systems based on their properties and determine the response of them. (L4).

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

Syllabus

Unit I:Introduction to Signals & Systems

Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error, Fourier series: Trigonometric & Exponential, Properties of Fourier series, concept of discrete spectrum, Illustrative Problems.

Learning Outcomes:

- Understand different types of signals and systems. (L1)
- State principles of vector spaces and concept of Orthogonality. (L2)
- Describe continuous time signal and discrete time signal. (L2)
- Analyze the periodic signals by applying Fourier series. (L3)

Unit II : Continuous Time Fourier Transforms

Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Statement and proof of sampling theorem of low pass signals, Illustrative Problems.

Learning Outcomes:

- Identify system properties based on impulse response and Fourier analysis. (L1)
- Analyze the spectral characteristics of signals. (L3)
- Illustrate signal sampling and its reconstruction. (L2)
- Apply Fourier transform to solve problems. (L2)

Unit III: **Discrete Time Fourier Transforms**

Definition, Computation and properties of Discrete Time Fourier transform for different types of signals and systems, Illustrative Problems.

Learning Outcomes:

- Understand the properties of the discrete-time Fourier transform. (L1)
- Analyze the spectral characteristics of signals using Fourier transform. (L3)
- Evaluate the Fourier transform of Discrete-time signals. (L2)

Unit IV: **Signal Transmission through Linear Systems**

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

Learning Outcomes:

- Understand the impulse response, transfer characteristics of LTI system and various filters. (L1)
- Analyse filter characteristics and physical realisation of LTI system. (L3)
- Apply the relation between bandwidth and rise time & energy and power spectral densities in various applications. (L2)

Unit V:**Laplace and Z Transforms**

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

Definition, ROC, Properties, Poles and Zeros in Z-plane, The inverse Z-Transforms, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems.

Learning Outcomes:

- Understand the limitations of Fourier transform and need for Laplace transform and develop. (L1)
- Apply transform techniques to analyse discrete-time signals and systems. (L2)
- Evaluate response of linear systems to known inputs by using Laplace transforms. (L2)
- Analyze the continuous-time and discrete-time signals and systems using Laplace and Z-transforms.(L3)

Text Books:

1. "Signals and Systems",A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edition, 2009.
2. "Signals & Systems",Simon Haykin and Van Veen, Wiley, 2nd Edition, 2005.

References:

1. "Principles of Linear Systems and Signals",BP Lathi, Oxford University Press, 2nd Edition, 2015.
2. "Signals and Systems A primer with MATLAB",Matthew N.O. Sadiku and Warsame H. Ali, CRC Press, 2016.
3. "Schaum's Outline of Signals and Systems", Hwei Hsu, Fourth Edition, TMH, 2019.
4. NPTEL Lectures on Signals and Systems by Prof.K.S.Venkatesh,IIT Kanpur.
5. NPTEL Lectures on Signals and Systems by Prof.Aditya K Jagannatham, IIT Kanpur

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ELECTRICAL AND ELECTRONICS ENGINEERING

II B.Tech – I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A20202	**DC MACHINES & TRANSFORMERS**	2	1	0	3

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1	Understand the concepts of magnetic circuits.
CO 2	Understand the operation of DC machines.
CO 3	Analyse the differences in operation of different DC machine configurations.
CO 4	Analyse single phase and three phase transformers circuits.

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

UNIT-I Basic Principles

Magnetic Material Properties and Applications:

Introduction, Magnetic materials and their properties, magnetically induced emf and force, AC operation of magnetic circuits, hysteresis and eddy current losses, permanent magnets, and applications of permanent magnet materials.

Principles of electromechanical energy conversion:

Energy in magnetic system, field energy and mechanical force, multiply-excited magnetic field systems, forces/torques in systems with permanent magnets, energy conversion via electric field, dynamical equations of electro mechanical systems

Learning Outcomes:

- Able to understand the electromechanical energy conversion system
- To understand about various magnetic materials, properties and Applications

UNIT-II DC Generators

Constructional details of DC machine, principle of operation of DC generator, armature windings and its types, emf equation, armature reaction, effect of brush lead, demagnetizing and cross magnetizing ampere turns, compensating windings, commutation, emf induced in a coil undergoing commutation, methods of improving commutation, OCC and load characteristics of different types of generators.

Parallel operation of DC Generators:DC shunt and series generators in parallel, equalizing connections

Learning Outcomes:

- Able to understand the construction, operation and armature windings of a DC generator
- Able to analyze the characteristics of DC generators

UNIT-III DC Motors

Force on conductor carrying current, back emf, Torque and power developed by armature, speed control of DC motors (Armature control and Flux control methods), Necessity of starters,

constructional details of 3-point and 4-point starters, characteristics of DC motors, Losses in DC machines, condition for maximum efficiency. Testing of DC machines: Brake test, Swinburne's test, Hopkinson's test, Fields test, Retardation test.

Learning Outcomes:

- Able to analyze speed control of DC motors, testing methods and parallel operation of DC machines
- Analyze the characteristics of DC motors

UNIT-IV

Single Phase Transformers

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagrams(no load and on load), Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, losses and efficiency Testing - open circuit and short circuit tests, voltage regulation, Sumpner's test, separation of hysteresis and eddy current losses. Parallel operation of single-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer.

Learning Outcomes:

- Able to understand the construction, operation and parallel operation of transformer
- To predetermine the efficiency and regulation of a transformer

UNIT-V

Three Phase Transformers

Three-phase transformer – construction, types of connection and their comparative features, Phase conversion - Scott connection, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers- Cooling of transformers, Distribution transformer, Power transformer- Comparison between distribution transformer and power transformer.

Learning Outcomes:

- Able to understand and analyze the phase conversions
- Analyze the tap changing of transformers

Text Books:

1. "Electrical Machinery", P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 7th Edition (1977).
2. "Electric Machines", I. J. Nagrath and D. P. Kothari, McGraw Hill Education,Fifth edition (23 June 2017).

References:

1. "Electric Machinery",A. E. Fitzgerald and C. Kingsley, New York, McGraw Hill Education, 6th edition (September 1, 2005).
2. "The Performance and design of DC machines", A. E. Clayton and N. N. Hancock, CBSPublishers, 1st edition (2004).
3. "The Performance and design of AC machines", M. G. Say, CBS Publishers, 3rd edition (2002).
4. NPTEL Lectures on Electrical machines by Prof. G. Bhuvaneswari, IIT Delhi.
5. NPTEL Lectures on Electrical Machines-I by Prof Tapas Kumar Bhattacharya IIT Kharagpur.

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II B.Tech – I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A20203	**ENGINEERING ELECTROMAGNETICS**	2	1	0	3

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

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

CO 1	Understand the concept of electrostatics
CO 2	Understand the concepts of Conductors and Dielectrics
CO 3	Understand the fundamental laws related to Magneto Statics
CO 4	Understand the concepts of Magnetic Potential and Time varying Fields

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

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

Behavior 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:

- Understand the concept of capacitance for parallel plates, spherical & co-axial capacitors.
- Analyze the Concepts of Conduction and Convection currents.
- 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 in Different loops.

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.
- Able to calculate the magnetic forces and torque produced by currents in Magnetic Field.
- 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 Pointing 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 Mahmood Nahvi , Joseph Edminister (Author) Mc Graw Hill, 5th Edition, 2018.
4. "Electromagnetic Field Theory", K.A. Gangadhar and P.M. Ramanathan, Khanna Publications, 8th Reprint, 2015.
5. NPTEL Lectures on Engineering Electromagnetics by Prof.Harikrishna Ramachandran, IIT Madras.

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II B.Tech – I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A24202	**SEMICONDUCTOR DEVICES AND CIRCUITS**	1	1	0	2

Course Objectives:

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

Course Outcomes:

1. CO1. List various types of semiconductor devices (L1)
2. CO2. Study the characteristics of various types of semiconductor devices (L2)
3. CO3. Apply the characteristics of semiconductor devices to develop engineering solutions (L3)
4. CO4. Analyse functioning of various types of electronic devices and circuits (L4)

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

Unit I

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-ndiode 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 II

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 III

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 amplifierusing h parameters, Comparison of Transistor amplifier configurations.

Unit IV

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 V

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.

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, McGrawHill, 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):: ANANTAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

II B.Tech - I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A20901	**UNIVERSAL HUMAN VALUES**	2	0	0	2

Introduction:

This course discusses the role of human values in one's family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one

more semester for which the foundation course names as"H-102 Universal Human Values 2 : "Understanding Harmony" is designed which may be covered in their III or IV Semester.

In the Induction Program, students would get an initial exposure to human valuesthroughUniversalHumanValues–I.Thisexposureistobeaugmentedby this compulsory full semester foundationcourse.

Course Objective:

The objective of the course is four fold:

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

COURSE OUTCOME:

By the end of the course,

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

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

COURSE TOPICS:

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

Unit 1:

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

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

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

Unit 2:

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam andHealth.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit 3:

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

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

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

Unit 4:

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

- Understanding the harmony in theNature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation innature
- Understanding Existence as Co-existence of mutually interacting units in all-pervasivespace
- Holistic perception of harmony at all levels ofexistence.

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

Unit 5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of humanvalues
- Definitiveness of Ethical HumanConduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic UniversalOrder
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above productionsystems.

- Case studies of typical holistic technologies, management models and productionsystems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions andorganizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

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

Reference Books

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. A.N.Tripathi, "HumanValues", NewAgeIntl.Publishers,NewDelhi,2004.
3. The Story of Stuff(Book).
4. **MohandasKaramchandGandhi "TheStoryofMyExperimentswithTruth"**
5. **E. FSchumacher. "Small is Beautiful"**
6. SlowisBeautiful–CecileAndrews
7. J C Kumarappa "Economy of Permanence"
8. PanditSunderlal"Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K.Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. **Gandhi - Romain Rolland (English)**

MODE OF CONDUCT (L-T-P-C 2-1-0-2)

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their

analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic humanvalues.

OUTCOME OF THECOURSE:

By the end of the course,

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

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ELECTRICAL AND ELECTRONICS ENGINEERING

II B.Tech - I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A20204	**DC Machines & Transformers Lab**	-	-	3	1.5

Course Objectives: To conduct various experiments on	
1	DC motors and DC Generators
2	The speed control techniques of DC motors.
3	To conduct various experiments for testing on 1-phase transformers

Course Outcomes:	
CO1	Able to conduct and analyze load test on DC shunt generators
CO2	Able to understand and analyze magnetization characteristics of DC shunt generator
CO3	Able to understand and analyze speed control techniques and efficiency of DC machines
CO4	Able to understand to predetermine efficiency and regulation of single phase Transformers

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

From the following list experiments minimum ten experiments are required to be conducted as compulsory experiments:

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. Brake test on DC shunt motor. Determination of performance curves.
4. Swinburne's test on DC shunt motor,Predetermination of efficiency.
5. Speed control of DC shunt motor (Armature control and Field control method).
6. Hopkinson's tests on DC shunt machines. Predetermination of efficiency.
7. OC and SC test on single phase transformer
8. Parallel operation of single phase transformers.
9. Sumpner's test on single phase transformers.
10. Load test on DC long shunt compound generator. Determination of characteristics.
11. Load test on DC short shunt compound generator. Determination of characteristics.
12. Separation of losses in DC shunt motor.

Reference Book:

1. "Laboratory Manual for Electrical Machines", by D. P. Kothari and B. S. Umre, I.K International Publishing House Pvt. Ltd., 2017

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II B.Tech - I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A24203	**SEMICONDUCTOR DEVICES AND CIRCUITS LAB**	-	-	3	1.5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
CO1	2	3	3	3	3	3			3			2	2	3	3
CO2	2	3	3	3	3	3			3			2	2	3	3
CO3	2	3	3	3	3	3			3			2	2	3	3
CO4	2	3	3	3	2	3			3			2	2	3	3

All the experiments shall be conducted and there is no choice.

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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II B.Tech - I SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A20205	**ELECTRICAL CIRCUITS AND SIMULATION LAB**	-	-	3	1.5

Course Objectives:

To make the students learn about:

1	Experimental verification of theorems.
2	Experimental verification of Resonance phenomenon.
3	Drawing current locus diagrams and Practical implementation of active and reactive power measurement techniques.
4	Practical determination of two port network parameters and introduction to P-Spice.

Course Outcomes:

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

CO1	Apply suitable theorems for circuit analysis and verify the results theoretically.
CO2	Experimental determination of two port network parameters and theoretical verification.
CO3	Measure active and reactive power experimentally and verify the theoretical values.
CO4	Experimentally determine self inductance, mutual inductance and coefficient of coupling Practically determine band width, Q-factor and verify with theoretical values.

Mapping of Course outcomes with Program outcomes:

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

From the following list experiments minimum eight experiments from Part-A and minimum two experiments from Part-B are required to be conducted:

PART-A

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 Power for Star and Delta Connected Balanced Loads
11) Measurement of Reactive Power for Star and Delta Connected Balanced Loads
12) Measurement of 3-Phase Power by Two Wattmeter Method for Unbalanced Loads

PART-B:

1) Simulation of DC Circuits
2) DC Transient Response
3) Mesh Analysis
4) Nodal Analysis

REFERENCES:

1. "Fundamentals of Electric Circuits: Lab Manual", David A. Bell, OUP Canada, 7th Edition,2009.
2. "Introduction to PSPICE using OrCAD for Circuits and Electronics", Muhammad H. Rashid, Pearson Education, 3rd Edition, 2003

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

Subject Code	Title of the Subject	L	T	P	C
19A28801	**Biology for Engineers**	3	0	0	0

Course Objectives: **To provide basic understanding about life and life Process. Animal an plant systems. To understand what bimolecules, are, their structures are functions. Application of certain bimolecules in Industry.**

- Brief introduction about human physiology and bioengineering.
- To understand hereditary units, i.e. DNA (genes) and RNA and their synthesis in living organism.
- How biology Principles can be applied in our daily life using different technologies.
- Brief introduction to the production of transgenic microbes, Plants and animals.

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

Unit I: Introduction to Basic Biology

Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Brief introduction to five kingdoms of classification.

Unit Outcomes:

After completing this unit, the student will be able to

- Summarize the basis of life. (L1)
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes). (L2)
- Understand how organisms are classified. (L3)

Unit II: Introduction to Biomolecules

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what are biomolecules? their role in living cells, their structure, function and how they are produced. (L1)
- Interpret the relationship between the structure and function of nucleic acids. (L2)
- Summarize the applications of enzymes in industry. (L3)
- Understand what is fermentation and its applications of fermentation in industry. (L4)

Unit III: Human Physiology

Nutrition: Nutrients or food substances. Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle. Excretory system.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what nutrients are (L1)
- Understand the mechanism and process of important human functions (L2 & L3)

Unit IV: Introduction to Molecular Biology and recombinant DNA Technology

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. rDNA technology. Introduction to gene cloning.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand and explain about gene structure and replication in prokaryotes and Eukaryotes (L1)
- How genetic material is replicated and also understands how RNA and proteins are synthesized. (L2)
- Understand about recombinant DNA technology and its application in different fields.(L3)
- Explain what is cloning. (L4)

Unit V: Application of Biology

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, biochips, Bio fuels, and Bio Engineering. Basics of Production of Transgenic plants and animals.

Unit Outcomes:

After completing this unit, the student will be able to Understand.

- How biology is applied for production of useful products for mankind.(L1)
- What are biosensors, biochips etc. (L2)
- Understand transgenic plants and animals and their production (L3)

Unit III: Human Physiology

Nutrition: Nutrients or food substances. Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle. Excretory system.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what nutrients are (L1)
- Understand the mechanism and process of important human functions (L2 & L3)

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Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. rDNA technology. Introduction to gene cloning.

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- How genetic material is replicated and also understands how RNA and proteins are synthesized. (L2)
- Understand about recombinant DNA technology and its application in different fields.(L3)
- Explain what is cloning. (L4)

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Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, biochips, Bio fuels, and Bio Engineering. Basics of Production of Transgenic plants and animals.

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After completing this unit, the student will be able to Understand.

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- What are biosensors, biochips etc. (L2)
- Understand transgenic plants and animals and their production (L3)

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

Subject Code	Title of the Subject	L	T	P	C
19A20205	TRANSMISSION SYSTEM ANALYSIS AND DESIGN	2	1	0	3

Course Objectives:
The student will be able to:

1	About the various factors that affect the performance of Transmission lines
2	Understand the theory of transmission lines modeling
3	To comprehend the different issues related to overhead lines and underground cables.
4	To provide the knowledge about the system transients, sag and various issues related to cables and transmission lines.

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

CO1	Ability to do calculation of resistance, Inductance and Capacitance of Transmission Lines.
CO2	Able to discuss various factors governing the performance of Transmission Line.
CO3	Ability to do calculation of sag for different types of Transmission systems.
CO4	Ability to discuss construction of Underground Cables

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

Syllabus:

Unit-I: Transmission Line Parameters

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 configuration with and without transposition. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

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

- Obtain the transmission line parameters for different types of lines and also for symmetrical and asymmetrical single and three phase, single and double circuit lines.

Unit-II:Modeling of Transmission Lines

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

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

- Obtain the classification of transmission lines and A,B,C,D constants for transmission lines, need of shunt compensation.

Unit-III:Insulators, Corona and Mechanical Design of lines

Types of Insulators, String efficiency and Methods for improvement, Numerical Problems – Voltage Distribution, Calculation of string efficiency, Capacitance grading and Static shielding. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference. 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 the unit, students will be able to

- Understand different types of Insulators, effects of corona and sag and tension Calculations.

Unit-IV:Power System Transients

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

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

- Obtain the knowledge about transients and the concept of Bewley's Lattice Diagrams.

Unit-V: Power 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.

Learning Outcomes:

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

- Obtain the calculations of Insulation resistance, Capacitance of a single and 3 core belted cables and grading of cables.

Text Books:

1. "Power System Analysis" by W.D.Stevenson, J.J. Grainger McGrawhill, 2nd edition (December 28, 2015).
2. "Electrical power systems" - by C.L.Wadhwa, New Age International (P) Limited, Publishers, 7th edition (1 January 2016).

Reference Books:

1. "A Text Book on Power System Engineering" by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, DhanpatRai& Co Pvt. Ltd (2008).
2. "Power System Engineering" by D.P. Kothari and I.J. Nagrath, 3rd Edition, McGraw Hill Publications.
3. "Power System Analysis" by HadiSaadat, McGraw-Hill Inc.,US; Subsequent edition (1 March 1998)
4. "Power System Analysis and Design" by J. Duncan Glover, Cengage Learning Custom Publishing, 5th edition (14 January 2011).
5. **Power System Analysis and Design by B.R.Gupta, S Chand & Company, Re-issue edition (8 August 2005).**
6. **NPTEL Lectures on Power System Generation, Transmission and Distribution (Encapsulated from earlier Video) by Prof. D.P. Kothari IIT Delhi**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A20207	**POWER ELECTRONICS**	2	1	0	3

Course Objectives:
The student will be able to:

1	Understand the differences between signal level and power level devices.
2	Analyze controlled rectifier circuits.
3	Analyze the operation of DC-DC choppers.
4	Analyze the operation of voltage source inverters.

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

CO1 Remember and understand of about basic operating principles of various power semiconducting switching devices

CO2 Apply the concepts of power electronics techniques Understand high efficiency and high reliability power conversion methods.

CO3 Analyses of the of various power electronics converter their control and to solve the problems and demonstrate the use of these techniques through good power skills.

CO4 Design and develop of some of power electronics converter methods. Able to apply principles and methods to practical applications.

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

UNIT-I: Power switching devices

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET, IGBT and GTO.

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

- Understand the basic power semiconductor devices their construction, principle of working and their characteristics.
- Understand in detail about SCR i.e., its characteristics, series and parallel connection of SCR's, specification, its ratings and various commutation methods.
- Apply the above concepts to solve numerical problems.

UNIT-II: Thyristor rectifiers

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 the unit, students will be able to

- Understand the concepts of phase control technique, midpoint and bridge connections of half and full controlled converters with various loads for both 1Ø and 3Ø phase converters, effect of source inductance and dual converters.
- Analyze and evaluate voltages and currents, active and reactive power inputs to converter with and without freewheeling diode for 1Ø and 3Ø converters.
- Apply the above concepts to solve numerical problems.

UNIT-III: DC-DC converters

Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, 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, Buck-Boost converter (Principle of operation only).

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

- Understand the concepts of various control strategies, types of choppers and analyze their principle operation, waveforms of voltages and currents at different loads.
- Apply the above concepts to solve numerical problems.

UNIT-IV: Inverters

Single phase Voltage Source inverters – operating principle - Steady State Analysis, Simple forced commutation circuits for bridge inverters – Mc Murray and Mc Murray 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 - Numerical problems.

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

- Understand the construction, working of single phase voltage inverters with their waveforms in various operating modes when different loads are applied and the different modulating techniques available.
- Understand the construction, working of three phase voltage inverters with their waveforms in various operating modes when different loads are applied, harmonic components and the different modulating techniques available.
- Apply the above concepts to solve numerical problems.

UNIT-V: AC Voltage Controllers &Cyclo Converters:

AC voltage controllers – Principle of phase control – Principle of integral cycle control - Single phase two SCRs in anti-parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – RMS load voltage, current and power factor - wave forms – 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 the unit, students will be able to

- Understand the concept of AC voltage controllers
- Understand the concept of Cyclo Converters

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.

REFERENCE BOOKS:

1. "Power Electronics" by M. D. Singh & K. B. Kanchandhani, Tata McGraw Hill Publishing Company, 1998.
2. "Power Electronics, A first Course" by Ned Mohan, Wiley, 2011.
3. "Fundamentals of Power Electronics" by Robert W. Erickson and Dragan Maksimovic, Kluwer Academic Publishers, 2nd Edition, 2004.
4. "Power Electronics" by VedamSubramanyam, New Age International (P) Limited, 1996.
5. "Power Electronics" by V.R.Murthy , OXFORD University Press, 1st Edition, 2005.
6. "Power Electronics" by P.C.Sen, Tata McGraw-Hill Education, 1987.
7. NPTEL Lectures on Power Electronics by Prof. Kishore Chatterjee and Prof.B.G.Fernandes, IIT Bombay.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A20208	**AC Machines**	2	1	0	3

Course Objectives:
The students will be able to:

1	Understand the fundamentals of AC machines, know equivalent circuit performance characteristics.
2	Understand the methods of starting of Induction motors.
3	Understand the methods of starting of Synchronous motors.
4	Understand the parallel operation of Alternators.

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

CO1	Understand the basics of ac machine windings, construction, principle of working, equivalent circuit of induction and synchronous machines.
CO2	Analyze the phasor diagrams of induction and synchronous machine, parallel operation of alternators, synchronization and load division of synchronous generators.
CO3	Apply the concepts to determine V and inverted V curves and power circles of synchronous motor.
CO4	Analyze the various methods of starting in both induction and synchronous machines.

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

UNIT-I: Fundamentals of AC machine windings

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factors.

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

- Understand the fundamentals of various parts used, different types of windings, distribution factor, air gap mmf distribution, constant and pulsating magnetic fields, addition of pulsating magnetic fields and revolving magnetic field.

- Analyze Magnetic and pulsating fields produced by spatially displaced windings and when the windings are spatially shifted by an angle.
- Apply above concepts to solve numerical problems.

UNIT-II: Induction Machines

Operating principle, Construction, Types (squirrel cage and slip-ring), Starting and Maximum Torque, Equivalent circuit, Phasor Diagram, Torque-Slip Characteristics, power flow in induction machines, Losses and Efficiency, No load and blocked rotor test, Circle diagram-performance characteristics, Numerical problems. Methods of starting, braking and speed control for induction motors, Doubly-Fed Induction Machines, crawling and cogging.

Learning Outcomes:

By the end of the unit, student will be able to:

- Understand the construction, types, equivalent circuit, torque slip characteristics and various losses present in an induction machine.
- Analyze the phasor diagram, efficiency, starting and maximum torque, effect of parameter variation on torque speed characteristics
- Apply above concepts to solve numerical problems.

UNIT-III; Single-phase induction motors

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and its applications, capacitor start and run single phase motors, reluctance single phase motors, stepper motors, BLDC motors.

Learning Outcomes:

By the end of the unit, student will be able to:

- Understand induction generator operation, self-excitation, doubly fed induction machines, various methods of starting, braking and speed control of induction motors.
- Understand the constructional features, principle involved, equivalent circuit of single-phase induction motor and various starting methods and its applications.
- Apply above concepts to solve numerical problems.

UNIT-IV: Synchronous generators

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation- EMF, MMF, ZPF and ASA methods. Operating characteristics of synchronous machines, Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

Learning Outcomes:

By the end of the unit, student will be able to:

- Understand the constructional features, emf generated, equivalent circuit, armature reaction, voltage regulation, characteristics, two reaction theory of synchronous machine.
- Analyze the phasor diagrams, parallel operation of alternators, synchronization and load division of synchronous generators.
- Apply above concepts to solve numerical problems.

UNIT-V: Synchronous motors

Principle of operation, methods of starting, Phasor diagram of synchronous motor, variation of current and power factor with excitation, Predetermination of V and inverted V curves, Hunting and use of damper bars, Synchronous condenser and power factor correction, Excitation and power circles.

Learning Outcomes:

By the end of the unit, student will be able to:

- Understand the principle of operation, methods of starting, concept of hunting, synchronous condenser and power factor correction of synchronous motors.
- Analyze the phasor diagram, determination of V and inverted V curves and power circles of synchronous motor.
- Apply above concepts to solve numerical problems.

Text Books:

1. "Electric Machinery", A. E. Fitzgerald and C. Kingsley, McGraw Hill Education, 6th edition (September 1, 2005).
2. "Electrical Machinery", P. S. Bimbhra, Khanna Publishers, 7th Edition (1977).

References:

1. "The Performance and design of AC machines", M. G. Say, CBS Publishers, 3rd edition (2002).
2. "Electric Machines", I. J. Nagrath and D. P. Kothari, McGraw Hill Education, 5th edition (23 June 2017).
3. "Alternating current machines", A. S. Langsdorf, McGraw Hill Education, 1984.
4. "Principles of Electric Machines and Power Electronics", P. C. Sen, John Wiley & Sons, 2007.
5. NPTEL Lectures on Electrical Machines-II by Prof .Tapas Kumar Bhattacharya, IIT Kharagpur.

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ELECTRICAL AND ELECTRONICS ENGINEERING
II B.Tech – II SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A20209	CONTROL SYSTEMS	2	1	0	3

Course Objectives:

To make the students learn about:

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 overall transfer 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

Course Outcomes:

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

CO1	Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis
CO2	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 these techniques.
CO3	Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.
CO4	Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.

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

UNIT – I CONTROL SYSTEMS CONCEPTS

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transfer function 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 electrical systems
- Obtain the transfer function from block diagrams, servo motors and signal flow graphs

UNIT-II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, P, PI, PID Controllers.

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

- Analyze the time domain specifications
- Calculate the steady state errors
- Understand about Proportional, Integral and Derivative controllers along with combinations

UNIT – III STABILITY ANALYSIS IN TIME DOMAIN

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

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

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

UNIT – IV FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis.
Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

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

- *Evaluate the frequency domain specifications from Bode, Polar and Nyquist plots*
- *Design Compensators for various systems*
- Deducing transfer functions from Bode Plots
- Understand difference between Phase and Gain margins

UNIT – V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

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

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

- Understand the concept of state space, controllability and observability
- Obtain the transfer function from sate space and vice versa
- Understand the state transition method of solving time invariant state equations

TEXT BOOKS:

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, Mc Graw 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, Mc Graw 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. \
6. NPTEL Lectures on Control Systems by Prof.C.S.Shankar Ram, IIT Madras.

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ELECTRICAL AND ELECTRONICS ENGINEERING

II B.Tech - II SEM (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A24204	**Digitial Electronic Circuits and Logic Design**	2	1	0	3

Course Objectives:

- To understand common forms of number representation in logic circuits.
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand the concepts of combinational logic circuits and sequential circuits.
- To understand the Realization of Logic Gates Using Diodes & Transistors.

Course Outcomes:

Upon completing this course, the student will be able to

- Understand the numerical information in different forms and Boolean Algebra theorems.
- Postulates of Boolean algebra and to minimize combinational functions.
- Design and analyze combinational and sequential circuits.
- Known about the logic families and realization of logic gates.

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

UNIT I

Boolean Algebra:

Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

Realization of Logic Gates Using Diodes & Transistors:

Use of Diode and Transistor as switch; AND, OR and NOT Gates using Diodes and Transistors, Concept of noise margin, fanout, propagation delay; TTL, Schottky TTL, Tristate; CMOS Logic, Interfacing TTL with CMOS

UNIT II

Number Systems:

Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

Minimization of Boolean functions:

Karnaaugh Map Method - Up to five Variables, Don’t Care Map Entries, Tabular Method.

UNIT III

Combinational Logic Circuits:

Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations, Design of combinational circuits-Encoders and decoders, Multiplexer and demultiplexers.

UNIT IV

Sequential Circuits Fundamentals:

Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters:

Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

UNIT V

Sequential Machines:

Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N – Counters, Finite state machine-capabilities and limitations, Mealy and Moore models.

Text Books:

1. Switching and Finite Automata Theory –ZviKohavi&Niraj K. Jha, 3rd Edition, Cambridge, 2010
2. Digital Design- Morris Mano, PHI, 4th Edition,2006.

References:

1. Modern Digital Electronics – R. P. Jain, 3rd edition, Tata McGraw-Hill, 2007.
2. Digital Integrated Electronics, Taub and Shilling, McGraw Hill.
3. Digital Fundamentals 9e, Thomas L Floyd, Pearson.
4. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.

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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A25501	**Fundamentals of Python Programming**		0	0	2

Course Objectives:

- To teach the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To train in the development of solutions using modular concepts
- To introduce the programming constructs of python

Course Outcomes: After completion of the course a successful student is able to

- List the basic constructs of Python
- Design programs for data structure list and manipulating strings
- Apply object orientation concepts, use data structure dictionaries
- Organize data in the form of files

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

Unit – I

Introduction: What is a program, Running python, Arithmetic operators, Value and Types.

Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Learning Outcomes: Student should be able to

- List the basic constructs of Python (L1)
- Solve the problems by applying modularity principle (L3)

Unit – II

Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.
Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types,

Learning Outcomes: Student should be able to

- Apply the conditional execution of the program (L3)
- Apply the principle of recursion to solve the problems (L3)

Unit - III

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.
Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

Learning Outcomes: Student should be able to

- Design programs for manipulating strings (L6)

Unit – IV
Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.
Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Learning Outcomes: Student should be able to
- Apply object orientation concepts (L3)
- Use data structure lists and tuples (L3)

Unit – V

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus planning.

Learning Outcomes: Student should be able to

- Organize data in the form of files (L6)
- Plan programs using object orientation approach (L6)

Text books:

- Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.

Reference Books:

- Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
- Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
- R. NageswaraRao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019

Course Outcomes: Student should be able to

- Explain the features of Python language (L2)
- Select appropriate data structure for solving a problem (L4)
- Design object oriented programs for solving real-world problems (L6)

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

Subject Code	Title of the Subject	L	T	P	C
19A20210	**CONTROL SYSTEMS & SIMULATION LAB**	0	0	3	1.5

COURSE OBJECTIVES

Objectives: This course introduces

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.

COURSE OUTCOMES

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

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.

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

From the following list experiments minimum Eight experiments from Part-A and minimum two experiments from Part-B are required to be conducted:

Part-A

1. Time response of Second order system.
2. Characteristics of Synchros.
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor.
5. Transfer function of DC Machine.

6. Effect of P, PD, PI, PID Controller on a second order system.
7. Lag and lead compensation – Magnitude and phase plot.
8. Temperature controller using PID.
9. Characteristics of magnetic amplifiers.
10. Characteristics of AC servo motor.

Part-B

1. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
2. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB.
3. State space model for classical transfer function using MATLAB – Verification.
4. Verification of controllability and observablity of a given system using MATLAB.

REFERENCE BOOKS:

1. MATLAB and its Tool Books user's manual –Mathworks, USA.
2. "Modeling and Simulation using MATLAB – Simulink", Dr. Shailendra Jain, Wiley (1 January 2013) 2nd edition.
3. "Essential MATLAB for Engineers and Scientists"by Brian Hahn and Daniel T. Valentine, Academic Press, 5th edition (1 February 2013).
4. "Getting Started with MATLAB" by RudraPratap, Oxford University Press, Seventh edition (2019).

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

Subject Code	Title of the Subject	L	T	P	C
19A20211	**POWER ELECTRONICS AND SIMULATION LAB**	0	0	3	1.5

Course Objectives:

By the end of the course the student will be able to:

CO1	Understand and analyze various characteristics of power electronic devices with gate firing circuits and forced commutation techniques.
CO2	Analyze the operation of single-phase half & fully-controlled converters and inverters with different types of loads.
CO3	Analyze the operation of DC-DC converters, single-phase AC Voltage controllers, cyclo converters with different loads.
CO4	Create and analyze various power electronic converters using PSPICE software.

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

From the following list experiments minimum Eight experiments from Part-A and minimum two experiments from Part-B are required to be conducted:

Part- A

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR's: (a) R triggering (b) R-C triggering.
3. Single Phase AC Voltage Controller with R and RL Loads.
4. Single Phase fully controlled bridge converter with R and RL loads.
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E).
6. DC Jones chopper with R and RL Loads.
7. Single Phase Parallel, inverter with R and RL loads.
8. Single Phase Cycloconverter with R and RL loads.
9. Single Phase Half controlled converter with R load.
10. Three Phase half controlled bridge converter with R-load.
11. Single Phase series inverter with R and RL loads.
12. Single Phase Bridge converter with R and RL loads.
13. Single Phase dual converter with RL loads.

Part-B

1. PSPICE simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.
2. PSPICE simulation of resonant pulse commutation circuit and Buck converters and chopper.
3. PSPICE 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A25502	**Fundamentals of Python Programming Lab**	0	0	2	1

Course Objectives:

1. To train solving computational problems
2. To elucidate solving mathematical problems using Python programming language
3. To illustrate the features of Python language

Course outcomes: Student should be able to

1. Design solutions to mathematical problems (L6)
2. Organize the data for solving the problem (L6)
3. Develop Python programs for numerical and text based problems (L3)
4. Select appropriate programming construct for solving the problem (L5)
5. Illustrate object oriented concepts (L3)

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

Laboratory Experiments

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a Scientific Calculator

2. Write a function that draws a grid like the following:

```
+ - - - - + - - - - +
|       |       |
|       |       |
|       |       |
|       |       |
+ - - - - + - - - - +
|       |       |
|       |       |
|       |       |
|       |       |
+ - - - - + - - - - +
```

3. Write a function that draws a Pyramid with # symbols

```
          #
        # # #
      # # # # #
    # # # # # # #
          .
          .
          .
```

Up to 15 hashes at the bottom

4. The letters of the alphabet can be constructed from a moderate number of basic elemlents, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.

5. The time module provides a function, also named time that returns the current Greenwich Mean Time in “the epoch”, which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January 1970.

```
>>> import time
>>>time.time()
1437746094.5735958
```

Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.

6. Given n+r+1 <= 2^r .n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.

7. Write a program that evaluates Ackermann function

8. The mathematician SrinivasaRamanujan found an infinite series that can be used to generate a numerical approximation of 1/ **π** :

9. Write a function called estimate_pi that uses this formula to compute and return an estimate of **π.**

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

It should use a while loop to compute terms of the summation until the last term is smaller than 1e-15 (which is Python notation for 10^{-15}). You can check the result by comparing it to math.pi.

10. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.

11. Given a text of characters. Write a program which counts number of vowels, consonants and special characters.

12. Given a word which is a string of characters. Given an integer say 'n'. Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.

13. Write program which performs the following operations on list's. Don't use built-in functions

    a) Updating elements of a list

    b) Concatenation of list's

    c) Check for member in the list

    d) Insert into the list

    e) Sum the elements of the list

    f) Push and pop element of list

    g) Sorting of list

h) Finding biggest and smallest elements in the list

i) Finding common elements in the list

14. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
15. Write a program that takes a string and prints the letters in decreasing order of frequency.
16. Write a program that reads a word list from a file (see Section 9.1) and prints all the sets of words that are anagrams.

    Here is an example of what the output might look like:

    ['deltas', 'desalt', 'lasted', 'salted', 'slated', 'staled']

    ['retainers', 'ternaries'] ['generating', 'greatening']

    ['resmelts', 'smelters', 'termless']
17. Consider all the files on your PC. Write a program which checks for duplicate files in

    your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
18. Write a program illustrating the object oriented features supported by Python.
19. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
20. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)

Reference Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rd edition, Available at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016
3. DainelY.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

II B.TECH – II SEMESTER(R-19)

SubjectCode	TitleoftheSubject	L	T	P	C
19A10804	**Environmental Science**	3	0	0	3

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

UNIT – I:

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.

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

UNIT – II:

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

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

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

UNIT – III:

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

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

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

UNIT – IV:

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

UNIT – V:

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health –

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

TEXT BOOKS :

(1) Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
(2) Environmental Studies by Palani Swamy – Pearson education
(3) Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

REFERENCES :

(1) Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications.
(2) Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
(3) Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.
(4) Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
(5) A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Pubilishing House
(6) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

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ELECTRICAL AND ELECTRONICS ENGINEERING

III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A50201	**MICROPROCESSORS AND MICROCONTROLLERS**	3	0	0	3

Course Objectives:

1. Architecture and designing of 8086 Microprocessor with Assembling language programming 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 and interfacing with various modules
4. To know about Assembly Language Programs for the Digital Signal Processors and usage of Interrupts
5. To understand Xilinx programming and understanding of Spartan FPGA board

Course Outcomes:

CO1 Understand the concepts of internal architecture, organization and Pin diagram of 8086,Functional block diagram of 8051 microcontroller, Basic architectural features, Physical memory of TMS320LF2407 DSP Controller, Xilinx, XC3000 and 4000 Series, Configurable Logic Blocks (CLB) , Input /Output Block (IOB) ,Programmable Interconnect Point (PIP), Spartan 3E and Virtex II pro FPGA boards**.**

CO2 Apply knowledge of various addressing modes and instruction set to write simple programs, data transfer instructions of the 8086 microprocessor and 8051 microcontroller, Xilinx 4000 Series.

CO3 Analyze the concepts of Minimum and Maximum mode of operation with Timing diagrams of 8086 microprocessor, Addressing modes and assembler directives of 8086,data transfer information through serial & parallel ports, properties of Microprocessors & Microcontrollers, DSP controllers.

CO4 Design and Develop simple programming exercises of 8086 microprocessor, 8051 microcontroller interfacing with other devices and its applications, FPGA based Xilinx-HDL Programming.

Mapping between Course Outcomes and Programme Outcomes:

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

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.

Learning Outcomes:

- To know about 8086 as one of digital computer 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 modes of 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 computer 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 computer 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 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 TMS320LF2407 DSP 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 –overview of Spartan 3E and Virtex II pro FPGA boards- case study.

Learning Outcomes:

- To know about FPGA as one of the digital computer 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 with 8085, 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 J Ayala, 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.

Web Sources: https://nptel.ac.in/courses/108/105/108105102/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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ELECTRICAL AND ELECTRONICS ENGINEERING
III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A50202	**ELECTRICAL & ELECTRONIC MEASUREMENTS**	3	0	0	3

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.

Course Outcomes:

CO1 Remember and understand the various working principles of instruments and equipments used for the measurement of various parameters like Voltage, Current, Power, Energy, P.F, Resistance, Inductance and Capacitance.

CO2 Apply the concepts to Extend the range of ammeters and voltmeters, measurement of various parameter by DC and AC bridge and different characteristics of periodic and aperiodic signals using CRO.

CO3 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.

CO4 Design and development of various voltage and current measuring meters and the varieties of issues coming up in the field of electrical measurements.

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

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 Problems

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
5. Identify errors in measurements and to mitigate them for desired precision and accuracy

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:

1. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpatRai& 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.

Web Sources: https://nptel.ac.in/courses/108/105/108105153/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year B.Tech I-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A50203	**ANALOG ELECTRONICS CIRCUITS**	2	0	0	2

Course Objectives:

1 To give understanding of various types of amplifier circuits such as large signal and tuned amplifiers.
2 To familiarize the concept of feedback in amplifiers so as to differentiate between negative and positive feedback.
3 To explain clippers, clampers, switching characteristics of transistors.
4 To construct various multivibrators using transistors.

Course Outcomes:

Upon completion of the course, the students will be able to:
CO1 Design and realize different classes of power amplifiers and tuned amplifiers useable for audio and radio applications.
CO2 Utilize the concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.
CO3 Understand the applications of diode as integrator, differentiator, clippers, clampler circuits..
CO4 Understand switching characteristics of diodes and transistors.
CO5 Design mutivibrator circuits for various applications.

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

UNIT –I: POSITIVE & NEGATIVE FEEDBACK IN AMPLIFIERS Classification of amplifiers, Concepts of feedback – Classification of feedback amplifiers – General characteristics of negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems. Condition for oscillations. RC and LC type Oscillators – Frequency and amplitude stability of oscillators – Generalized analysis of LC oscillators, Quartz, Hartley, and Colpitts Oscillators – RC-phase shift and Wien-bridge oscillators.

Learning Outcomes:

- Knowledge about Classification of feedback amplifiers and characteristics of negative feedback amplifiers
- Understand the RC and LC type Oscillators and Generalized analysis of LC oscillators

UNIT – II: LARGE SIGNAL AMPLIFIERS Class A Power Amplifier, Maximum Value of Efficiency of Class – A Amplifier, Transformer Coupled Amplifier, Push Pull and Complimentary Symmetry Class B and Class AB Power Amplifiers – Principle of operation of class –C Amplifier, Transistor Power Dissipation, Heat Sinks.

Learning Outcomes:

- Knowledge about Class A Power Amplifier, Class B and Class AB Power Amplifiers
- Analyze thePush Pull and Complimentary Symmetry Class B and Class AB Power Amplifiers and class – c Amplifier.

UNIT – III: TUNED AMPLIFIERS Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading single Tuned amplifiers on Bandwidth, Effect of Cascading Double Tuned amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned amplifiers.

Learning Outcomes:

- Knowledge about Small Signal Tuned Amplifiers
- Analyze the Effect of Cascading single Tuned amplifiers on Bandwidth

UNIT – IV

Linear Wave Shaping: High pass and low pass RC circuits and their response for Sinusoidal, Step, Pulse, Square, & Ramp inputs, High pass RC network as Differentiator, Low pass RC circuit as an Integrator. Non-Linear Wave Shaping: Diode clippers, Transistor clippers, Clipping at two independent levels. Clamping Operation, Clamping circuit taking Source and Diode resistances into account, Clamping Circuit Theorem, Practical Clamping Circuits.

Learning Outcomes:

- Knowledge about High pass and low pass RC circuits
- Analyze the Diode clippers, Transistor clippers, Clamping Operation

UNIT- V: Switching Characteristics of Devices: Diode as a Switch, Piecewise Linear Diode Characteristics, Diode Switching times, Transistor as a Switch, Break down voltages, Transistor in Saturation, Temperature variation of Saturation Parameters, Transistor-switching times. Multivibrators: Analysis and Design of Bistable, Monostable, AstableMultivibrators and Schmitt trigger using Transistors.

Learning Outcomes:

- Knowledge about Switching Characteristics of Devices
- Analyze theDesign of Bistable, Monostable, AstableMultivibrators and Schmitt trigger using Transistors.

TEXT BOOKS:

1. Electronic Devices and Circuits, David A. Bell – 5 thEdition, Oxford.
2. Millman‟s Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. PrakashRao, 2 Ed., 2008, TMH.

REFERENCES:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, TMH
2. Introductory Electronic Devices and Circuits (Conventional flow version) – Robert T. Paynter, 7th Edition, 2009, PEI.
3. Microelectronic Circuits – Sedra / Smith – 5 th Edition – Oxford, 2009
4. Electronic Devices and Circuit Theory, Robert L.Boylestad, Louis Nashelsky, 9th Edition, Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year B.Tech I-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A50204	**ELECTRICAL DISTRIBUTION SYSTEM ANALYSIS & AUTOMATION (PEC-I)**	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

Course Outcomes:

- To know and understand the basics of distribution systems and substations principles of SCADA, Automation distribution system and management
- understand To understand about modelling of various loads
- To perform distribution load flow solutions
- To evaluate power loss and feeder cost

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

UNIT-I: DISTRIBUTION SYSTEM FUNDAMENTALS

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 effecting the primary feeder loading.

Learning Outcomes:

- To understand various distribution system classifications
- To know more about primary feeders rating, types
- To know about substation location, bus schemes, etc.
- To know about factors effecting the primary feeder loading

UNIT-II: DISTRIBUTION SYSTEM SUBSTATIONS AND LOADS

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation service area, K constant, Radial feeder with uniformly and non-uniformly distributed loading. **Loads:** Various types of loads, Definitions of various terms related to system loading, detailed description of distribution transformer loading, feeder loading, Modelling of star and delta connected loads, two-phase and single-phase loads, shunt capacitors.

Learning Outcomes:

- To know about uniformly distributed loading in distribution substations
- To know about non-uniform distributed loading in distribution substations
- To know about classification of various types of loading
- To understand about modelling of various types of loads and shunt capacitor

UNIT-III: DISTRIBUTION SYSTEM LOAD FLOW

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:

- To know about various distribution line models
- To know about step voltage regulator
- To know about line drop compensator
- To evaluate distribution load flow pattern using sweeping algorithms

UNIT-IV: VOLTAGE DROP AND POWER LOSS CALCULATION

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:

- To know about analysis of various distribution system configurations
- To know how to calculate percent power loss calculations
- To know about methods of calculating distribution feeder cost
- To understand about economic justification of capacitors
- To understand about installation of capacitors at various locations

UNIT-V: DISTRIBUTION AUTOMATION

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:

- To know about basic concept of automation of distribution systems
- To know about various distribution management /automation systems and functions
- To know about Supervisory Control And Data Acquisition System
- To know about automation of feeders, substations, etc.
- To understand about database structures and interfacing

Text Books:

1. Distribution System Modelling and Analysis, William H. Kersting, CRC Press, Newyork, 2002.
2. Electric Power Distribution System Engineering, Turan Gonen, 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.

Web Sources: https://nptel.ac.in/courses/108/107/108107112/

Course Outcomes:

- To understand basics of distribution systems and substations
- To understand about modelling of various loads
- To perform distribution load flow solutions
- To evaluate power loss and feeder cost
- To know the principles of SCADA, Automation distribution system and management

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ELECTRICAL AND ELECTRONICS ENGINEERING

III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A50205	**DC Drives (PEC-I)**	3	0	0	3

Course Objectives: To get the student exposed to:

1 Understand the basic concepts of DC Motor fundamentals, mechanical systems.

2 Understand the concept of converter control

3 Design various chopper control techniques.

4 Understand the concept of closed loop control of DC Drives

5 Design digital control of DC Drives.

Course Outcomes: Student should be able

CO1 Understand the basics of high speed DC Motor Drives.
CO2 Understand the various characteristics of mechanical systems
CO3 To analyze different modes of operation of converters and control strategies
CO4 To understand basics of Chopper control and analysis
CO5 To know about closed loop and digital control strategies of DC drives

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

UNIT-I: DC MOTORS FUNDAMENTALS AND MECHANICAL SYSTEMS: Introduction to high speed drives and modern drives. Characteristics of mechanical system – dynamic equations, components of torque, types of load;

Learning Outcomes:

- To understand the basic concepts of high speed drives
- To understand the basic concepts of modern drives
- To understand the basic concepts of mechanical systems
- To understand the basic concepts of types of loads and characteristics

UNIT-II: CONVERTER CONTROL: Principle of phase control – Fundamental relations; Analysis of series and separately excited DC motor with single-phase and three-phase converters – waveforms

performance parameters, performance characteristics. Continuous and discontinuous armature current operations; Current ripple and its effect on performance; Operation with freewheeling diode; Implementation of braking schemes; Drive employing dual converter.

Learning Outcomes:

- Understand the concept of phase control of separately excited DC motor.
- Understand the concept of breaking mechanisms of DC motor.
- Understand the performance characteristics of 1-phase and 3-phase converters
- To distinguish between various modes of operation

UNIT-III : CHOPPER CONTROL: Introduction to time ratio control and frequency modulation; Class A,B, C, D and E chopper controlled DC motor – performance analysis, multi-quadrant control – Chopper based implementation of braking schemes; Multi-phase chopper; Related problems.

Learning Outcomes:

- Understand the concept of Chopper Control
- Design of Chopper.

UNIT-IV: CLOSED LOOP CONTROL: Modelling of drive elements – Equivalent circuit, transfer function of self, separately excited DC motors; Linear Transfer function model of power converters; Sensing and feedback elements - Closed loop speed control – current and speed loops, P, PI and PID controllers – response comparison. Simulation of converter and chopper fed DC drive.

Learning Outcomes:

- Understand Equivalent circuit, transfer function of self, separately excited DC motor.
- Designing of current and speed loops, P, PI and PID controllers.

UNIT-V: DIGITAL CONTROL OF D.C DRIVE: Phase Locked Loop and micro-computer control of DC drives – Program flow chart for constant horse power and load disturbed operations; Speed detection and gate firing.

Learning Outcomes:

- Understand the concept of PLL and micro controlled DC drives.
- Design of Speed detection and gate firing.

TEXT BOOKS

1. Gopal K Dubey, Power Semiconductor controlled Drives, Prentice Hall Inc., New Jersey, 1989.
2. R. Krishnan, Electric Motor Drives –Modeling, Analysis and Control, Prentice-Hallof India Pvt. Ltd., New Delhi, 2003.

REFERENCES

1. Gobal K.Dubey, Fundamentals of Electrical Drives, Narosal Publishing House, New Delhi, 2001.
2. Bimal K. Bose, Modern Power Electronics and AC Drives, Pearson Education Pvt. Ltd., NewDelhi, 2003.
3. VedamSubramanyam, Electric Drives – Concepts and Applications, Tata McGraw-Hill publishing company Ltd., New Delhi, 2002.
4. P.C Sen, Thyristor DC Drives, John wiely and sons, New York, 1981
5. Power Electronics By M. D. Singh and K.B. Khanchandani, 2nd Edition, Tata McGraw Hill, 2008.

Web Sources:

1. https://nptel.ac.in/courses/108/104/108104140/
2. https://nptel.ac.in/courses/108/108/108108077/

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COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year B.Tech I-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A50206	**Advanced Control Systems (PEC-I)**	3	0	0	3

Course Objectives: This course introduces

- 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.

Course Outcomes:

1. To understand and develop models for full order and reduced order based observers, phase plane analysis of non-linear control systems basic principles of optimal control and solving discrete and continuous linear state regulator systems
2. To understand and develop models for Lyapunov's stability criterion
3. To know about describing function and analyse systems
4. To develop state variable models and its solution for various systems t understand

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

UNIT – I STATE VARIABLE DISCRIPTION

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 Modeling 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.

UNIT – II POLE PLACEMENT OBSERVER

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 the unit the student will be able to:

- To know about design of pole assignment
- To know about state observer using state feedback
- To know about full order based controller design aspects
- To know about reduced order design aspects

UNIT – III DESCRIBING FUNCTION AND PHASE-PLANE ANALYSIS

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 phase-plane analysis, Method of Isoclines for Constructing Trajectories, Singular points, Phase-plane analysis of nonlinear control systems – Numerical problems

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

- Develop the describing function for the nonlinearity present to assess the stability of the system
- To understand about classification of describing functions
- To understand about construction of trajectories
- To know about Phase plane analysis of non-linear control systems

UNIT-IV STABILITY ANALYSIS

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 the unit the student will be able to:

- To understand about Lyapunov stability
- Develop Lyapunov function for the stability analysis of nonlinear systems
- To understand Lyapunov instability theorems
- To understand and solve direct method of Lyapunov with numerical examples

UNIT –V OPTIMAL CONTROL

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 the unit the student will be able to get exposed to:

- Introduction to optimal control
- To know about discrete and continuous time linear state regulators
- To understand about Matrix Riccati equation
- To solve numerical problems using the above methods

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Digital Control and State Variable Methods by M. Gopal, Tata Mc Graw-Hill, 1997.
2. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell, 6th Edition, Pearson, 2010.
3. Systems and Control by Stainslaw H. Zak , Oxford Press, 2003
4. Control Systems, by N. K. Sinha, New Age International, 3rd Edition, 2005**.**
5. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E.Salgado, Pearson, 2000
6. Feedback Control System Analysis and Synthesis (Electrical & Electronics Engineering), by D'Azzo, Jhon J, Second revised edition, Mc Graw-Hill.

Web Sources: https://nptel.ac.in/courses/108/103/108103007/

Course Outcomes:

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

To understand basic principles of optimal control and solving discrete and continuous linear state regulator systems

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III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A50207	**ENERGY STORAGE SYSTEMS (OEC-I)**	3	0	0	3

Course Objectives:

1. To understand the need for energy storage
2. To understand about the fundamentals of ESS
3. To know about types, features and benefits of ESS
4. To know about various management and control including market potential of ESS
5. To study about various applications of ESS

Course Outcomes:

1. To get exposed to latest technology of ESS
2. To understand the Principle, features and benefits of ESS
3. To understand about marketing and management strategies of ESS in working environment in future
4. To distinguish wide variety of applications of EES for practical applications
5. To know about latest technology applications of Battery SCADA, which is going to be vital in future applications, trend in new and renewable energy sources

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

UNIT – I: Fundamentals of ESS

Definitions, Characteristics of ESS, Electricity and roles of ESSs, Emerging needs in ESS, Classification of ESSs, Roles of Electrical storage technologies

Learning Outcomes:

- To know about the fundamentals of ESS
- To know about emerging needs and roles of ESS
- To know about various classifications of ESS
- To understand about roles of energy storage technologies

UNIT – II: Types and features of ESS Technologies

Mechanical storage systems, Electromechanical storage systems, Chemical energy storage, Electrical storage systems, Thermal storage systems, standards for EES, Comparison of ESS technology storage systems, Power and discharge duration, Energy and power density, Storage operating cost, Power quality, Reactive power capability

Learning Outcomes:

- To understand about various types of ESS technologies
- To understand about standards for ESS
- To learn about power and discharge duration of ESS
- To know about preliminaries of ESS operating cost
- To understand about power quality issues and reactive power capability of ESS

UNIT – III: Storage Benefits

Definitions, Applications, specifications, benefits, Electric energy time shift, Electric supply capacity, reserve capacity, voltage support, Electric service power quality and reliability, Incidental benefits, energy losses, access charges, Risk, dynamic operating benefits, p.f. correction, reduced air emissions, flexibility, energy benefits

Learning Outcomes:

- To know various storage benefits
- To distinguish between application specific benefits and identical benefits
- To know about dynamic operating benefits
- To understand about electric service power quality and reliability issues
- To learn about energy benefits from storage systems

UNIT – IV: EES Market and Management

Utility and Consumer use, Measurement and Control hierarchy, Internal configurations, External connections, Battery SCADA, Market potential, estimation, role of aggregators, Maximum market potential estimates, Demand change management, Time-of-use energy cost management, storage modularity

Learning Outcomes:

- To understand about management of ESS technologies
- To distinguish between internal and external configuration of ESS
- To know about battery SCADA system and storage modularity
- To understand about market potential estimations
- To distinguish between demand change and time-of-use energy cost management

UNIT – V: Applications of EES

Power Vs Energy, Capacity Vs energy applications, specific power and discharge durations, Electric supply applications, ancillary service applications, End user/utility customer applications, Distributed energy storage applications, Locational, Non-locational and incidental applications

Learning Outcomes:

- To know about various ESS
- To distinguish between power, capacity, energy applications of ESS

- To distinguish between electric supply and ancillary applications
- To distinguish between end user/utility customer applications
- To understand about the importance of distributed energy storage applications

Text Books:

1. James M. Eyer, Joseph J. Iannucci and Garth P. Corey, "Energy Storage Benefits and Market Analysis", Sandia National Laboratories, 2004.
2. The Electrical Energy Storage by IEC Market Strategy Board – White paper.

Reference Book:

1. Jim Eyer, Garth Corey, Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

Web Courses: https://nptel.ac.in/content/storage2/courses/108103009/download/M9.pdf

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ELECTRICAL AND ELECTRONICS ENGINEERING

III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A50208	**ELECTRICAL ENGINEERING MATERIALS (OEC-I)**	3	0	0	3

Course Objectives: To make the students learn about

1. Classification of materials.
2. Properties of materials and its applications.
3. Domestic wiring and earthing

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

CO1 Understand the classification of materials, domestic wiring materials and earthing.
CO2 Analyze the properties of different electrical materials
CO3 Apply where the materials are applicable based on properties of materials
CO4 Design and develop Residential wiring, godown wiring and earthing.

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

UNIT-I Conducting Materials

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, aluminium, iron, steel, lead, tin and their alloys – applications.

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

1. Uunderstand the classification of conducting materials.
2. Analyze the properties of different conducting materials
3. Apply the materials where it is applicable
4. Know about electron configuration of atom

UNIT-II Dielectric and High Resistivity Materials

Introduction – solid, liquid and gaseous dielectrics, leakage current, permittivity, dielectric constant, dielectric loss – loss angle – loss constant, Breakdown voltage and dielectric 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 the unit, the student will be able to
1. Understand the classification of dielectric and high resistivity materials.
2. Analyze the properties of dielectric and high resistivity materials
3. Understand about concept of polarization and dipolar polarization
4. Apply the materials where it is applicable

UNIT-III Solid Insulating Materials

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, thermo plastics. Resins, polystyrene, PVC, porcelain, glass, cotton and paper.

Learning Outcomes: At the end of the unit, the student will be able to
1. Understand about various characteristics of solid insulating materials
2. Understand the classification of solid insulating materials.
3. Analyze the properties of solid insulating materials
4. Apply the materials where it is applicable

UNIT-IV Liquid & Gas Insulating Materials

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 the unit, the student will be able to
1. Understand the classification of liquid insulating materials.
2. Analyze the properties of liquid insulating materials
3. Apply the materials where it is applicable
4. Understand about properties and classification of gaseous insulators

UNIT-V Domestic Wiring

Wiring materials and accessories – Types of wiring – Types of Switches - Specification of Wiring – Stair case wiring - Fluorescent lamp wiring- Godown wiring – Basics of Earthing – single phase wiring layout for a residential building.

Learning Outcomes: At the end of the unit, the student will be able to
1. Understand about wiring materials and accessories
2. Understand about earthing and wiring layout of domestic buildings
3. Design and develop Residential wiring
4. Know about go down wiring

Text Books:
1. Electrical Engineering Materials by G.K. Mithal, Khanna publishers, 2nd edition, 1991.
2. A course 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,

S Chand & 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.

Web Courses: https://nptel.ac.in/courses/113/106/113106032/

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III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A50209	**Illumination Technology (OEC-I)**	3	0	0	3

Course Objectives

- To provide an introduction to the fundamentals of illumination engineering and architectural lighting design.
- To impart lighting fundamentals, measurement, and technology and their application in the analysis and design of architectural lighting systems

Course Outcomes:

The students will be able to:

- Identify the criteria for the selection of lamps and lighting systems for an indoor or outdoor space
- Perform calculations on photometric performance of light sources and luminaires for lighting design
- Evaluate different types of lighting designs and applications

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

Unit I

Introduction of Light : Types of illumination, Day lighting, Supplementary artificial lighting and total lighting, Quality of good lighting, Factors affecting the lighting-shadow, glare, reflection, Colour rendering and stroboscopic effect, Methods of artificial lighting, Lighting systems-direct, indirect, semi direct, semiindirect, Lighting scheme, General and localized

Learning Outcomes:

- To classify types of illumination
- To understand the factors affecting the lightning and methods of lightning

Unit II

Measurement of Light : Definition of luminous flux, Luminous intensity, Lumen, Candle power, Illumination, M.H.C.P, M.S.C.P, M.H.S.C.P, Lamp efficiency, Brightness or luminance, Laws of illumination, Inverse square law and Lambert's Cosine law, Illumination at horizontal and vertical plane from point source, Concept of polar curve, Calculation of luminance and illumination in case of linear source, round source and flat source

Learning Outcomes:

- To understand the definitions of illumination, concepts of polar curves
- To calculate luminance and illumination at different cases

Unit III

Design of Interior Lighting : Definitions of maintenance factor, Uniformity ratio, Direct ratio, Coefficients of utilization and factors affecting it, Illumination required for various work planes, Space to mounting height ratio, Types of fixtures and relative terms used for interior illumination such as DLOR and ULOR, Selection of lamp and luminance, Selection of utilization factor, reflection factor and maintenance factor, Determination of Lamp Lumen output taking into account voltage and temperature variations, Calculation of wattage of each lamp and no of lamps needed, Layout of lamp luminaire, Calculation of space to mounting height ratio, Indian standard recommendation and standard practices for illumination levels in various areas, Special feature for entrance, staircase, Corridor lighting and industrial building.

Learning Outcomes:

- To understand definitions of different factors related to illumination and special features for entrance staircase and industrial building
- To remember Indian standards recommendation and standard practices for illumination levels in various areas
- To evaluate wattage of each lamp, space to mounting height ratio for interior lightning

Unit IV

Design of Outdoor Lighting: Street Lighting: Types of street and their level of illumination required, Terms related to street and street lighting, Types of fixtures used and their suitable application, Various arrangements in street lighting, Requirements of good street lighting, Selection of lamp and luminaire, Calculation of their wattage, Number and arrangement, Calculation of space to mounting height ratio, Calculation of illumination level available onroad

Learning Outcomes:

- To understand the requirements of good lighting and selection of lamp
- To design outdoor lighting
- To calculate wattage, number and space to mounting height ratio for outdoor lightning

Unit V

Design of Outdoor Lighting: Flood Lighting : Terms related to flood lighting, Types of fixtures and their suitable applications, Selection of lamp and projector, Calculation of their wattage and number and their arrangement, Calculation of space to mounting height ratio, Recommended method for aiming of lamp.

Learning Outcomes:

- To analyze and design outdoor lighting and terms related to different outdoor lightings

Text Books

1. D.C. Pritchard Lighting, Routledge, 2016
2. Jack L. Lindsey, Applied Illumination Engineering , PHI, 1991
3. John Matthews Introduction to the Design and Analysis of Building Electrical Systems, Springer, 1993
4. M.A. Cayless, Lamps and Lighting , Routledge, 1996

References:

1. IS CODE 3646
2. IS CODE 6665

Web Sources: https://nptel.ac.in/courses/108/105/108105061/

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****** DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES ******
IIIB.TECH – I SEMESTER(EEE)

Subject Code	Title of the Subject	L	T	P	C
19A55501	English Language Skills	3	0	0	3

Course Description:

English Language Skills aims to enable the engineering students to meet the demands of the modern job market through thorough training in LSRW skills, presentation skills, interview skills, academic writing etc. Students of our region have knowledge of their respective subjects, but the surveys make it clear that they are lagging behind in expressing themselves effectively in a professional setting. So this course will enable them to hone these skills and excel in their respective fields.

COURSE OBJECTIVES	
1	To develop awareness in students of the relevance and importance of technical communication and presentation skills.
2	To prepare the students for placements
3	To sensitize the students to the appropriate use of non-verbal communication
4	To train students to use language appropriately for presentations and interviews
5	To enhance the documentation skills of the students with emphasis on formal and informal writing

COURSE OUTCOMES	
CO1	To recall and memorize the basic concepts of effective communication
CO2	To understand the various components of effective communication.
CO3	To apply writing skills in order to meet the demands of work place environment.
CO4	To analyze verbal and non-verbal interpretations in multicultural context.
CO5	To evaluate different aspects of verbal and linguistic competence to become effective presenters.
CO6	To design and develop an effective written documents in technical domain.

Mapping between Course Outcomes and Programme Outcomes

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

SYLLABUS

UNIT 1: LSRW SKILLS

Introduction to LSRW Skills – Definition – Importance of LSRW Skills - Advantages and Disadvantages of Oral and Written Skills – Advantages and disadvantages of Written & Speaking skills - Barriers to effective communication

OUTCOMES
To recall and memorize the basic concepts of LSRW skills
To understand the various components of oral and written skills
To apply English language skills to avoid barriers to effective communication

UNIT II: VERBAL & NON-VERBAL SKILLS

Informal and Formal Conversation - Non-verbal Skills–Kinesics, Proxemics, Chronemics, Haptics, Oculesics ,Paralinguistic features – Body language for interviews

To understand the basic components of non-verbal communication.
To apply the knowledge of the difference between informal and formal conversation in order to meet the demands of work place environment.
To analyze non-verbal interpretations in multicultural context.

UNIT III: ACADEMIC WRITING SKILLS

Writing Skills–Art of condensation- summarizing and paraphrasing - Abstract Writing, Synopsis Writing – Formal Letter Writing - Report Writing

To understand the basic components of written communication.
To apply knowledge of different formats of written communication needed in work place environment.
To analyze the structure of letters, reports etc.

UNIT IV: CREATIVE WRITING SKILLS

Film Review Writing – Creative Writing- Short Story Writing – Speeches for academic settings – Writing Skits – Script for Short Films/Web Series

To apply writing skills in creative writing to meet the demands of documentation in professional life
To analyze different figures of speech in creative writing
To evaluate different aspects creative and academic writing to become effective at written communication

UNIT V: PROFESSIONAL SPEAKING SKILLS

Job Interviews –Types of Job Interviews – Characteristics of a job interview - Interview Preparation Techniques –How to overcome Stage fright
Group Discussions(GD): Importance of Group Discussion- Characteristics of a GD - GD as a tool for selection – GD Strategies – Do's & Don't of GD - GD Vs Debates

To analyze the different aspects of interviews and group discussions
To evaluate the group dynamics to excel in group discussions
To design and develop strategies to answer effectively in interviews

Text Books:

1. **Effective Technical Communication,** Ashrif Rizvi, TataMcGrahill, 2011
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma,3rd Edition, O U Press 2015

References:

1.Communication Skills by Pushpalatha& Sanjay Kumar, Oxford Univsesity Press

2.Books on **TOEFL/GRE/GMAT/CAT/IELTS** by Barron's/DELTA/Cambridge University Press.2012.

3. Soft Skills for Everyone, Butterfield Jeff, Cengage Publications, 2011.

4. Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.

5. Successful Presentations by John Hughes & Andrew Mallett, Oxford.

6. Winning at Interviews by Edgar Thorpe and Showick Thorpe, Pearson

7. Winning Resumes and Successful Interviews by Munish Bhargava, Mc Graw Hill

WEB LINKS

1. **https://blog.allaboutlearningpress.com/listening-comprehension/**
2. **https://www.englishclub.com/**
3. **https://www.helpguide.org/articles/relationships-communication/nonverbal-communication.htm**
4. **https://www.slideshare.net/poojavrs/lsrw-109040479**
5. https://www.slideshare.net/nandapalit/non-verbal-verbal-communication
6. https://www.slideshare.net/madeehasaeed96/writing-skills-71430610
7. https://www.slideshare.net/rhinautan/creative-writing-76208225
8. https://www.slideshare.net/vikkerkar/interview-skills-presentation
9. https://www.slideshare.net/ritikadhameja/group-discussion-46255658

Method of Evaluation:

The distribution shall be 40 marks for Internal Evaluation and 60 marks for the External Evaluation. Each Internal examination shall consist of an objective test for 10 marks and a subjective test for 20 marks with duration of 20 and 90 minutes respectively. In addition to that 10 marks will be awarded for assignment.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A50210	**AC MACHINES LAB**	3	0	0	3

COURSE OUTCOMES:

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

CO1 Analyze and apply load test, no-load and blocked-rotor tests for construction of circle diagram and equivalent circuit determination in a single phase induction motor.
CO2 Predetermine regulation of a three-phase alternator by synchronous impedance & m.m.f methods.
CO3 Predetermine the regulation of Alternator by Zero Power Factor method
CO4 X_d and X_q determination of salient pole synchronous machine.
CO5 Evaluate and analyze V and inverted V curves of 3 phase synchronous motor

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

From 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 starter 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 X_d and X_q of a salient pole synchronous machine.
10. V and inverted V curves of a 3-phase synchronous motor.

Reference Books:

1. Laboratory Manual for Electrical Machines by D. P.Kothari and B. S. Umre, I.K International Publishing House Pvt. Ltd, 2017.
2. A Laboratory Course in Electrical Machines by D.R. Kohli and S.K. Jain, NEM Chand & Bros.

Virtual Labs:

- **http://vem-iitg.vlabs.ac.in/**
- http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical Engineering
- http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Sadhya/experimentlist.html

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COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
****** DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES ******
III B. TECH – I/II SEMESTER(R-19)

Subject Code	Title of the Lab	L	T	P	C
19A55402	English Language Skills Lab	-	-	3	1.5

Course Description:

English Language Skills Lab aims to enable the engineering students to meet the demands of the modern job market through group activities, individual presentations, mock interviews and group discussions. Students of our region have knowledge of their respective subjects, but the surveys make it clear that they are lagging behind in expressing themselves effectively in a professional setting. So, this course will enable them to hone these skills and excel in their respective fields.

COURSE OBJECTIVES	
1	To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
2	Further, they would be required to communicate their ideas relevantly and coherently in writing.
3	To prepare all the students for their placements.
4	To initiate them into greater use of the computer in resume preparation, report writing, format making etc.
5	To train them to use language effectively to face interviews, group discussions, public speaking.

COURSE OUTCOMES	
CO1	To recall and memorize tips to communicate effectively
CO2	To understand various listening components that includes listening comprehension of gist and detailed information.
CO3	To apply extensive and intensive reading methods for specific reading and

	voracious reading of vast material.
CO4	To analyze differentdescriptive and technical writing material.
CO5	To evaluate and develop, academic research paper with appropriate citations, quotations, and references when needed.
CO6	To develop communicative competency and make the students job ready

Mapping between Course Outcomes and Programme Outcomes

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

UNIT-I: COMMUNICATIVE COMPETENCY

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary for competitive purpose

OUTCOMES
To recall and memorize the basic concepts of reading and listening skills
To understand the various components to build up vocabulary
To apply English language skills to avoid barriers to effective reading and listening

UNIT-II: TECHNICAL WRITING

1. Email Writing
2. CV/Resume Writing
3. Mini Project Writing

To understand the basic components of writing Emails
To apply the knowledge of writing eye catching resumes
To analyze different ways of writing a mini project

UNIT-III: ORAL PRESENTATION SKILLS

1. Self-Introduction – Introducing Others – Welcome Speech – Vote of Thanks
2. Oral Presentation-Individual/Impromptu Speeches/ JAM
3. Stage Dynamics– Barriers to Effective Presentation

To understand the basic components of speeches
To apply knowledge of different forms of presentation.
To analyze stage dynamics for effective presentation

UNIT-IV: TECHNICAL PRESENTATION SKILLS

1. Information Transfer
2. PPT Presentation
3. Poster Presentation

To apply knowledge of different types of pictograms to transfer the information
To analyze the techniques of preparing PPTs
To evaluate different skills in poster presentation

UNIT-V: PROFESSIONAL SKILLS

1. Group discussions-II
2. Interview skills
3. Answering Strategies

To analyze the different aspects of interviews and group discussions

To evaluate the group dynamics to excel in group discussions
To design and develop strategies to answer effectively in interviews

MINIMUM REQUIREMENT FOR ELCS LAB:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

SUGGESTED SOFTWARE:

1. Orell: Language Lab Software
2. Clarity Pronunciation Power – Part I (Sky Pronunciation)
3. Clarity Pronunciation Power – part II
4. LES(Learn English Select) by British council
5. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
6. English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
7. Cambridge Advanced Learners' English Dictionary with CD.

The software consisting of the prescribed topics elaborated above should be procured and used.

REFERENCE BOOKS

1. **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
2. **TOEFL &GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
3. **Train2success.com**

1. **Objective English for Competitive Exams**, Hari Mohana Prasad, 4th edition, Tata Mc Graw Hill.
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 2009.
3. Books on **TOEFL/GRE/GMAT/CAT/IELTS** by Barron's/DELTA/Cambridge University Press.2012.
4. **Handbook for Technical Writing** by David A McMurrey& Joanne Buckely CENGAGE Learning 2008.
5. **English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.**
6. **Word Power Made Handy,** Shalini Verma, S Chand Publications, 2011.
7. **Effective Technical Communication,** Ashrif Rizvi, TataMcGrahill, 2011.

WEB LINKS

1. https://www.slideshare.net/ruschellecossid/reading-comprehension-56872438
2. https://www.slideshare.net/FiveEEE/listening-comprehension-40031081
3. https://www.slideshare.net/shrutisalunkhe2/english-for-competitive-exams
4. https://www.slideshare.net/nidhipandey16/email-writing-52942112
5. https://www.slideshare.net/aamirmuhammadaamir77/resume-writing-ppt
6. https://www.powershow.com/view/1d8cf2-OWFhN/Mini_Project_Report_Writing_Workshop_powerpoint_ppt_presentation
7. https://www.slideshare.net/8788902/oral-presentations-28994496
8. https://www.slideshare.net/nandapalit/presentation-skills-33500438
9. https://www.slideshare.net/ritikadhameja/group-discussion-46255658
10. https://www.slideshare.net/vikkerkar/interview-skills-presentation

Method of Evaluation:

English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the Language lab sessions, there shall be a continuous evaluation during the year for 40 sessional marks and 60 year-end Examination marks. Of the 40 marks, 20 marks shall be awarded for day-to-day work and 20 marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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ELECTRICAL AND ELECTRONICS ENGINEERING

III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A50211	**Electronic Circuits Lab**	0	0	3	1.5

Course Objectives

1 To perform the analysis, design, and test of various electronic circuits.

2 Use hardware/software tools to characterize the behavior of circuits.

COURSE OUTCOMES

Students will be able to

CO1 Design, simulate and test diode as a rectifier, clipper and clamper.

CO2 analyze, design, simulate and test the low frequency amplifier circuits using BJT.

CO3 analyze, design, simulate and test the cascade, cascade and darlington amplifier circuits.

CO4 write and prepare a lab report that details design procedures and experimental results.

CO5 work in a team using available resources to design circuits to meet a given specification

Mapping between Course Outcomes and Programme Outcomes:

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

Note: The students are required to design the electronic circuit and they have to perform the analysis through simulator using Multisim/ Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory.

LIST OF EXPERIMENTS:

1. Rectifiers

a. To construct half wave, full wave & bridge rectifiers with and without filters - Calculation of ripple factors.

b. Simulation of rectifiers and trace their output waveforms with and without filters.

2. Clipper & Clamper circuits using diodes

a. To design, construct and observe output of Positive, negative, biased and combinational clippers.

b. To design, construct and observe output of i. Positive, negative and biased clampers.

3. Biasing Circuits

a. To design, construct and test different biasing circuits using BJTs,

b. To simulate the biasing circuits and obtain the Q point

4. RC coupled amplifier

a. To design, construct and obtain frequency response of the circuit

b. To measure signal handling capacity, input and output impedance

c. Compare performance practically and through simulation

5. Emitter follower

a. To design, construct and obtain frequency response of the circuit

b. To measure signal handling capacity, input and output impedance

c. Compare practical and simulated results

6. Cascade Amplifier

a. To design, construct and obtain frequency response of a two stage RC coupled amplifier

b. To measure signal handling capacity, input and output impedance

c. Compare performance practically and through simulation

7. Darlington pair To design, construct and obtain frequency response practically and through simulation

8. Cascode amplifiers To design, construct and obtain frequency response practically and through simulation

Equipment required for Laboratory Software:

i. Multisim/ Pspice/Equivalent Licensed simulation software tool ii. Computer Systems with required specifications Hardware:

1. Regulated Power supplies

2. Analog/Digital Storage Oscilloscopes

3. Analog/Digital Function Generators

4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats, Decade Capacitance Boxes
6. Ammeters (Analog or Digital), Voltmeters (Analog or Digital)
7. Active & Passive Electronic Components
8. Bread Boards
9. Connecting Wires, CRO Probes etc.

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ELECTRICAL AND ELECTRONICS ENGINEERING

Socially Relevant Projects (19A50212)

6. Energy Auditing
7. Solar Water Pumping Systems
8. Automatic Traffic Light Control Systems
9. Building Electrical Safety Measures
10. Electrical Protection Systems in Agricultural Fields

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****** DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES ******
(Mandatory course)

III B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A55404	**CONSTITUTION OF INDIA**	3	0	0	0

COURSE OBJECTIVES : The objective of this course is	
1	To Enable the student to understand the importance of constitution
2	To understand the structure of executive, legislature and judiciary
3	To understand philosophy of fundamental rights and duties
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-state relation in financial and administrative control

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	State the historical background of the constitution making and its importance for building a democratic India.
CO2	Understand the functioning of three wings of the governmentie., executive, legislative and judiciary.
CO3	Demonstrate the value of the fundamental rights and duties for becoming good citizen of India.
CO4	Analyze the decentralization of power between central, state and local self-

	government
CO5	Appraise the knowledge in strengthening of the constitutional institutions like CAG,Election Commission and UPSC for sustaining democracy.
CO6	Develop themselves as responsible citizens and pave way to build a democratic country.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1										3					
CO2											3				
CO3				3											
CO4				3						3	2	2			
CO5									3		3	2			
CO6				3				2		3		2			

Syllabus

UNIT-IIntroduction to Indian Constitution

Constitution -Meaning of the term - Indian Constitution- Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History and features of Indian constitution
- Learn about Preamble, Fundamental Rights and Duties

UNIT-IIUnion Government and its Administration

Structure of the Indian Union- Federalism - Centre-State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat–LokSabha-RajyaSabha - The Supreme Court and High Court - Powers and Functions

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-IIIState Government and its Administration

Structure of the State Govt. -Governor - Role and Position -CM and Council of Ministers - State Secretariat-Organization Structure and Functions

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the structure of state government

- Analyze the role of Governor and Chief Minister
- Explain the role of State Secretariat
- Differentiate between structure and functions of state secretariat

UNIT-IVLocal Administration

District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation PanchayatiRaj - Functions– PRI–ZillaParishath - Elected officials and their roles – CEO, ,ZillaParishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration's role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Learn about the role ofZillaParishath block level organization

UNIT-VElection Commission

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

LEARNING OUTCOMES:-After completion of this unit student will

- Know the role of Election Commission
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze the role of state election commission
- Evaluate various commissions vizSC/ST/OBC and women

TEXT BOOKS

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi

2. SubashKashyap, Indian Constitution, National Book Trust

REFERENCES:

1. J.A. Siwach, Dynamics of Indian Government & Politics,

2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

3. .J.C. Johari, Indian Government andPolitics, Hans India

4. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

E-RESOURCES:

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

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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A60201	**POWER SYSTEM ANALYSIS**	3	0	0	3

Course Objectives:

To make the students learn about:

- The use of per unit values and graph theory concepts, solving a problem using computer.
- Formation of Y_{bus} and Z_{bus} of a Power System network, power flow studies by various methods.
- Different types of faults and power system analysis for symmetrical and also unsymmetrical faults.
- Analysis of power system for steady state and transient stability and also methods to improve stability.

Course Outcomes:

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

- Remember and understand the concepts of per unit values, Y Bus and Z bus formation, load flow studies, symmetrical and unsymmetrical fault calculations.
- Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution and experiment some of these methods using modern tools and examine the results.
- Analyse the symmetrical faults and unsymmetrical faults and done the fault calculations, analyse the stability of the system and improve the stability. Demonstrate the use of these techniques through good communication skills.
- Develop accurate algorithms for different networks and determine load flow studies and zero, positive and negative sequence impedances to find fault calculations.
- Design and select efficient Circuit Breakers to improve system stability. Implement them in resolving various day-to-day issues ina Power System.

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

UNIT -I p. u. system and Y_{bus} formation

Per-Unit representation of Power system elements - Per -Unit equivalent reactance network of a three phase Power System - Graph Theory: Definitions, Bus Incidence Matrix, Y_{Bus} formation by Direct and Singular Transformation Methods, Numerical Problems.

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

1. Understand the concepts of Per-Unit equivalent system
2. To know about basic graph theory concepts as applied to power systems
3. To compute the Bus Incidence matrix
4. To formulate Y_{Bus} matrix using different methods.

UNIT -II Formation of Z_{bus}

Formation of Z_{Bus}: Partial network, Algorithm for the Modification of Z_{Bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses - Modification of Z_{Bus} for the changes in network (Problems)

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

1. Analyze the concept of formation of Z_{Bus}
2. To develop algorithm for modification of Z_{Bus}.
3. Determine the Z_{Bus} matrix
4. To compute modified Z_{Bus} for the changes in network.

UNIT –III Power flow Analysis

Static load flow equations – Load flow solutions using Gauss Seidel Method: Algorithm and Flowchart. Acceleration Factor, Load flow Solution for Simple Power Systems (Max. 3-Buses): Newton Raphson Method in Polar Co-Ordinates Form: Load Flow Solution- Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods

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

1. Understand about Load flow Solution for Simple Power Systems.
2. To determine the Load flow Solution using Gauss Seidel iterative method
3. To determine the Load flow Solution using NR method in polar form
4. To determine solution of DLF and FDLF
5. To know about comparison of various Load flow solutions

UNIT – IV Short Circuit Analysis

Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Symmetrical Component Theory: Positive, Negative and Zero sequence components: Positive, Negative and Zero sequence Networks. Unsymmetrical Fault Analysis: LG, LL, LLG and LLLG faults with and without fault impedance, Numerical Problems.

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

1. Analyze the Calculations of MVA Calculations, Fault levels
2. To understand about Sequence Components.
3. Calculate the fault current using sequence impedances for unsymmetrical faults
4. To determine the fault current for symmetrical faults

UNIT –V Stability Analysis

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Derivation of Swing Equation, Power Angle Curve and Determination of Steady State Stability. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Numerical methods for solution of swing equation - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

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

1. Learn the stability and types of stability
2. Analyze the stability using equal area criterion
3. To understand methods to improve stability
4. Understand and evaluation of fault clearing angle and time

TEXT BOOKS:

1. Computer Methods in Power System Analysis by G.W.Stagg and A.H.El-Abiad, Mc Graw-Hill, 2006.
2. Modern Power system Analysis by I.J.Nagrath & D.P.Kothari, Tata McGraw-Hill Publishing Company, 4th Edition, 2011.

REFERENCE BOOKS:

1. Power System Analysis by Grainger and Stevenson, McGraw Hill, 1994.
2. Power System Analysis by Hadi Saadat, McGraw Hill, 1998.
3. Power System Analysis and Design by B.R.Gupta, S. Chand & Company, 2005.

Web Sources: https://nptel.ac.in/courses/108/105/108105067/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year B.Tech II-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A60202	**DIGITAL SIGNAL PROCESSING**	3	0	0	3

Course Objectives:

1 Understanding the fundamental characteristics of signals and systems.
2 Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling
3 Knowledge of frequency-domain representation and analysis concepts using Fourier Analysis tools, Z-transform
4 Realization of FIR and IIR digital filters

Course Outcomes:

CO1 Compute the z-transform of a sequence, identify its region of convergence, and compute the inverse z-transform by partial fractions.
CO2 Compute the linear and circular convolutions of discrete-time sequences
CO3 Realize various filters and finding solution for various filter designs
CO4 Understanding of different transformation techniques

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

Syllabus:

Unit-1: INTRODUCTION TO DIGITAL SIGNAL PROCESSING

Discrete Time Signals and Sequences, Linear Shift Invariant Systems, Stability and Causality, Linear Constant Coefficient Difference Equations. Frequency Domain Representation of Discrete Time Signals and Systems.

At the end of the unit student will be able to

- Understand the discrete time signals.(L1)
- Study about stability and causality of linear shift invariant systems.(L2)

Unit-2: DISCRETE FOURIER SERIES AND FAST FOURIER TRANSFORMS

Properties of Discrete Fourier Series, DFS Representation of Periodic Sequences, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences Using DFT, Computation of DFT. Relation between Z-Transform and DFS, Fast Fourier Transforms (FFT)-Radix2 Decimation in Time and Decimation in Frequency FFT Algorithms, Inverse FFT and FFT for Composite N.

At the end of the unit student will be able to

- Understand the concept of DFT and its properties.(L1)
- Find N-Point DFT/FFT for a given signal/sequence.(L2)

Unit-3: REALIZATION OF DIGITAL FILTERS

Z-Transforms: Concept, Properties, Region of Convergence, and Applications; Solution of Difference Equations of Digital Filters, Block Diagram Representation of Linear Constant-Coefficient Difference Equations, Basic Structures of IIR Systems, Transposed Forms, Basic Structures of FIR Systems, System Function.

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

- Understands signal block diagram representations of difference equations that realize digital filters(L1)

Unit-4: IIR AND FIR DIGITAL FILTERS

Analog Filter Approximations-Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Design Examples: Analog-Digital Transformations, Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Window Techniques, Frequency Sampling Technique, Comparison of IIR and FIR Filters, Illustrative Problems.

At the end of the unit student will be able to

- Realization of different structures for IIR& FIR filters(L2)
- Design of IIR & FIR filters using different techniques. (L4)
- Compare FIR and IIR filters (L5)

Unit-5: MULTIRATE DIGITAL SIGNAL PROCESSING

Basic Sample Rate Alteration Devices, Multirate Structures for Sampling Rate Converters, Multistage Design of Decimator and Interpolator, Polyphase Decomposition, Nyquist Filters. Spectral Analysis of Nonstationary Signals, Musical Sound Processing, Signal Compression, Trans multiplexers, Discrete Multitone Transmission of Digital Data.

At the end of the unit student will be able to

- Design of IIR & FIR filters using different techniques. (L4)
- Compare FIR and IIR filters (L5)

Text Books:

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 2007.
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd edition, 2009.

Reference Books:

1. Signals - Discrete Time Signal Processing – Allan V Oppenheim and Systems, Pearson
2. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
3. A Text book on Digital Signal processing – R S Kaler, M Kulkarni, Umesh Gupta, I K International Publishing House Pvt. Ltd., 2009

Web Sources: https://nptel.ac.in/courses/108/106/108106151/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A60203	**Power System Protection**	3	0	0	3

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

- The different types of electromagnetic relays and microprocessor based relays
- The protection of Generators
- The protection of Transformers
- The protection of feeders and lines
- The technical aspects involved in the operation of circuit breakers
- Generation of over voltages and protection from them

Course Outcomes: At the end of the course the student should be able to:

- Distinguish between the principles of operation of electromagnetic relays, static relays and microprocessor based relays
- Determine the unprotected percentage of generator winding under fault occurrence, numerical problems for arc interruption and recovery in circuit breakers
- Identify various types of the relays in protecting feeders, lines and bus bars Design the protection system for transformers
- Demonstrate the protection of a power system from over voltages

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

UNIT – I Fuses and Circuit breakers:

Fuses: Definitions, characteristics, types, HRC fuses.

Circuit Breakers: Elementary Principles of Arc Interruption, Restriking Voltage and Recovery Voltage - Restriking Phenomenon, Average and Max. RRRV, Current Chopping and Resistance Switching - CB Ratings and Specifications: Types and Numerical Problems. – Auto Reclosures. Minimum Oil Circuit Breakers, Air Blast Circuit Breakers, Vacuum and SF6 Circuit Breakers.

Learning outcomes:

- To understand the purpose and operation of fuses.
- To understand the occurrence of arc and different types of circuit breakers
- To classify among different types of fuses and circuit breakers
- To do numerical examples for selecting ratings of fuses and CBs

UNIT – II Relays

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.

Learning outcomes:

- To understand the operation of different types of relays
- To analyze the importance of zones of protection
- To be able to classify among electromagnetic relays
- To be able to classify among static relays
- To be able to classify among numerical relays

UNIT – III Protection of Generators & Transformers

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, Buchholtz Relay Protection, Numerical Problems.

Learning outcomes:

- To understand various types of faults and abnormal conditions that occur in generators
- To understand various types of faults and abnormal conditions that occur in transformers
- To be able to calculate percentage winding and CT ratios
- To apply different protection schemes for the occurrence of faults in generators
- To apply different protection schemes for the occurrence of faults in transformers

UNIT – IV Protection of Feeders & Lines

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:

- To understand protection schemes of feeders
- To understand protection schemes of bus bars
- To elucidate the protection of transmission lines
- To understand about over current relays
- To know about what is meant by 3-zone protection

UNIT – V Over Voltages in Power Systems

Generation of Over Voltages in Power Systems.-Protection against Lightning over Voltages - Valve Type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL.

Learning outcomes:

- To understand the concept of Generation of over voltages
- To analyze various methods of protection for over voltages in power systems
- To know about Lightning arresters
- To understand about Insulation coordination

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, Bhuvanesh Oza, TMH, 2010.

Web Courses: https://nptel.ac.in/courses/108/106/108106151/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A60204	**Analog and Digital IC Applications (PEC-II)**	3	0	0	3

(Professional Elective – II)

Course Objectives:

The main objectives of the course are:

1 To introduce the basic building blocks of linear & digital integrated circuits.

2 To learn the linear and non - linear applications of operational amplifiers.

3 To introduce the theory and applications of 555 and PLL.

4 To learn the theory of ADC and DAC

5 To understand different families of digital integrated circuits and their characteristics.

Course Outcomes:

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

CO1 Understand the basic concepts of Op -AMPs, characteristics and specifications.

CO2 Design circuits using operational amplifiers for various applications .

CO3 Develop, apply and analyze circuits for advanced applications using Opamps, PLL, VCO and Analog multipliers.

CO4 Understand different families of digital integrated circuits and their characteristics

CO5 Design various and sequential circuits using digital ICs.

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

SYLLABUS

UNIT -I: Operational Amplifier Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 OpAmp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

Learning Outcomes:

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

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

UNIT -II: Op-Amp, IC-555 & IC 565 Applications Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square, Wave,IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

Learning Outcomes:

- Able to understand IC-555 & IC 565 Applications
- Learn about Characteristics of Band pass, Band reject and All Pass Filters

UNIT -III: Data Converters Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

Learning Outcomes:

- Able to understand Data Converters and basic DAC techniques.
- Learn about Different Types of ADCs - Parallel Comparator Type ADC.

UNIT -IV: Digital Integrated Circuits Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

Learning Outcomes:

- Able to understand Data Converters and basic DAC techniques.
- Learn about Different Types of ADCs - Parallel Comparator Type ADC.

UNIT -V: Sequential Logic IC's and Memories Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Learning Outcomes:

- Able to understand Sequential Logic IC's and Memories.
- Understand about 74XX & CMOS 40XX Series ICs
- Learn about ROM Architecture, Types of ROMS & Applications.

TEXT BOOKS: 1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.

Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003. 3. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005.

REFERENCE BOOKS: 1. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore, Cengage Learning/ Jaico, 2009.

2. Operational Amplifiers with Linear Integrated Circuits by K.Lal Kishore – Pearson, 2009.

3. Linear Integrated Circuits and Applications – Salivahana, TMH.

4. Modern Digital Electronics – RP Jain – 4/e – TMH, 2010.

5. Digital Design Principles and Practices – John. F. Wakerly 3/e, 2005. Operational Amplifiers with Linear Integrated Circuits, 4/e William D.Stanley, Pearson Education India, 2009

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COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A60205	**Programmable Logic Controllers (PEC-II)**	3	0	0	3

Course Objectives: To get the student exposed to:

1 Understand the basic functions and types of PLCs
2 Get exposure of Easy Veep software, its applications
3 Classification of PLCs and applications
4 Programming using PLCs
5 Troubleshooting aspects using PLCs

Course Outcomes:
At the end of the course, the student will be able to:
CO1 Understand different types of PLCs

CO2 Understand the usage of Easy Veep software

CO3 Understand the hardware details of Allen Bradley PLC

CO4 Programming of PLCs

CO5 Know about few applications of PLCs in different fields of Science and Technology

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

UNIT-I
Introduction:
Basic functions of PLCs, Mechanical relays versus PLC, Different types of PLC's – Allen-Bradley – Micrologix: ML1000, ML1100, SLC500, Compact Logix, Mitsubishi FX series, HMI's, Processor and I/O cards

Learning Outcomes:

- To understand about basic functions of PLCs
- To know about classification of PLCs
- To distinguish between PLCs and Mechanical relays
- To know about Processor and I/O cards

UNIT-II

Introduction to Easy Veep software, Link between mechanical, electrical and programming documentation, Logic diagrams, Flip-Flop Logic, M8000, M8001 internal bits interpretation, Binary code, data table, manipulation and search engine in Mitsubishi environment Communication between PC and PLC, Communication between PC and HMI, PLC and HMI Serial Local network, Introduction to SLC500

Learning Outcomes:

- To know about Easy Veep software
- To know about Logic diagrams
- To understand about Search engine
- To know about interfacing of PC and PLCs

UNIT-III

PLC software and applications, Boolean algebra – understanding binary code, ADD and SUB functions, UP and Down Counters, Introduction to k1Y0, MOV function, CPR and ZCP functions, SHWT and SHRD instructions, Introduction to Absolutely Drum Instruction.

Allen Bradley PLC: Introduction to Rockwell Software, Hardware focus, Hardware considerations (Field wiring, Master Control Relay, VFD),Basic programming and applications, Cascade control – subroutine, Different programs.

Learning Outcomes:

- To know about basic features of PLCs
- To know about various instructions of PLC
- To know about various PLC versions
- To understand about Cascade control and subroutines

UNIT-IV

Programming instructions: Instructions and binary interpretation, Bit Instruction, Timers and counters, Comparison instructions, Programming Instructions – Math instructions, Move and Logical Instructions, Discussions of programming, communications for PLC-Robotic arm, Exercise of setup and monitoring

Learning Outcomes:

- To know about various Programming instructions
- To understand Math instructions in PLCs
- To know about Logical instructions
- To understand about Communications with PLC using set up and monitoring

UNIT-V

Analog and Digital parameters by using SLC5/03-VFD-Panel Mate series 1700, Practical Troubleshooting, troubleshooting technique, Control system stability and tuning basics. Applications: Process to rewind, test, and integrate with extrusion process for wiring and fibre optic industries, Food industry – yeast, flour distribution and control. Process Medical equipment Industry – Gas analyzer, Leak tester (using CO2), plastic wrapping machines etc.

Learning Outcomes:

- To know about analog and digital parameters in certain PLCs

- To apply PLCs for control system stability aspects
- To know about troubleshooting techniques
- To identify few applications of PLCs in Science and Technology fields

Text Books:

1. Automating manufacturing systems with PLCs by Hugh Jack, 2010.
2. PLC Hand Book (Automation direct Siemens)

References:

1. Programmable Logic Controllers by R. Bliesener, F Ebel, Festo. Didactic publishers, 2002.
2. Programmable Logic Controllers by W. Bolton, 4th Edition, Newnes, 2006.
3. Introduction to PLCs by Jay F. Hooper, 2nd Edition, Carolina Academic Press, 2006.

Web Courses: https://nptel.ac.in/content/storage2/courses/108105063/pdf/L-21(SM)%20(IA&C)%20((EE)NPTEL).pdf

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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A60206	**Introduction to Embedded System Design (PEC-II)**	3	0	0	3

COURSE OBJECTIVES

1 To provide an overview of design principles of Embedded System.

2 To provide clear understanding about the role of firmware , operating systems in correlation with hardware systems.

COURSE OUTCOMES

CO1 Expected to understand the selection procedure of Processors in the Embedded domain.

CO2 Design Procedure for Embedded Firmware.

CO3 Expected to visualize the role of Real time Operating Systems in Embedded Systems.

CO4 Expected to evaluate the Correlation between task synchronization and latency issues

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

UNIT I Introduction to Embedded Systems Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Learning Outcomes:

- Able to understand History of Embedded Systems, Classification, Major Application Areas
- Understand knowledge about Purpose of Embedded Systems

UNIT II Typical Embedded System Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Learning Outcomes:

- Able to Typical Embedded System Core
- Understand knowledge about Memory: ROM, RAM, Memory according to the type of Interface and Onboard and External Communication Interfaces.

UNIT III Embedded Firmware Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Learning Outcomes:

- Able to understand Embedded Firmware Reset Circuits
- Understand knowledge about Embedded Firmware Design Approaches and Development Languages.

UNIT IV RTOS Based Embedded System Design Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Learning Outcomes:

- Understand RTOS Based Embedded System Design
- Understand knowledge about Types of Operating Systems, Tasks, Process and Threads..

UNIT V Task Communication Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Learning Outcomes:

- Understand Task Communication Shared Memory
- Understand knowledge about Task Communication/Synchronization

Text Books:

1. Introduction to Embedded Systems - Shibu K.V, McGraw Hill
2. Embedded Systems - Raj Kamal, TMH.
3. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.

References:

1 Embedded Systems – Lyla, Pearson, 2013
3. Embedded System design : S. Heath (Elsevier)
4. An Embedded Software Primer - David E. Simon, Pearson Education.
5. Embedded microcontroller and processor design: G. Osborn (Pearson)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A60207	**Renewable Energy Sources (OEC-II)**	3	0	0	3

Course Objectives: At the end of the course the student will be able to

1. Identify various sources of Energy and the need of Renewable Energy Systems.
2. Understand the concepts of Solar Radiation, Wind energy and its applications.
3. Distinguish between solar thermal and solar PV systems
4. Interpret the concept of geo thermal energy and its applications.
5. Understand the use of biomass energy and the concept of Ocean energy and fuel cells.

Course Outcomes:

1. To distinguish between various alternate sources of energy for different suitable application requirements
2. To differentiate between solar thermal and PV system energy generation strategies
3. To understand about wind energy system
4. To get exposed to the basics of Geo Thermal Energy Systems
5. To know about various diversified energy scenarios of ocean, biomass and fuel cells

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

UNIT -I Solar Energy

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

Learning outcomes:

1. To understand about solar thermal parameters
2. To distinguish between flat plate and concentrated solar collectors
3. To know about thermal storage requirements
4. To know about measurement of solar radiation

UNIT – II PV Energy Systems

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems.

Learning outcomes:

1. Understand the concept of PV effect in crystalline silicon and their characteristics
2. Understand other PV technologies
3. To know about electrical characteristics of PV cells & modules
4. To know about grid connected PV systems

UNIT - III Wind Energy

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations.

Learning outcomes:

1. To understand basics of wind energy conversion and system
2. To distinguish between VAWT and HAWT systems
3. To understand about design considerations
4. To know about site selection considerations of WECS

UNIT - IV Geothermal Energy

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

Learning outcomes:

1. Understand the Geothermal energy and its mechanism of production and its applications
2. Analyze the concept of producing Geothermal energies
3. To learn about disadvantages and advantages of Geo Thermal Energy Systems
4. To know about various applications of GTES

UNIT -V Miscellaneous Energy Technologies

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.
Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration
Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Learning outcomes:

1. Analyze the operation of tidal energy
2. Analyze the operation of wave energy
3. Analyze the operation of bio mass energy
4. Understand the principle, working and performance of fuel cell technology

5. Apply these technologies to generate power for usage at remote centres

Text Books:

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.

References:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria & Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Web Sources: https://nptel.ac.in/courses/121/106/121106014/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A60208	**INSTRUMENTATION (OEC-II)**	3	0	0	3

Course Objectives: The student has to acquire knowledge 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

Course Outcomes: To know about

- Measuring systems, error measurements, test signals, different types of data transmission and modulation techniques
- Various telemetry systems and basic operation of Data acquisition systems, measuring meters and signal analyzers
- Transducers and their measurement of electrical and non-electrical quantities
- The application of the above as a prerequisite topics to SCADA in power systems, state estimation theory, etc.

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

UNIT-I: INSTRUMENT ERRORS

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 the unit student will be able to

- Understand the concept of generalized measurement system.
- Know about the static and dynamic characteristics.
- Solve problems related to statistical Analysis of Random Errors.
- Analyze the test signals and modulation phenomenon.
- Be able to solve Numerical problems

UNIT-II: DATA TRANSMISSION AND TELEMETRY

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 the unit student will be able to

- Understand the concepts of different modulations and compare different types of modulations in telemetry system.
- Know about the various telemetry systems and basic operation of Data acquisition systems.
- Distinguish between pulse code and amplitude modulation techniques
- Distinguish between analog and digital Data Acquisition Systems

UNIT-III: SIGNAL ANALYZERS

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 the unit student will be able to

- Understand the principles of Wave Analyzers.
- Demonstrate the applications of Wave Analyzers.
- Be able to distinguish between harmonic and spectral wave analyzers
- Distinguish between peak, rms, impedance and Q-factor meters

UNIT-IV: TRANSDUCERS

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 the unit student will be able to

- Understand the working principle, characteristics of various transducers
- Understand about applications of various transducers
- Distinguish between Resistive, Inductive and Capacitive transducers
- Distinguish between Piezo electric and Photo electric transducers
- Know about use of various transducers in different electrical field applications.

UNIT-V: MEASUREMENT OF NON-ELECTRICAL QUANTITIES

Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow, Liquid level

Learning outcomes:

At the end of the unit student will be able to

- Learn about measurement the various non-electrical quantities such as pressure, temperature, displacement, velocity
- Understand the concepts of measuring of various non-electrical quantities
- Know about liquid level measurement

- Know about force and torque measurements
- Know the applications of transducers in various industries

TEXT BOOKS:

1. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India, 2004.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co., 2012.

REFERENCE BOOKS:

1. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 3/e., 2010.
2. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India., 1990.
3. Industrial Instrumentation – Principles and Design by T. R. Padmanabhan, Springer, 3rd re print, 2009.

Web Courses: https://nptel.ac.in/courses/108/105/108105064/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

III B. Tech –II Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A60209	**INDUSTRIAL ELECTRICAL SYSTEMS (OEC – II)**	3	0	0	3

Course Objectives:

- To understand the various electrical system components
- To know the residential and commercial electrical systems
- To study the illumination systems
- To discuss about the industrial electrical systems

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the electrical wiring systems for residential, commercial and industrial consumers,representing the systems with standard symbols and drawings, SLD.
- Understand various components of industrial electrical systems.
- Analyze and select the proper size of various electrical system components.

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

UNIT- I

Electrical System Components: LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

Learning Outcomes:

- To understand LT system components

UNIT- II

Residential and Commercial Electrical Systems: Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of mainswitch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

Learning Outcomes:

- To understand types of wiring, rules and guidelines for installation
- To analyze load calculation, size of wire, rating of switch and distribution board and earthing system calculations

UNIT- III:

Illumination Systems: Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premise, flood lighting.

Learning Outcomes:

- To learn various illumination schemes

UNIT- IV:

Industrial Electrical Systems – I: HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

Learning Outcomes:

- To understand about industrial electrical systems like HT connectins, substations, transformer selection, loads , switchgear selection and earthining
- To analyze power factor correction, kVAR calculations and Breakers and LT panel components

UNIT- V:

Industrial Electrical Systems – II: DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Learning Outcomes:

- To understand about DG systems,UPS, Battery banks
- To analyze the sizing of DG, UPS and Battery banks

TEXT BOOKS:

1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & costing”, Khanna publishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.

REFERENCE BOOKS:

1. S. Singh and R. D. Singh, “Electrical estimating and costing”, Dhanpat Rai and Co., 1997.
2. Web site for IS Standards.
3. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.

Web Courses: https://nptel.ac.in/courses/108/105/108105062/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
****** Department of Humanities & Social Sciences ******

III B. Tech –II Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A65401	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (HS-I)**	3	0	0	3

COURSE OBJECTIVES: The objective of this course is	
1	To inculcate the basic knowledge of micro economics and financial accounting
2	To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
3	To know the various types of Market Structures & pricing methods and its strategies
4	To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
5	To provide fundamental skills on Accounting and to explain the process of preparing Financial statements

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the concepts related to Managerial Economics, financial accounting and management.
CO2	Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
CO3	Apply the concepts of production, cost and revenues for effective business decisions
CO4	Analyze how to invest their capital and maximize returns
CO5	Evaluate the capital budgeting techniques
CO6	Develop theaccounting statements and evaluate the financial performance of business entity.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
CO1						3									
CO2									3						

CO3												3			
CO4									3						
CO5									3						
CO6									3			3			

SYLLABUS

UNIT-I:Managerial Economics

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

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

State the Nature of Managerial Economics and its importance

- Understand the concept of demand andits determinants
- Analyze the Elasticity and degree of elasticity
- EvaluateDemand forecasting methods
- Design the process of demand estimation for different types of demand

UNIT-II: Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Shortrun and longrun Production Function- Isoquants andIsocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost&Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) -Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Define the production function, Input-Output relationship and different cost concepts
- Apply the least-cost combination of inputs
- Analyze the behavior of various cost concepts
- Evaluate BEA for real time business decisions
- Develop profit appropriation for different levels of business activity

UNIT-III: Business Organizations and Markets

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

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Explain the structure of markets, features of different markets and forms of business organizations
- Apply the price output relationship in different markets
- Analyze the optimum output levels to maximize profit in different markets

- Evaluate price-output relationship to optimize cost,revenue and profit

UNIT- IV:Capital Budgeting

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

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Explain the concept of capital budgeting and its importance in business
- Contrast and compare different investment appraisal methods
- Analyze the process of selection of investment alternatives using different appraisal methods
- Evaluate methods of capital budgeting for investment decision making and for maximizing returns
- Design different investment appraisals and make wise investments

UNIT-V: Financial Accounting and Analysis

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions-Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). ***Financial Analysis -*** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Discuss the concept,convention and significance of accounting
- Apply the fundamental knowledge of accounting while posting the journal entries
- Analyze the process and preparation of final accounts and financial ratios
- Evaluate the financial performance of an enterprise by using financial statements

Text Books:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

References:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Data Books Required:

Present Value Factors table

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
****** Department of Humanities & Social Sciences ******

III B. Tech –II Sem. (E.E.E

Subject Code	Title of the Subject	L	T	P	C
19A65402	ENTREPRENEURSHIP& INCUBATION (HS-I)	3	0	0	3

COURSE OBJECTIVES:The objective of this course is	
1	To make the student understand about Entrepreneurship
2	To enable the student in knowing various sources of generating new ideas in setting up ofnew enterprise
3	To facilitate the student in knowing various sources of finance in starting up of a business
4	To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
5	To encourage the student in creating and designing business plans

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the Concepts related to the Entrepreneurship and Incubators
CO2	Understand the concept of Entrepreneurship and challenges in the world of competition.
CO3	Apply the Knowledge in generating ideas for New Ventures.
CO4	Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
CO5	Evaluate the role of central government and state government in promoting Entrepreneurship.
CO6	Create and design business plan structure through incubations.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
CO1						3									
CO2		1				2			3						

CO3		2				1						3			
CO4		1							3						
CO5		3							3						
CO6							1		3			3			

Syllabus

UNIT-I: Entrepreneurship

Introduction-Nature, meaning, significance, functions and advantages. concept, characteristics-knowledge and skills requirement - process - Factors supporting entrepreneurship - Differences between Entrepreneur and Intrapreneur - entrepreneurial mindset and personality - Recent trends.

LEARNING OUTCOMES

At the end if the Unit, the learners will be able to

- Understand theconcept of Entrepreneur and Entrepreneurship in India
- Analyzerecent trends in Entrepreneurship across the globe
- Develop a creative mind set and personality in starting a business.

UNIT-II: Women Entrepreneurship

Introduction – Nature, meaning, significance, functions and advantages. Growth of women entrepreneurship in India. - Issues & Challenges - Entrepreneurial motivations.Entrepreneurship Development and Government. Role, of Central and State Government - incentives, subsidies and grants – Export-oriented Units - Fiscal and Tax concessions.

LEARNING OUTCOMES

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

- Understand the role of government in promoting women entrepreneurship
- Analyze the role of export-oriented units
- Evaluate the tax concessions available for Women entrepreneurs

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UNIT-III:Product Development

Introduction – Nature, meaning, significance, functions and advantages. Startup Initiatives - Generating business/ Service idea – Sources and methods –Identifying opportunities - Feasibility study - Market feasibility, technical/operational feasibility, Financial feasibility. Developing business plan, Preparing project report, Presenting business plan to investors.

LEARNING OUTCOMES

At the end if the Unit, the learners will be able to

- Analyze the sources of new methods in generating business idea
- Evaluate market feasibility, financial feasibility and technical feasibility
- Design and draw business plansin project preparation and prepare project reports

UNIT-IV:Startups

Introduction – Nature, meaning, significance, functions and advantages. Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence theType/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure -Value proposition

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to:

- Understand the importance of business incubation
- Apply brilliant ideas in the process of business incubation
- Analyze the process of business incubation/incubators.
- Design their own business incubation/incubators as viable-business unit.

UNIT-V: Finance

Introduction – Nature, meaning, significance, functions and advantages. Sources - Long term and Short term - Institutional Finance – Commercial Banks, SFC's and NBFC's in India, Role in small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey-Institutions supporting entrepreneurship development.

LEARNING OUTCOMES

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

- Understand the various sources of finance in Starting the new venture
- Analyze the role of banks and other financial institutions in promoting entrepreneurship in India
- Evaluatethe need and importance of MSMEs in the growth of country

TEXT BOOKS

1. D F Kuratko and T V Rao, **Entrepreneurship** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit :login.cengage.com)
2 .Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

REFERENCES

1. Vasant Desai,Small Scale Industries and Entrepreneurship, Himalaya Publishing 2012.
2. Rajeev Roy Entrepreneurship, 2nd Edition, Oxford, 2012.
3.B.JanakiramandM.Rizwana‖ Entrepreneurship Development: Text & Cases, Excel Books, 2011.
4.Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

E-RESOURCES

1. Entrepreneurship-Through-the-Lens-of-enture Capital

2.http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship

3.http://nptel.ac.in/courses/122106032/Pdf/7_4.pd

4.http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
***** DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES ******

III B. Tech –II Sem. (E.E.E

Subject Code	Title of the Subject	L	T	P	C
19A65403	**BUSINESS ETHICS AND CORPORATE GOVERNANCE (HS-I)**	3	0	0	3

COURSE OBJECTIVES : The objectives of this course are	
1	To make the student understand the principles of business ethics
2	To enable them in knowing the ethics in management
3	To facilitate the student's role in corporate culture
4	To impart knowledge about the fair-trade practices
5	To encourage the student in creating knowingabout the corporate governance

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the Ethics and Types of Ethics.
CO2	Understand business ethics and ethical practices in management
CO3	Understand the role of ethics in management
CO4	Apply the knowledge in cross cultural ethics
CO5	Analyze law and ethics
CO6	Evaluate corporate governance

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
CO1						3									
CO2		1				2			3						
CO3		2				1						3			
CO4		1							3						
CO5		3							3						
CO6							1		3			3			

Syllabus

UNIT-I:ETHICS

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior - Value systems - Business Ethics,Types, Characteristics, Factors, Contradictions and Ethical Practices inManagement-Corporate Social Responsibility – Issues of Management – Crisis Management.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the meaning of loyalty and ethical Behavior
- Explain various types of Ethics
- Analyze the corporate social responsibility of management

UNIT-II: ETHICS IN MANAGEMENT

Introduction Ethics in production, finance, ,Human Resource Managementand,Marketing,Management - Technology Ethics and Professional ethics - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the meaning of Marketing Ethics
- Compare and contrasttechnical ethics and professional ethics
- Develop ethical values

UNIT-III: CORPORATE CULTURE

Introduction, Meaning,definition,Nature, Scope, Functions,andsignificance– Cross cultural issues in Ethics - - Emotional Honesty – Virtue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind. The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

LEARNING OUTCOMES: -After completion of this unit student will

- Define UniversalismUtilitarianism, Distributive
- Understand the corporate culture in business

- Analyze Ethical Value System Ethical Values in different Cultures

UNIT- IV:LEGAL FRAME WORK

Law and Ethics, Agencies enforcing Ethical Business Behavior, Legal Impact– Environmental Protection, Fair Trade Practices,legal Compliances, Safeguarding Health and wellbeing of Customers.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand Law and Ethics
- Analyze Different fair-trade practices
- Make use of Environmental Protection andFair-Trade Practices

UNIT -V : CORPORATE GOVERNANCE

Introduction, meaning – scope Nature - Issues, need, corporate governance code, transparency & disclosure, role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work, corporate scams, committees in India and abroad, corporate social responsibility. of BODs composition, Cadbury Committee - various committees - reports - Benefits and Limitations.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand corporate governance code
- Analyze role ofauditors, board of directors and shareholders in corporate governance
- Implementing corporate socialresponsibility in India.

Text books.

1. Murthy CSV: Business Ethics and Corporate Governance, HPH

2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH.

Reference books

1. Dr. K. Nirmala, KarunakaraReaddy : Business Ethics and Corporate Governance, HPH

2. H.R.Machiraju: Corporate Governance

3. K. Venkataramana, Corporate Governance, SHBP.

4. N.M.Khandelwal : Indian Ethos and Values for Managers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year B.Tech II-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A60210	**ELECTRICAL & ELECTRONIC MEASUREMENTS LAB**	0	0	3	1.5

Course Objective: This laboratory deals with the practical exercises for:

- 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

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

- Calibrate various electrical measuring instruments
- Accurately determine the values of inductance and capacitance using AC bridges
- Compute the coefficient of coupling between two coupled coils
- Accurately determine the values of very low resistances

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

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
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 & Anderson bridge
7. Measurement of 3-phase reactive power with single-phase wattmeter
8. Measurement of parameters of a choke coil using 3-voltmeter and 3-ammeter methods

In addition to the above eight experiments, atleast 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
16. Generation of Lissajious Pattern using CRO
17. Measurement of voltage & frequency using CRO

Virtual Labs:

- **http://vem-iitg.vlabs.ac.in/**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year B.Tech II-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A60211	**Microprocessor and Microcontrollers Lab**	0	0	3	1.5

Course Objectives: The student will understand about

1. Assembly language programming on 8086 Microprocessors
2. Interfacing of various devices with 8086
3. MASAM Programming
4. Interfacing 8051 Microcontroller with its peripheral devices.

Course Outcomes: The student able to perform:

1. Assembly language programming on 8086 Microprocessors.
2. Interfacing of various devices with 8086.
3. MASAM Programming.
4. Interfacing 8051 Microcontroller with its peripheral devices

Mapping between Course Outcomes and Programme Outcomes:

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

PART-A: List of Programs using MASAM/ALP:

1. Programs for 16 bit arithmetic operations for 8086 (using various addressing modes) .
2. Program for sorting an array for 8086
3. Program for searching for a number or character in a string for 8086
4. Program for String manipulations for 8086

PART-B: List of experiments using 8086 and 8051 modules:

1. Interfacing ADC and DAC to 8086.
2. Parallel communication between two microprocessors using 8255.
3. Serial communication between two microprocessor kits using 8251.
4. Interfacing to 8086 and programming to control stepper motor.
5. Programming using arithmetic, logical and bit manipulation instructions of 8051
6. Program and verify Timer/Counter in 8051.
7. Program and verify interrupt handling in 8051.
8. UART operation in 8051.
9. Communication between 8051 kit and PC.
10. Interfacing LCD to 8051.

11. Interfacing matrix or keyboard to 8051.

Note: List of programs in PART-A are mandatory and in PART-B at least Eight experiments must be performed

Reference Books:

1. Ray A. K., Bhurchandi K. M., Advanced Microprocessor and Peripherals, Tata McGraw-Hill Publications, 3rd Edition, 2013.
2. Microprocessor and Interfacing by Douglas V Hall, 2nd Edition, Tata McGraw hill, 1992
3. Microprocessors and Microcontrollers Lab Manual: 8086 & 8051 by Srinivasa Murthy, Kindle Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
****** DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES ******
(Mandatory course)

III Year B.Tech II-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A55401	**Research Methodology**	**3**	**0**	**0**	**0**

COURSE OBJECTIVES :The objective of this course is	
1	**To understand the basic concepts of research and research problem**
2	**To make the students learn about various types of data collection and sampling design**
3	**To enable them to know the method of statistical evaluation**
4	**To make the students understand various testing tools in research**
5	**To make the student learn how to write a research report**
6	**To create awareness on ethical issues n research**

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	**Define the basic concepts and its methodologies**
CO2	**Understand the concept of sampling, research design etc.**
CO3	**Demonstrate the knowledge of research processes**
CO4	**Analyze the importance of research articles in their academic discipline**
CO5	**Select appropriatetesting toolsused in research**
CO6	**Design a research paper without any ethical issues**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1									3			1		3
CO2	1										3		2	2	3
CO3	1	2		3									1	1	3
CO4	1	2		3						2			2	1	2
CO5	1	2		2					3	2	2		1	1	3
CO6	1	3		1						3			1	2	2

Syllabus

UNIT I Introduction to Research

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:-After completion of this unit student will

- Understand the concept of research and its process
- Explain various types of research
- Know the steps involved in research design
- Understand the different research approaches

UNIT IISampling 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 Series Analysis – Interpolation and Extrapolation. Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the concept of sampling and sampling design
- Explain various techniques in measurement and scaling
- Learn various methods of data collection
- Design survey questionnaires for different kinds of research
- Analyze the questionnaires

UNIT III Correlation and Regression Analysis

Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications

LEARNING OUTCOMES:-After completion of this unit student will

- Know the association of two variables
- Understand the importance of correlation and regression
- Compare and contrast correlation and regression
- Learn various types of correlation
- Apply the knowledge of C&R Analysis to get the results

UNIT IV Statistical Inference

Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multivariate Analysis

LEARNING OUTCOMES:-After completion of this unit student will

- Know the statistical inference
- Understand the hypothesis testing procedure
- Compare and contrast Parametric and Non-parametric Tests
- Understand the use of chi-square test in investigating the distribution of categorical variables
- Analyze the significance of variance and covariance

UNIT VReport 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:-After completion of this unit student will

- Learn about report writing
- Understand how to write research paper
- Explain various techniques of interpretation
- Understand the importance of professional ethics in research
- Design a scientific paper to present in the conferences/seminars
-

Text books:

1. Research Methodology:Methods and Techniques – C.R.Kothari, 2nd Edition, New Age International Publishers.

2. Research Methodology: A Step by Step Guide for Beginners- Ranjit Kumar, Sage Publications

REFERENCES:

1. Research Methodology and Statistical Tools – P.Narayana Reddy and G.V.R.K.Acharyulu, 1st Edition,Excel Books,New Delhi.

2. Business Research Methods–Donald R. Cooper & Pamela S Schindler, 9/e,

3. S C Gupta, Fundamentals of Statistics,7th Edition Himalaya Publications

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year B.Tech I-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A70201	**POWER SYSTEM OPERATION AND CONTROL (PCC)**	3	0	0	3

Course Objectives:

- To know about economic load dispatch problems with and without losses in Power Systems
- To distinguish between hydro-electric and thermal plants and coordination between them
- 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
- To understand about deregulation aspects in Power Systems

Course Outcomes:

- To be able to understand to deal with problems in Power System as Power System Engineer
- To be able to Understand to deal with AGC problems in Power System, l the problems in hydro electric and hydro thermal problems
- To understand the complexity of reactive power control problems and to deal with them
- To understand the necessity of deregulation aspects and demand side management problems in the modern power system era.

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

UNIT-I: ECONOMIC OPERATION OF POWER SYSTEMS

Brief description about electrical power systems, introduction to power system operation and control, Characteristics of various steam units, combined cycle plants, cogeneration plants, Steam units economic dispatch problem with & without considering losses and its solutions, B Matrix loss formula – Numerical problems

Learning outcomes:

1. To know about basic Power System Operation and Control strategies
2. To distinguish between generation and co-generation plants
3. To understand economic load dispatch problem without losses of the Power System
4. To understand economic load dispatch problem with losses of the Power System
5. To know about computation of loss coefficients in Power Systems

UNIT-II: HYDRO-THERMAL COORDINATION AND OPTIMAL POWER FLOW

Hydro-thermal Coordination: Characteristics of various types of hydro-electric plants and their models, Introduction to hydro-thermal Coordination, Scheduling energy with hydro-thermal coordination, Short-term hydro-thermal scheduling. **Optimal Power Flow:** Optimal power flow problem formulation for loss and cost minimisation, Solution of optimal power flow problem using Newton's method and Linear Programming technique – Numerical problems

Learning outcomes:

1. To distinguish between hydro electric and hydro thermal plants
2. To understand about characteristics of thermo-electric and hydro-thermal plants
3. To understand about optimal power flow problem formulation with losses and minimisation of cost
4. OPF problem solving using specified methods
5. To do numerical exercises in solving OPF problems

UNIT-III: AUTOMATIC GENERATION CONTROL

Speed governing mechanism, modelling of speed governing mechanism, models of various types of thermal plants (first order), definitions of control area, Block diagram representation of an isolated power system, Automatic Load Frequency control of single area system with and without control, Steady state and dynamic responses of single area ALFC loop, Automatic Load-frequency control of two area system, Tie-line bias control of two area and multi-area system, Static response of two-area system – Numerical examples

Learning outcomes:

1. To understand about speed governing mechanism modelling
2. To identify control areas and block diagram representations
3. To identify Load Frequency Control problems with and without control
4. To understand about steady state and dynamic responses of single and two area system with tie-lines
5. To do numerical problems of AGC problems

UNIT-IV: REACTIVE POWER CONTROL

Requirements in ac power transmission, factors affecting stability & voltage control, fundamental transmission line equation, surge impedance, Natural loading, uncompensated line on open circuit, uncompensated line under load, types of compensations on compensated transmission lines, passive and active compensators, uniformly distributed fixed and regulated shunt compensation, series compensation, compensation by sectioning – Numerical problems

Learning outcomes:

1. To know about understanding of Reactive Power problems in Power Systems
2. To distinguish between compensated and uncompensated lines under no-load and load
3. To distinguish between active and passive compensations
4. To distinguish between shunt and series compensation in Reactive Power Control

5. To do numerical problems and to understand the complexity of reactive power problems in power systems

UNIT-V: OPERATION OF MODERN POWER SYSTEMS

Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems

Learning outcomes:

1. To understand the philosophy of power exchange in electricity market
2. To know about transmission system pricing charges
3. To know about distribution system pricing charges
4. To understand the trend of Demand side management
5. To solve numerical problems in above aspects

Text Books:

3. Power Generation, Operation and Control, Allen J. Wood and Bruce F. Wollenberg, John Wiley & Sons, Inc., New York, 2nd edition, 1996.
4. Power System Engineering, D P Kothari and I J Nagrath, McGraw Hill Education India Pvt. Limited, Chennai, 3e, 2019.

References:

1. Electric Energy Systems Theory: An Introduction, Olle I. Elgerd, TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.
2. Reactive Power Control in Electric Systems, T J E Miller, John Wiley & Sons, New York, 1982.

Web Courses: https://nptel.ac.in/courses/108/101/108101040/

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ELECTRICAL AND ELECTRONICS ENGINEERING

IV B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A70202	**UILIZATION OF ELECTRICAL ENERGY (PCC)**	3	0	0	3

Course Objectives:

1	To make the students aware about the importance of maximizing the energy efficiency by optimum utilization of electrical energy.
2	To ensure that the knowledge acquired can be applied in various fields such as electric heating, illumination, chemical processes and electric traction.
3	To develop ability amongst the students to analyze the performance of arc furnaces, electric traction, different sources of light, illumination schemes, electric traction.
4	To provide knowledge about above processes and applications of these in practical world.

Course Outcomes:

CO1: Understand the importance of maximizing the energy efficiency by its optimum utilization and mould their practical work in professional world accordingly

CO 2: Understand the performance of simple resistance furnaces, modern welding techniques, illumination schemes and electric traction

CO3: Able to get technical knowledge of various control devices and their use, in practical world

CO 4: Able to design various illumination systems and apply them to real world usage

Mapping between Course Outcomes and Programme Outcomes:

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

UNIT – I ILLUMINATION

Definition – Laws of illumination – Polar curves – Calculation of MHCP and MSCP. Lamps: Incandescent lamp, Sodium Vapour lamp, Fluorescent lamp. Requirement of good lighting scheme – Types, Design and Calculation of illumination. Street lighting and Factory lighting – Numerical Problems.

Unit Outcomes:

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

- Understand and remember the basics of illumination and various types of lamps present.

- Analyze the types, design and calculation of illumination.
- Apply the above concepts to solve numerical problems.

UNIT – II ELECTRICAL HEATING & ELECTRIC WELDING

Advantages. Methods of Electric heating – Resistance, arc, Induction and dielectric heating. Types of electric welding – Resistance, Electric arc, gas welding and Ultrasonic welding, Welding electrodes of various metals, Defects in welding.

Unit Outcomes:

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

- Understand and remember the basic concepts of electric heating and electric welding and their classification.
- Analyze various methods and different materials used and defects present in welding.
- Apply the above concepts to solve numerical problems.

UNIT – III ELECTROLYTIC PROCESS

Basic principle of Electrolysis, Faradays laws of Electrolysis – Numerical problems, Applications of Electrolysis – Electro deposition-manufacturing of chemicals – anodizing – electro polishing – electro cleaning – electro parting – electro metallurgy, Power supply for Electrolysis.

Unit Outcomes:

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

- Understand and remember the basic principle involved in electrolysis process.
- Analyze in detail the process involved in electrolysis and the amount of power required for electrolysis.
- Apply and analyze electrolysis process to various applications like electro polishing, cleaning, parting, etc.,
- Apply the above concepts to solve numerical problems.

UNIT – IV ELECTRIC TRACTION

Introduction –Traction Systems, Systems of Electric Traction- Advantages of Electric Traction, Systems of Track Electrification, Desirable features of Traction Motors – Suitability of D.C. series motor, A.C. series motor, 3 phase induction motor and linear induction motor for traction. Electric Braking in traction– Plugging, Rheostatic and Regenarative types – Suitability of different motors for braking, Temperature Rise and Load Equalization.

Unit Outcomes:

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

- Understand and remember the basic principle involved, different systems available and advantages of electric traction.
- Analyze the desirable features of traction motors and suitability of various motors.

- Apply and analyze various braking methods applicable and suitability of different motors for braking.
- Apply the above concepts to solve numerical problems.

UNIT – V TRACTION MECHANICS

Types of services – urban – sub-urban and main line services, Speed-time curves of different services – trapezoidal and quadrilateral speed-time curves – Numerical Problems, Tractive effort, Power, Specific Energy Consumption- factors affecting Specific Energy Consumption, Mechanics of train movement - Adhesive weight and coefficient of adhesion – Problems.

Unit Outcomes:

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

- Understand and remember the types of services present and their respective speed-time curves.
- Analyze the concept of tractive effort, Power, Specific Energy Consumption- and factors affecting Specific Energy Consumption,
- Understand and analyze the mechanics of train movement, adhesive weight and coefficient of adhesion.
- Apply the above concepts to solve numerical problems.

TEXT BOOKS:

1. Utilization of Electrical Energy' by E. O. Taylor – Revised in S.I. Units by V.V.L.Rao, Orient Longman
2. Generation, Distribution and Utilization of Electrical Energy' by C. L. Wadhwa, Eastern Wiley Ltd.
3. 'Utilization of Electric Power and Electric Traction' by J.B. Gupta, S.K. Kataria and sons,Delhi.

REFERENCE BOOKS:

1. Art & Science of Utilization of electrical Energy – by H. Partab, Dhanpat Rai & Sons.
2. A text book on Power System Engineering' by A. Chakraborti, M. L. Soni, P. V. Gupta, U.S.Bhatnagar, Dhanpat Rai and Co.(P) Ltd – Delhi
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.

Web Courses: https://nptel.ac.in/courses/108/105/108105060/

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ELECTRICAL AND ELECTRONICS ENGINEERING

IV B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A70203	**HVDC AND FACTS (PEC-III)**	3	0	0	3

Course Objectives: To get the student exposed to:

1 High voltage DC transmission systems
2 Flexible AC transmission systems
3 Various configurations of the above, Principle of operation, Characteristics of various FACTS devices

Course Outcomes: Student should be able

CO1 To understand Transmission networks, electronic switching devices conventional control mechanisms, types of HVDC links principle of working and differences between various pulse configurations of various converters.
CO2 To analyze bridge circuits, firing angle controls and characteristics of flexible AC transmission systems.
CO3 To develop Equivalent circuits.

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

UNIT-I: INTRODUCTION

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:

- Know about difference between HVDC and FACTS
- Know about limitations of conventional transmission systems
- Know about recent developments in Power Electronic switching devices

UNIT – II: HIGH VOLTAGE DC TRANSMISSION – I

Types of HVDC links - Monopolar, Homopolar, Bipolar and Back-to-Back, Advantages and disadvantages of HVDC Transmission, Analysis of bridge circuit, Analysis of bridge circuit without overlap, Analysis of bridge with overlap less than 60^0, Rectifier and inverter characteristics, complete characteristics of rectifier and inverter, Equivalent circuit of HVDC Link.

Learning Outcomes:

- To learn about various HVDC link configurations
- To develop equivalent circuit of HVDC link

UNIT – III: HIGH VOLTAGE DC TRANSMISSION – II

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:

- To learn about various DC link control techniques
- To learn about starting, stopping and reversal of power flow in DC links

UNIT-IV: FLEXIBLE AC TRANSMISSION SYSTEMS-I

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:

- To understand principle of working and differences between various pulse configurations of various converters
- To understand the necessity of compensators
- To analyze the configurations of shunt, VAR, series configurations, etc.

UNIT-V: FLEXIBLE AC TRANSMISSION SYSTEMS-II

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:

- To know more about advanced Power flow controllers
- To analyze the transmission control strategies
- To know about voltage and phase regulators

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.

Web Sources: https://nptel.ac.in/courses/108/104/108104013/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year B.Tech I-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A70204	**AC Drives (PEC-III)**	3	0	0	3

Course Objectives:

1. To understand the basic concepts of phase Controlled Induction Motor Drive
2. To understand the concept of Voltage Source Inverter Fed Induction Motor Drive
3. To design various Rotor Side Control of Slip-Ring Induction Motor
4. To understand the concept of Control of Synchronous Motor Drives
5. To understand the concept of PMSM and BLDC Drives.

Course Outcomes:

1. Understand the basic concepts of AC Motor Drives.
2. Modelling and analysis Stator Voltage and Frequency Control of Induction Motor, Torque-Speed Characteristic Static Frequency Changers, PWM Inverter Fed Induction Motor Drive.
3. Design of speed control of induction motor from rotor end.
4. Design and analysis of synchronous motor drives.
5. Understand Design the concept of BLDC motor PMSM Motor

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

UNIT-I Phase Controlled Induction Motor Drive
Stator Voltage Control of Induction Motor, Phase-Controlled Converter Fed Induction Motor, Power Circuit and Gating, Reversible Phase-Controlled Induction Motor Drive, Torque-Speed Characteristics.

Learning Outcomes:

- Understand the concept of Selection of control of AC motor drive
- To know about various characteristics of phase controlled drives
- To know about power circuit and gating configurations of converter
- To understand about reversible drive

UNIT-II: Voltage Source Inverter Fed Induction Motor Drive

Stator Voltage and Frequency Control of Induction Motor, Torque-Speed Characteristic Static Frequency Changers, PWM Inverter Fed Induction Motor Drive, Variable-Voltage Variable-Frequency Operation of Induction Motor, Constant E/f And V/f Control Schemes, Slip Regulation.

Learning Outcomes:

- Understand the concept of Variable-Frequency operation of Induction Motor
- To understand about variable-voltage, variable-frequency operation of Induction motor
- Understand the concept of Stator Voltage and Frequency Control of Induction Motor
- To understand about PWM fed IM drive

UNIT-III: Rotor Side Control of Slip-Ring Induction Motor

Slip-Power Recovery Schemes, Steady-State Analysis- Range of Slip, Equivalent Circuit, Performance Characteristics; Rating of Converters.

Vector Control of Induction Motor:

Principles of Vector Control, Direct Vector Control, Indirect Vector Control, Implementation – Block Diagram, Estimation of Flux, Flux Weakening Operation.

Learning Outcomes:

- Understand the concept of rotor side control Slip-Ring Induction Motor
- To know about performance characteristics
- To know about direct vector control of IM drive
- To know about indirect vector control of IM drive

UNIT-IV: Control of Synchronous Motor Drives

Synchronous Motor - Control Strategies-Constant Torque Angle Control-Power Factor Control, Constant Flux Control, Flux Weakening Operation, Load Commutated Inverter Fed Synchronous Motor Drive, Motoring and Regeneration, Phasor Diagrams.

Learning Outcomes:

- Understand Synchronous Motor Control Strategies
- Designing of Commutated Inverter Fed Synchronous Motor Drive
- To know about Motoring and Regeneration
- To understand phasor diagrams of Synchronous Motor Drive

Unit-V: PMSM and BLDC Drives

Characteristics of Permanent Magnet, Synchronous Machines With Permanent Magnet, Vector Control of PMSM- Motor Model and Control Scheme, Constant Torque Angle Control, Constant Mutual Flux Linkages, Unity PF Control. Modelling of PM Brushless DC Motor, Drive Scheme, Commutation Torque Ripple, Phase Advancing.

Learning Outcomes:

- Understand the concept of PMSM and BLDC Drives
- Design of motor model and control schemes of BLDC motors.
- To understand characteristics of PMSM
- To understand BLDC motor modelling aspects

TEXT BOOK:

1. R. Krishnan, **Electric Motor Drives Modelling, Analysis & control**, Pearson Education, 2001.
2. B. K. Bose **Modern Power Electronics and AC Drives**, Pearson Publications, 2001.

REFERENCE BOOKS:

1. MD Murphy & FG Turn Bull, Power Electronics control of AC motors, 1st Edition, Pergaman press, 1998.
2. G.K. Dubey, **Fundamentals of Electrical Drives,** Narosa Publications, 1995.
3. S. K. Pillai, A First Course on Electrical Drives, New Age International, 1989.
4. Vedam Subrahmanyam, Electric Drives: Concepts and Applications, 2nd Edition, Mc Graw Hill Education, 2017

Web Sources: https://nptel.ac.in/courses/108/108/108108077/

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ELECTRICAL AND ELECTRONICS ENGINEERING

IV B. Tech I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A70205	**Digital Control Systems (PEC-III)**	3	0	0	3

Course Objectives:

- To understand the fundamentals of digital control systems, z-transforms
- To understand state space representation of the control systems, concepts of controllability and observability
- To study the estimation of stability in different domains
- To understand the design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Obtain discrete representation of LTI systems.
- Analyze stability of open loop and closed loop discrete-time systems.
- Design and analyze digital controllers.
- Design state feedback and output feedback controllers.
-

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

UNIT- I

Discrete Representation of Continuous Systems: Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modeling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

Learning Outcomes:

- To understand the concepts of digital control systems, Sample and hold circuit, Quantization
- To analyze the mathematical modelling of sample and hold circuit, effect of sampling and quantization

UNIT- II

Discrete System Analysis: Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system. Stability of Discrete Time System: Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of

digital control system with dead beat response.

Learning Outcomes:

- To remember the concepts of Z-Transforms, inverse Z-Transforms and pulse transfer function
- To understand the S-plane and Z-plane
- To analyze the stability analysis using bilinear transformation Jury stability test
- To Design digital control system with dead beat response

UNIT- III

State Space Approach for Discrete Time Systems: State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability and observability analysis. Effect of pole zero cancellation on the controllability & observability.

Learning Outcomes:

- To understand the state space models of discrete systems, state space analysis, controllability and observability
- To analyze the lyapunov stability, controllability, observability and effect of pole zero cancelation

UNIT- IV

Design of Digital Control System: Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

Learning Outcomes:

- To understand PID controller
- To design discrete PID Controllers, observers for LTI systems and compensators

UNIT- V

Discrete Output Feedback Control: Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.

Learning Outcomes:

- To understand fast output sampling
- To design discrete output feedback control

TEXT BOOKS:

1. K. Ogata, “Digital Control Engineering”, Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, “Digital Control Engineering”, Wiley Eastern, 1988.

REFERENCE BOOKS:

1. G. F. Franklin, J. D. Powell and M. L. Workman, “Digital Control of Dynamic Systems”, Addison-Wesley, 1998.
2. B.C. Kuo, “Digital Control System”, Holt, Rinehart and Winston, 1980.

Web Sources: https://nptel.ac.in/courses/108/103/108103008/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year B.Tech I-Sem (EEE)

Subject Code	Title of the Subject	L	T	P	C
19A70206	**SYSTEM RELIABILITY CONCEPTS (OEC-III)**	3	0	0	3

Course Objectives:

To make the students learn about:

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

Course Outcomes:

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

- Understand the concepts for combining Probabilities of events, Bernoulli's trial, and Binomial distribution.
- Network Reliability/Unreliability using conditional probability, path and cutset based approach, complete event tree and reduced event tree methods.
- Understanding Reliability functions and to develop relationship between these functions, expected value and standard deviation of Exponential distribution and measures of reliabilities.
- Analyze the time dependent reliability evaluation of single component repairable model, frequency and duration concepts, Frequency balance approach.
- Recursive relation for evaluation of equivalent transitional rates, cumulative probability and cumulative frequency and 'n' component repairable model.

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

UNIT-I: Basic Probability Theory

Basic concepts – Rules for combining Probabilities of events – Failure Density and Distribution functions – Bernoulli's trials – Binomial distribution – Expected value and standard deviation for binomial distribution – Examples

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

- To know about basic rules for probabilities of events
- To distinguish between pdf and cdf
- Get detailed information about Probability of failure density and distribution functions
- Obtain the expected value and standard deviation for binomial distribution.

UNIT-II: Network Modeling and Reliability Evaluation

Basic concepts – Evaluation of network Reliability / Unreliability – Series systems, Parallel systems, Series - Parallel systems, partially redundant systems – Types of redundancies - Evaluation of network Reliability / Unreliability using conditional probability method – Paths based and Cutset based approach – complete event tree and reduced event tree methods - Examples.

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

- How to find the Probability of success and failures of network using different approaches for series-parallel configurations.
- Classification of redundancies.
- To find reliability / unreliability of complex systems using different methods
- Comparison of approaches to solve probability index of SISO system

UNIT-III: Time Dependent Probability

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

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

- Understand the concepts of time domain functions and relationship between them.
- Obtain the expected value and standard deviation for exponential distribution.
- Obtain the values of probabilistic measures for series and parallel configurations.
- To obtain probabilistic measures for fully redundant and partially redundant configurations

UNIT-IV: Discrete Markov Chains & Continuous Markov Processes

Markov Chains: Basic concepts – Stochastic transitional Probability matrix – time dependent probability evaluation – Limiting State Probability evaluation – Absorbing states.

Markov Processes: Modeling concepts – State space diagrams – time dependent reliability evaluation of single component repairable model – Evaluation of Limiting State Probabilities of one, two component repairable models – Frequency and duration concepts – Frequency balance approach - Examples.

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

- Understand the concepts of Stochastic Transitional Probability Matrix, Limiting State Probability
- To know about evaluation for one and two component repairable models.
- Understand the concept of Frequency balance approach.
- To distinguish between Markov chains and Markov processes

UNIT-V: Multi Component & Approximate System Reliability Evaluation

Recursive relation for evaluation of equivalent transitional rates– cumulative probability and cumulative frequency and 'n' component repairable model – Series systems, Parallel systems, Basic probability indices – Series, Parallel systems – Complex Systems– Cutset approach – Examples.

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

- Understand the concepts of recursive relation for evaluation of equivalent transitional rates.
- Obtain the cumulative probability and cumulative frequency for different systems
- To know about computation of basic probability indices for series, parallel configurations
- To know how to evaluate basic probability indices using cut set approach

Text Books:

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

Reference Books:

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

Web Sources:

https://nptel.ac.in/content/storage2/courses/112101005/downloads/Module_5_Lecture_3_final.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

IV B. Tech I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A70207	**ELECTRIC VEHICLE ENGINEERING (OEC-III)**	3	0	0	3

Course Objectives:

- To get exposed to new technologies of battery electric vehicles, fuel cell electric vehicles
- To get exposed to EV system configuration and parameters
- To know about electro mobility and environmental issues of EVs
- To understand about basic EV propulsion and dynamics
- To understand about fuel cell technologies for EV and HVEs
- To know about basic battery charging and control strategies used in electric vehicles

Course Outcomes:

- To understand and differentiate between conventional and latest trends in Electric Vehicles
- To know about various configurations in parameters of EV syste, propulsion and dynamic aspects of EV
- To understand about fuel cell technologies in EV and HEV systems
- To understand about battery charging and controls required of Evs

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

UNIT-I Introduction to EV Systems and Parameters

Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters.

Learning Outcomes:

- To know about past, present and latest technologies of EV
- To understand about configurations of EV systems
- To distinguish between EV parameters and performance parameters of EV systems
- To distinguish between single and multiple motor drive EVs
- To understand about in-wheel EV

UNIT-II EV and Energy Sources

Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems

Learning Outcomes:

- To know about various types of EV sources
- To understand about e-mobility
- To know about environmental aspects of EV
- To distinguish between conventional and recent technology developments in EV systems

UNIT-III EV Propulsion and Dynamics

Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration.

Learning Outcomes:

- To know about what is meant by propulsion system
- To understand about single and multi motor EV configurations
- To get exposed to current and recent applications of EV
- To understand about load factors in vehicle dynamics
- To know what is meant acceleration in EV

UNIT-IV Fuel Cells

Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle.

Introduction to HEV, brake specific fuel consumption, comparison of series, series-parallel hybrid systems, examples

Learning Outcomes:

- To know about fuel cell technology of EV
- To know about basic operation of FCEV
- To know about characteristics and sizing of EV with suitable example
- To get exposed to concept of Hybrid Electric Vehicle using fuel cells
- To know about the comparison of various hybrid EV systems

UNIT-V Battery Charging and Control

Battery charging: Basic requirements, charger architecture, charger functions, wireless charging, power factor correction.

Control: Introduction, modelling of electro mechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle

Learning Outcomes:

- To understand about basic requirements of battery charging and its architecture
- To know about charger functions
- To get exposed to wireless charging principle

- To understand about block diagram, modelling of electro mechanical systems of EV
- To be able to design various compensation requirements

TEXT BOOKS:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCE BOOKS:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.
2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.

Web Sources: https://nptel.ac.in/courses/108/102/108102121/

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ELECTRICAL AND ELECTRONICS ENGINEERING

IV B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A70208	**DESIGN OF PHOTOVOLTAIC SYSTEMS (OEC-III)**	3	0	0	3

Course Objectives: To get the student exposed to:

1 Understand the basics of solar PV
2 Get exposure of various PV performance measure terminologies
3 Understand about manufacturing of PV cells & sizing aspects of PV systems
4 Understand about PV system components and apply them in installation practices,& associated trouble shootings
5 Understand about PV system applications & associated safety measures

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

CO1 Understand the principle of direct solar energy conversion to power using PV

CO2 Contrast the performance measures of PV

CO3 Infer on various Solar cells & design aspects of solar PV

CO4 Identify various PV components & construct few systems

CO5 Develop ideas for working on solar PV systems & associated safety practices.

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

Unit 1 : SOLAR CELL FUNDAMENTALS

Principle of solar energy conversion, Photovoltaic effect, Semiconductor properties, energy levels, basic equations. Solar cell structure, parameters of solar cell.

Learning Outcomes:

- To know about the principle of solar energy conversion
- To know about Photovoltaic effect
- To know about Solar cell structure, parameters of solar cell.

Unit 2 : PV MODULE PERFORMANCE

Solar PV modules & arrays, I-V &P-V characteristics, maximum power point ,series parallel combination, cell efficiency, fill factor, role of bypass & blocking diode, factors affecting output of a solar cell.

Learning Outcomes:

- To understand Solar PV modules & arrays, I-V &P-V characteristics
- To understand maximum power point ,series parallel combination
- To know about cell efficiency, fill factor, role of bypass & blocking diode, factors affecting output of a solar cell.

Unit 3 : MANUFACTURING OF PV CELLS & DESIGN OF PV SYSTEMS

Commercial solar cells - Production process of single crystalline silicon cells, multi crystalline silicon cells, amorphous silicon, cadmium telluride, copper indium gallium diselenide cells. Design of solar PV systems, cost estimation, various aspects, system simulation tools.

Learning Outcomes:

- To know about the production process of various PV cells.
- To understand Design of solar PV systems, cost estimation, various aspects, system simulation tools

Unit 4 : SOLAR PV SYSTEMS INSTALLATIONS & TROUBLE SHOOTING

Classification - Central Power Station System, Distributed PV System, Stand alone PV system, grid Interactive PV System, small system for consumer applications, hybrid solar PV system, concentrator solar photovoltaic. System components - PV arrays, inverters, batteries, charge controllers , net metering ,. PV array installation, operation, costs, reliability. Troubleshooting of PV system components.

Learning Outcomes:

- To understand the classification of Solar PV Systems.
- To know the concept of PV array installation.
- To analyse troubleshooting of PV system components.

Unit 5 : PV SYSTEM APPLICATIONS & SAFETY

Building-integrated photovoltaic units, grid connected central power stations, stand-alone devices for distributed power supply in remote and rural areas, Outlook for the Indian PV industry& challenges, Applications: solar home system, solar cars, Solar Charger, aircraft,space solar power satellites. Socio-economic and environmental merits of photovoltaic systems safety in Installation of solar PV systems

Learning Outcomes:

- To understand the outlook for the Indian PV industry & challenges.
- To know the PV system applications.

- To understand photovoltaic systems safety in installation of solar PV systems.

Text Books:

1. Chetan Singh Solanki., Solar Photovoltaic: "Fundamentals, Technologies and Application", PHI Learning Pvt., Ltd., 2009.
2. Jha A.R., "Solar Cell Technology and Applications", CRC Press,2010.
3. John R. Balfour, Michael L. Shaw, Sharlave Jarosek., "Introduction to Photovoltaics", Jones & Bartlett Publishers, Burlington, 2011.

Reference Books:

1. Chetan Singh Solanki "Solar PV technology and system", PHI learning private limited, 2015.
2. Luque A. L. and Andreev V.M., "Concentrator Photovoltaic",Springer, 2007.
3. Partain L.D., Fraas L.M., "Solar Cells and Their Applications", 2nd ed., Wiley, 2010.
4. S.P. Sukhatme, J.K.Nayak., "Solar Energy", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
5. R.K Pachauri "From Sun light to Electricity" TERI, 15th Reprint , 2013

Web Courses: https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ee35/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
****** DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES ******

IV B. Tech I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A75401	**MANAGEMENT SCIENCE (HE-II)**	3	0	0	3

COURSE OBJECTIVES: The objectives of this course are	
1	To provide fundamental knowledge on Management, Administration, Organization & its concepts.
2	To make the students understand the role of management in Production
3	To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training &Development, job evaluation and Merit rating concepts
4	To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
5	To make the students aware of the contemporary issues in management

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the Management, and its Functions
CO2	Understand the concepts & principles of management and designs of organization in a practical world
CO3	Apply the knowledge of Work-study principles & Quality Control techniques in industry
CO4	Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
CO5	Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
CO6	Create Modern technology in management science.

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

CO4											3		1	1	2
CO5												3	1	1	1
CO6											2	3	1	1	2

Syllabus

UNIT-I:INTRODUCTION TO MANAGEMENT

Management-Concept and meaning-Nature-Functions-Management as a Science and Art and both. Schools of Management Thought-Taylor's Scientific Theory-Henry Fayol's principles-Elton Mayo's Human relations-Systems Theory- **Organizational Designs**-Line organization-Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of Organization-Social responsibilities of Management.

LEARNING OUTCOMES: At the end if the Unit, the learners will be able to

- Understand the concept of management and organization
- Analyze the organization chart & structure for an enterprise.
- Apply the concepts & principles of management in real life industry.
- Evaluate and interpret the theories and the modern organization theory.

UNIT-II:OPERATIONSMANAGEMENT

Principles and Types of Plant Layout-Methods of Production (Job, batch and Mass Production), Work Study-Statistical Quality Control- Deming 's contribution to Quality. **Materials Management -** Objectives- Inventory-Functions - Types, Inventory Techniques-EOQ-ABC Analysis-Purchase Procedure and Stores Management-**Marketing Management -**Concept- Meaning - Nature-Functions of Marketing - Marketing Mix- Channels of Distribution -Advertisement and Sales Promotion- Marketing Strategies based on Product Life Cycle.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Understand the core concepts of Management Science and Operations Management
- Apply the knowledge of Quality Control, Work-study principles in real life industry.
- Analyze Marketing Mix Strategies for an enterprise
- Evaluate Materials departments &Determine EOQ
- Create and design advertising and sales promotion

UNIT-III:HUMAN RESOURCES MANAGEMENT (HRM)

HRM- Evolution of HRM - Definition and Meaning – Nature-Managerial and Operative functions--Job Analysis -Human Resource Planning (HRP)–Process of Recruitment&Selection - Training and Development-Performance Appraisal-Methods of Performance Appraisal – Placement-Employee Induction-Wage and Salary Administration.

LEARNING OUTCOMES: At the end if the Unit, the learners will

- Understand the concepts of HRM in Recruitment, Selection, Training & Development
- Apply Managerial and operative Functions
- Analyze the need of training
- Evaluate performance appraisal
- Design the basic structure of salaries and wages

UNIT-IV:STRATEGIC& PROJECT MANAGEMENT

Strategy Definition& Meaning-Vision - Mission- Goals- Corporate Planning Process- Environmental Scanning- Steps in Strategy Formulation and Implementation-SWOT Analysis

Project Management- Network Analysis- Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost Analysis - Project Crashing (Simple problems).

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Understand Mission, Objectives, Goals & strategies for an enterprise
- Apply SWOT Analysis to strengthen the project
- Analyze Strategy formulation and implementation
- Evaluate PERT and CPM Techniques
- Creative in completing the projects within given time

UNIT -V:Contemporary Issues In Management

The concept of Management Information System (MIS)- Materials Requirement Planning (MRP)- Customer Relations Management (CRM)- Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management (SCM)- Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO) - Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

LEARNING OUTCOMES At the end if the Unit, the learners will be able to

- Understand modern management techniques
- Apply Knowledge in Understanding in modern
- Analyze CRM,MRP,TQM
- Evaluate Six Sigma concept and SCM

Text Books:

1. A.R Aryasri, Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.

References:

1. Koontz &Weihrich, Essentials of Management, 6/e, TMH, 2005.
2. Thomas N.Duening& John M.Ivancevich, ManagementPrinciples and Guidelines,Biztantra.
3. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
4. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
****** DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES ******

IV B. Tech I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A75402	**ORGANIZATIONAL BEHAVIOUR(HE-II)**	3	0	0	3

COURSE OBJECTIVES:	
1	**Toenablestudent's comprehension of organizational behavior**
2	**To offer knowledge to students onself-motivation, leadership and management**
3	**To facilitate them to become powerful leaders**
4	**To Impart knowledge about group dynamics**
5	**To make them understand the importance of change and development**

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the Organizational Behavior, its nature and scope.
CO2	Understand the nature and concept of Organizational behavior
CO3	Apply theories of motivation to analyze the performance problems
CO4	Analyze the different theories of leadership
CO5	Evaluate group dynamics
CO6	Develop as powerful leader

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						3					2	3	1	2	1
CO2								3				2	1	1	2
CO3									3				1	2	1
CO4											3		1	1	2
CO5												3	1	1	1
CO6											2	3	1	1	2

Syllabus

Unit-I: Introduction

, Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective - Understanding Individual Behavior –Attitude -Perception - Learning – Personality.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the concept of OrganizationalBehavior
- Contrast and compare Individual& Group Behavior andattitude
- Evaluate personality types

Unit-II: Motivation and Leading

Theories of Motivation- Maslow'sHierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theoryof expectancy - McClelland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory – Locke's goal setting theory– Alderfer'sERG theory - Leadership–research,theories, traits - LeadersVs Managers.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the concept of Motivation
- Analyze theTheories of motivation
- Explain how employees are motivated according to Maslow's Needs Hierarchy

Unit-III: Organizational Culture

Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of goodLeader - Conflict Management -Evaluating Leader- Women and Corporate leadership.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the concept of Leadership
- Contrast and compare Trait theoryand Managerial Grid
- Distinguish the difference between Transactional and Transformational Leadership
- Evaluate the qualities of good leaders

Unit-IV:Group Dynamics

Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of groupbehavior - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution

LEARNING OUTCOMES: -After completion of this unit student will

- Understand theconcept of Group Dynamics
- Contrast and compare Group behavior and group development
- Evaluate how to resolve conflicts in the organization

Unit-V:Organizational Change and Development

Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the importance of organizational change and development
- Apply change management in the organization
- Analyze work stress management
- Evaluate Managerial implications of organization

TEXT BOOKS:

1. Luthans, Fred, OrganisationalBehaviour, McGraw-Hill, 12 Th edition 2011 2. P Subba Rao,OrganisationalBehaviour,HimalyaPublishing House 2017

References

- McShane, Organizational Behaviour, TMH 2009
- Nelson,OrganisationalBehaviour, Thomson, 2009.
- Robbins, P.Stephen, Timothy A. Judge, OrganisationalBehaviour, Pearson 2009.
- Aswathappa,OrganisationalBehaviour,Himalaya, 2009

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****** DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES ******

IV B. Tech I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A75403	**BUSINESS ENVIRONMENT (HE-II)**	3	0	0	3

Course Objectives	
1	To make the student understand about the business environment
2	To enable them in knowing the importance of fiscal and monitory policy
3	To facilitate them in understanding the export policy of the country
4	To Impart knowledge about the functioning and role of WTO
5	To Encourage the student in knowing the structure of stock markets

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define Business Environment and its Importance.
CO2	Understand various types of business environment.
CO3	Apply the knowledge of Money markets in future investment
CO4	Analyze India's Trade Policy
CO5	Evaluate fiscal and monitory policy
CO6	Develop a personal synthesis and approach for identifying business opportunities

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						3					2	3	1	2	1
CO2								3				2	1	1	2
CO3									3				1	2	1
CO4											3		1	1	2
CO5												3	1	1	1
CO6											2	3	1	1	2

Syllabus

Unit-I:Overview of Business Environment

Introduction – meaning Nature,Scope,significance, functions and advantages. Types- Internal & External, Micro and Macro. Competitive structure of industries -Environmental analysis- advantages & limitations of environmental analysis& Characteristics of business.

Learning Outcomes: -After completion of this unit student will

- Understand the concept of Business environment
- Classify various types of business environment
- Evaluate the environmental analysis in business
- Discuss the Characteristics of Business.

Unit-II:Fiscal Policy

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Public debt - Development activities financed by publicexpenditure - Evaluation of recent fiscal policy of GOI. 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: -After completion of this unit student will

- Understand the concept of public revenue and public Expenditure
- Identify the functions of RBI and its role
- Analyze the Monitory policy in India
- Know the recent trends and the role of Finance Commission in the development of our country
- Differentiate between Fiscal and Monitory Policy

Unit-III:India's Trade Policy

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral TradeAgreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

Learning Outcomes: -After completion of this unit student will

- Understand the role ofIndian international trade
- Understand and explain the need for Export and EXIM Policies
- Analyze causes for Disequilibrium and correction measure
- Differentiate between Bilateral and Multilateral Trade Agreements

UNIT-IV:World Trade Organization

Introduction – Nature, meaning, significance, functions and advantages. Organization and Structure - Role andfunctions 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: -After completion of this unit student will

- Understand the role of WTO in trade
- AnalyzeAgreements on trade by WTO
- Understand the Dispute Settlement Mechanism
- Compare and contrast the Dumping and Anti-dumping Measures.

Unit-V:Money Markets And Capital Markets

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI - StockExchanges - Investor protection and role of SEBI.

Learning Outcomes: -After completion of this unit student will

- Understand the components of Indian financial system
- Know the structure of Money markets and Capital markets
- Analyze the Stock Markets
- Apply the knowledge in future investments
- Understand the role of SEBI in investor protection.

TEXT BOOKS:

1. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of 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.
Bhattacharya (2009), International Business, Excel Publications, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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ELECTRICAL AND ELECTRONICS ENGINEERING
IV B. Tech I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A70209	**POWER SYSTEMS & SIMULATION LAB**	0	0	3	1.5

Course Objectives: The objectives of this course include

1. To do the experiments (in machines lab) on various power system concepts like determination of sequence impedance, fault analysis, finding of subtransient reactances.
2. To draw the equivalent circuit of three winding transformer by conducting a suitable experiment.
3. To develop the MATLAB program for formation of Y and Z buses. To develop the MATLAB programs for Gauss-Seidel and fast decoupled load flow studies.
4. To develop the SIMULINK model for single area load frequency problem.

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

CO1 Get the practical knowledge on calculation of sequence impedance, fault currents, voltages and sub transient reactances. Get the practical knowledge on how to draw the equivalent circuit of three winding transformer.
CO2 Get the knowledge on development of MATLAB program for formation of Y and Z buses.
CO3 Get the knowledge on development of MATLAB programs for Gauss-Seidel and Fast Decouple Load Flow studies.
CO4 Get the knowledge on development of SIMULINK model for single area load frequency problem.

Mapping between Course Outcomes and Programme Outcomes:

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

List of Experiments

CYCLE - I

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine
2. LG Fault Analysis on an un loaded alternator
3. LL Fault Analysis on conventional phases
4. LLG Fault Analysis
5. LLLG Fault Analysis
6. Determination of Sub transient reactance of silent pole synchronous machine

7. Equivalent circuit of three winding transformer.

CYCLE - II

8. Y_{Bus} formation using MATLAB
9. Z_{Bus} formation using MATLAB
10. Gauss-Seidel load flow analysis using MATLAB
11. Fast decoupled load flow analysis using MATLAB
12. Develop a Simulink model for a single area load frequency problem and simulate the same.

Note: In Cycle-I at least four experiments to be conducted, In Cycle-II at least four programs to tested. Both the cycles put together at least 10 experiments must be carried out.

Virtual Lab:

- **http://vp-dei.vlabs.ac.in/Dreamweaver/list.html**

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IV B. Tech -I Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A70210	**DIGITAL SIGNAL PROCESSING LAB**	0	0	3	1.5

Course Objectives:
The objectives of the course are to make the students learn about:
1 To implement the processing techniques using the instructions of DSP Processor.
2 To implement various filters using MATLAB Programming.

Course Outcomes: The student can be able to perform:
CO1 Programming concepts to implement various digital filters.
CO2 Generation of signals and their processing.
CO3 Interfacing of DSP processor with other peripherals.

Mapping between Course Outcomes and Programme Outcomes:

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

SIMULATION IN MATLAB

Generation of Signals

1. Linear and circular convolution of two sequences
2. Sampling and effect of aliasing
3. Design of FIR filters
4. Design of IIR filters
5. Calculation of FFT of a signal
6. Decimation by polyphase decomposition.

USING PROCESSOR

Study of various addressing modes of DSP using simple programming examples.

7. Implementation of Linear and Circular Convolution.
8. Sampling of input signal and display.
9. Waveform generation.
10. Implementation of FIR filter

Virtuval Lab:

http://vlabs.iitkgp.ernet.in/dsp/#

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

Subject Code	Title of the Subject	L	T	P	C
19A80201	**POWER QUALITY (PEC-IV)**	3	0	0	3

Course Objectives:

1. To learn about voltage disturbances and power transients that is occurring in power systems.
2. To know about voltage sag and transient over voltages for quality of power supply
3. To understand about harmonics and their mitigation
4. To study about different power quality measuring and monitoring concepts.
5. To know about long duration voltage variations

Course Outcomes:

1. To get knowledge about different power quality issues and to mitigate them
2. Analyze voltage disturbances and power transients that are occurring in power systems.
3. Understand the concept of harmonics in the system and their effect on different power system equipment.
4. Able to understand the principles of regulation of long duration voltage variations
5. To get knowledge about different power quality measuring and monitoring concepts.

Mapping between Course Outcomes and Programme Outcomes:

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

Unit-1: POWER QUALITY ISSUES

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:

- To learn about various issues of power quality
- To know about the evaluation procedure of power quality issues
- To distinguish between short duration and long duration over voltages
- To know about voltage fluctuations and power frequency variations
- To learn about CBEMA and ITI curves in power quality issues

Unit-2: VOLTAGE SAGS AND TRANSIENT OVER VOLTAGES

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:

- To understand what is meant by voltage sag
- To know about voltage sag performance estimations
- To know about fundamental principles of protection from sag and to study various protection schemes
- To understand about various devices for over voltage protection
- To know about utility system lightning protections

Unit-3: FUNDAMENTALS OF HARMONICS

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:

- To understand about effects of harmonics
- To distinguish between voltage and current harmonics
- To understand about computation of harmonic indices
- To understand about the filters used for controlling harmonic distortion
- To know about IEEE and IEC standards for various power quality issues

Unit-4: LONG-DURATION VOLTAGE VARIATIONS

Principles of regulating the voltage, Devices for voltage regulation, utility voltage regulator Application, capacitors for voltage regulation, End user capacitor applications, flicker.

Learning Outcomes:

- To know about principles of regulating the voltages
- To understand about the necessity of power electronic devices for voltage regulation
- To know how to use capacitors for voltage regulation
- To identify various capacitor placement applications

Unit-5: POWER QUALITY BENCH MARKING AND MONITORING

Benchmarking process, RMS Voltage variation Indices, Harmonic indices Power Quality Contracts, Monitoring considerations, power quality measurement equipment, Power quality Monitoring standards.

Learning Outcomes:

- To know about what is meant by bench marking in power quality issues
- To identify and able to compute voltage variation indices
- To identify and able to compute harmonic indices
- To know about power quality monitoring considerations
- To know about power quality monitoring standards

Text Books:

1. Electrical Power Systems Quality by Roger C. Dugan, Mark F.Mc Granaghan, Surya Santoso, H.Wayne Beaty, 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

Web Sources: https://nptel.ac.in/courses/108/107/108107157/

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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A80202	**SWITCHED MODE POWER CONVERTERS (PEC-IV)**	3	0	0	3

Course Objectives:

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

CO1 Understand basic concepts of DC-DC converters
CO2 Understand the concepts of resonant converters and their classification, various types of multilevel inverters, power conditioners, UPS and filters.
CO3 Apply various modulation and harmonic elimination techniques over the converters.
CO4 Analyze the state space modelling of various types of converters.
CO5 Design inductor and transformer for various power electronic applications.

Course Outcomes:

CO1 To be able to understand advanced converters of SMPCs and solve the problems and to design of various DC-DC converters
CO2 To understand the performance of resonant converters
CO3 To understand various types and performance characteristics of 1-ϕ and 3-ϕ inverters with single/multi levels
CO4 To understand about power conditioners, UPS and filters
CO5 To know about the applications of the above in Power Systems, EVE, Renewable Energy Systems, etc.

Mapping between Course Outcomes and Programme Outcomes:

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

UNIT I DC-DC CONVERTERS

Principles of stepdown and stepup converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters – Numerical Examples

Learning Outcomes:

By the end of the unit, the student will be able to:

- Understand and analyze various types of DC-DC converters
- Understand state space modeling of DC-DC converters

- Distinguish between stepdown and stepup converters
- Apply the above concepts to solve numerical problems

UNIT II SWITCHING MODE POWER CONVERTERS

Analysis and state space modelling of flyback, Forward, Luo, Half bridge and full bridge converters- control circuits and PWM techniques – Numerical Examples

Learning Outcomes:

By the end of the unit, the student will be able to:

- Understand various types of converters
- Know about state space modelling of converters
- Understand about various control circuits & PWM techniques
- Apply the above concepts to solve numerical problems

UNIT III RESONANT CONVERTERS

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:

By the end of the unit, the student will be able to:

- Understand and analyze various types of resonant converters
- Classification of resonant converters
- know about output voltages and its waveforms for various configurations
- Distinguish between series and parallel resonant converters
- Apply the above concepts to solve numerical problems

UNIT IV DC-AC CONVERTERS

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:

By the end of the unit, the student will be able to:

- Understand and analyze different single phase and three phase inverters
- Understand various modulation techniques
- Understand various harmonic elimination techniques
- Understand various types of multilevel inverters with waveforms and their applications
- Apply the above concepts to solve numerical problems

UNIT V POWER CONDITIONERS, UPS & FILTERS

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:

By the end of the unit, the student will be able to:

- Understand different types of power line disturbances, power conditioners, in detail working of UPS and its applications.
- Understand various types of filters with and without capacitors and selection of capacitors.
- Design inductor and transformer for various power electronic applications.
- Apply the above concepts to solve numerical problems.

Text Book:

1. Power Electronics: Essentials and Applications by L. Umanand, Wiley, 2009
2. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.
3. Course material on Switched Mode Power Conversion by V Ramanarayanan, Dept. of Electrical Engg. IISc. Bangalore.

REFERENCES:

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.

Web Sources: https://nptel.ac.in/courses/108/108/108108036/

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ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A80203	**INTELLIGENT CONTROL TECHNIQUES (PEC-IV)**	3	0	0	3

Course Objectives:

1. To get exposed to a few Intelligent Control Techniques
2. To learn about Artificial Neural Network based Estimators
3. To learn about Fuzzy Logic Control System as one of the ICT
4. To learn about a few evolutionary algorithms
5. To implement the various ICTs for linear and non-linear systems as case studies

Course Outcomes:

1. To get familiarity of various Intelligent Control Techniques
2. To be able to design the controllers and estimators using ANN
3. To be able to model and develop control schemes with Fuzzy Logic rule bases
4. To be able to implement an evolutionary algorithm suitable to optimize and design a given system specifications
5. To be able to use MATLAB tool boxes for implementation of various ICTs for system modelling, control schemes and to design estimators

Mapping between Course Outcomes and Programme Outcomes:

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

Unit-I: Fundamentals of AI

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:

- To get exposed to fundamentals of AI
- To understand about architecture of Intelligent Control
- To understand about rule based systems
- To learn about knowledge representation and symbolic reasoning system
- To know about the concepts of expert systems

Unit-II: ANN based Controllers and Estimators

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; Learning and Training the neural network-Supervised and unsupervised learning concepts; BAM networks, Hopfield network; Self-organizing network and Recurrent network; Neural Network based controllers and estimators design.

Learning Outcomes:

- To learn about basic concepts of ANN
- To develop mathematical models for various controllers of single and multilayer perceptrons
- To get exposed to learning and training the Neural Networks
- To distinguish between Supervised and Unsupervised learning concepts
- To be able to design ANN based controllers and estimators

Unit-III: Fuzzy Logic Control System

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; Fuzzy modelling and control schemes for linear and nonlinear systems; Fuzzy estimators.

Learning Outcomes:

- To learn about fundamentals of Fuzzy Logic Control systems
- To be able to understand knowledge and rule bases in Fuzzy Logic Systems
- To understand about the Fuzzy modelling and control schemes
- To develop the Fuzzy modelling and control schemes for Linear systems
- To develop the Fuzzy modelling and control schemes for non-linear systems

Unit-IV: Evolutionary Algorithms

Genetic Algorithm: Introduction - basic concepts, application, Adaptive Neuro-fuzzy Inference System (ANFIS), Neuro-Genetic, Fuzzy-Genetic systems. Ant colony optimization, Particle swarm optimization (PSO) – basic concepts and design procedures.

Learning Outcomes:

- To learn about basic concepts of evolutionary algorithms
- To learn about ANFIS
- To learn about Fuzzy-Genetic systems
- To learn about Neuro-Genetic systems
- To learn about a few optimization techniques

- To be able to design the systems with suitable evolutionary algorithms for specific requirements

Unit-V: Case Studies

Identification and control of linear and nonlinear dynamic systems using Neural Networks; Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox; optimization for controller design in case of constrained and unconstrained optimization issues.

Learning Outcomes:

- To identify case studies related to linear and non-linear dynamic systems
- To be able to implement control strategies with Neural Networks for the identified systems
- To be able to implement controllers using MATLAB Fuzzy Logic tool box
- To be able to implement optimization techniques for controller design with constrained and unconstrained conditions
- To be able to design systems with various tool boxes in MATLAB environment

TEXT BOOKS:

1. Padhy.N.P.; "Artificial Intelligence and Intelligent Systems"; Oxford University Press, 2005
2. Jacek. M. Zurada; "Introduction to Artificial Neural Systems", Jaico Publishing House, 1st Edition, 1994
3. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, WILEY Publications, 2011
4. S.N. Sivanandam and S.N. Deepa, Introduction to Genetic Algorithms, Springer Publications, 2008

REFERENCS:

1. J.S.R. Jang, C.T.Sun and E. Mizutami, "Neuro-Fuzzy & Soft Computing", Pearson India Education Services Pvt. Ltd.
2. Laurere Fauselt, "Fundamentals of Neural Networks", Pearson India Education Services Pvt. Ltd.

Web Sources: http://www.digimat.in/nptel/courses/video/108104049/L19.html

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IV B. Tech –II Sem. (E.E.E)

Subject Code	Title of the Subject	L	T	P	C
19A80204	**INTRODUCTION TO HYBRID AND ELECTRIC VEHICLES (OEC – IV)**	3	0	0	3

Course Objectives:

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

Course outcomes:

After learning the course the students will be able to:

- Explain the working of hybrid and electric vehicles. (l2)
- Choose a suitable drive scheme for developing an hybrid and electric vehicles dependingon resources. (l3)
- Develop the electric propulsion unit and its control for application of electricvehicles.(l3)
- Choose proper energy storage systems for vehicle applications. (l3)
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles.(l3)

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

UNIT I: Electric Vehicle Propulsion and Energy Sources

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 anddischarge, 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:

After successful completion of this unit, the students 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

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boostconverter, 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:

After successful completion of this unit, the students will be able to

- Choose a suitable drive scheme for developing an electric vehicles depending onresources.(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

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.

Learning Outcomes:

After successful completion of this unit, the students 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

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:

After successful completion of this unit, the students will be able to

- List the various electric and hybrid vehicles in the present market. (l1)
- Discus 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:

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:

After successful completion of this unit, the students 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", 2nd edition, CRCPress, 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.

References:

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", 1st edition, Wiley- Blackwell, 2018.

Web Sources: https://nptel.ac.in/courses/108/103/108103009/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU
ELECTRICAL AND ELECTRONICS ENGINEERING

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

Subject Code	Title of the Subject	L	T	P	C
19A80205	**Battery Management Systems (OE-IV)**	3	0	0	3

Course Objective:

- The objective of this course is to introduce learner to batteries, its parameters, modelling and charging requirements.
- The course will help learner to develop battery management algorithms for batteries

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

- Interpret the role of battery management system
- Identify the requirements of Battery Management System
- Interpret the concept associated with battery charging / discharging process
- Calculate the various parameters of battery and battery pack
- Design the model of battery pack

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

Unit I : Introduction:

Introduction to Battery Management System, Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging

Learning Outcomes:

- To understand cells, batteries and cell connections.
- To analyze the concepts of charging, discharging, over charge and undercharge

Unit II Battery Management System Requirement:

Introduction and BMS functionality, Battery pack topology, Voltage Sensing, Temperature Sensing, Current Sensing, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State-of-charge estimation, Cell total energy and cell total power

Learning Outcomes:

- To understand BMS functionality, voltage sensing, temperature sensing and current sensing

- To estimate state of charge and cell total energy and power
- To analyze High-voltage contactor control, Thermal control and communication interface

Unit III Battery State of Charge and State of Health Estimation, Cell Balancing:

Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, Lithium-ion aging: Negative electrode, Lithium ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing

Learning Outcomes:

- To understand aging concepts in batteries, cell balancing and imbalance and circuits for balancing
- To estimate SOC based on Voltage, model, battery health and aging

Unit IV Modelling and Simulation:

Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empirical modelling approach, Physics-based modelling approach, Simulating an electric vehicle, Vehicle range calculations, Simulating constant power and voltage, Simulating battery packs

Learning Outcomes:

- To obtain ECM based on physics, empirical approach.
- To simulate electric vehicle, vehicle range calculations, constant power and voltage and battery packs.

Unit V Design of battery:

Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system

Learning Outcomes:

- To analyze the design principle of BMS

Text Books

1. Plett, Gregory L. Battery management systems, Volume I: Battery modeling. Artech House, 2015.
2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.
3. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.
4. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs" Artech House, 2010
5. Pop, Valer, et al. Battery management systems: Accurate state-of-charge indication for battery-powered applications. Vol. 9. Springer Science & Business Media, 2008.

Web Sources: https://nptel.ac.in/content/storage2/courses/108103009/download/M9.pdf

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

Subject Code	Title of the Subject	L	T	P	C
19A80206	**SMART ELECTRIC GRID (OE-IV)**	3	0	0	3

Course Objectives:

1. To learn about recent trends in grids as smart grid
2. To understand about smart grid architecture and technologies
3. To know about smart substations
4. To learn about smart transmission systems
5. To learn about smart distribution systems

Course Outcomes:

1. To be able to understand trends in Smart grids
2. To understand the needs and roles of Smart substations
3. To understand the needs and roles of Smart Transmission systems
4. To understand the needs and roles of Smart Distribution systems
5. To distinguish between SCADA and DSCADA systems in practical working environment

Mapping between Course Outcomes and Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	3	2		3		2	3		3	3	3	3
CO2	2	3	2	3	2		3		2	3		3	3	3	3
CO3	1	3	2	2	1		3		2	3		2	3	3	3
CO4	2	3	1	2	2		3		2	3		3	3	3	3
CO6	3	2	2	2	1								2	2	2

UNIT-I: Introduction to Smart Grid

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:

- To understand basic definitions and architecture of Smart grid
- To learn about new technologies for smart grid
- To know about fundamental components of smart grid

- To understand key challenges of smart grid
- To understand the need for integration of Renewable energy sources

UNIT-II: Smart grid Technologies

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:

- To know about basic characteristic features of smart grid technologies
- To understand about definition, types, building blocks of Microgrids
- To know about integration requirements, standards of renewable energy sources in Microgrids
- To understand Load frequency and reactive power control of Microgrid
- To understand about Microgrid through a case study

UNIT-III: Smart Substations

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:

- To know about protection, monitor and control devices in Smart substations
- To know about the importance of SCADA in substations
- To understand about interoperability and IEC 61850
- To know about role of substations in Smart grid
- To understand about Volt/VAR control equipment inside substation

UNIT-IV: Smart Transmission

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:

- To know about Energy Management Systems in smart transmission systems
- To understand about WAMPC
- To know about role of transmission systems in Smart grid
- To know about Synchro Phasor Measurement units

UNIT-V: Smart Distribution Systems

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:

- To know about DSCADA in Smart Distribution Systems
- To distinguish between current and advanced DMSs
- To know about occurrence of voltage fluctuations
- To understand about VAR control and equipment on distribution feeders
- To know about FDIR objectives and benefits

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.

Web Sources: https://onlinecourses.nptel.ac.in/noc19_ee64/preview