R19 - COURSE STRUCTURE
&
SYLLABUS (FOR 4 YEARS)

ELECTRICAL & ELECTRONICS ENGINEERING

(Applicable for batches admitted from 2019-2020)

UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM *(Autonomous)*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

VIZIANAGARAM - 535 003, ANDHRA PRADESH, INDIA

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
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KAKINADA - 533 003, ANDHRA PRADESH, INDIA

B.Tech R19-COURSE STRUCTURE

I Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	C
1	HS	Communicative English	3	0	0	3
2	BS	Calculus	3	0	0	3
3	BS	Applied Chemistry	3	0	0	3
4	ES	Fundamentals of Computers	3	0	0	3
5	ES	Engineering Drawing	1	0	3	2.5
		Labs				
6	HS	English- Communication Skills Lab - I	0	0	3	1.5
7	BS	Applied Chemistry Lab	0	0	3	1.5
8	ES	IT Workshop	0	0	2	1
9	ES	Electrical Engineering Workshop	0	0	3	1.5
		Mandatory Courses				
10	MC	Constitution of India	3	0	0	0
11	MC	Physical Fitness Activities/ Yoga	0	0	0	0
		Total Credits	**17**	**0**	**14**	**20**

I Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	C
1	BS	Linear Algebra and Numerical Methods	3	0	0	3
2	BS	Vector Calculus, Transforms and PDE	3	0	0	3
3	BS	Applied Physics	3	0	0	3
4	ES	Problem Solving and Programming Using C	3	0	0	3
5	PC	Electrical Circuit Analysis - I	3	0	0	3
		Labs				
6	HS	English - Communication Skills Laboratory - II	1	0	3	1.5
7	BS	Applied Physics Lab	0	0	3	1.5
8	BS	Applied Physics Virtual Lab	0	0	2	0
9	ES	Problem Solving and Programming Using C Lab	0	0	3	1.5
10	PR	Engineering Exploration Project- Design Thinking (15 Hrs per Sem.)	0	0	0	0.5
		Mandatory Course				
11	MC	Professional Ethics and Human Values	3	0	0	0
		Total Credits	**19**	**0**	**12**	**20**

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II Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	C
1	PC	Electrical Circuit Analysis - II	3	0	0	3
2	PC	Electrical Machines-I	3	0	0	3
3	ES	Electronic Devices and Circuits	3	0	0	3
4	PC	Electro Magnetic Fields	3	0	0	3
5	ES	Thermal and Hydro Prime movers	3	0	0	3
6	BS	Complex Variables and Statistical Methods	3	0	0	3
7	ES	Thermal and Hydro Laboratory	0	0	2	1
8	PC	Electrical Circuits Laboratory	0	0	3	1.5
9	MC	Environmental Science	3	0	0	0
	Total Credits		**21**	**0**	**5**	**20.5**

II Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	C
1	PC	Electrical Measurements and Instrumentation	3	0	0	3
2	PC	Electrical Machines-II	3	0	0	3
3	ES	Digital Electronics	3	0	0	3
4	PC	Control Systems	3	0	0	3
5	PC	Power Systems-I	3	0	0	3
6	HS	Managerial Economics and Financial Analysis	3	0	0	3
7	PC	Electrical Machines -I Laboratory	0	0	3	1.5
8	ES	Electronic Devices & Circuits Laboratory	0	0	2	1
9	HS	IPR & Patents	3	0	0	0
	Total Credits		**21**	**0**	**5**	**20.5**

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B.Tech R19-COURSE STRUCTURE

III Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	C
1	PC	Power Systems-II	3	0	0	3
2	PC	Power Electronics	3	0	0	3
3	ES	Linear IC Applications	3	0	0	3
4	ES	Signals and Systems	3	0	0	3
5	OE	**Open Elective-I**	3	0	0	3
6	PC	Electrical Machines-II Laboratory	0	0	3	1.5
7	PC	Control Systems Laboratory	0	0	3	1.5
8	PC	Electrical Measurements & Instrumentation Laboratory	0	0	3	1.5
	Total Credits		**15**	**0**	**9**	**19.5**

III Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	C
1	PC	Electric Drives	3	0	0	3
2	PC	Power System Analysis	3	0	0	3
3	ES	Microprocessors and Microcontrollers	3	0	0	3
4	PC	Renewable Energy Systems	3	0	0	3
5	PE	**Program Elective-I**	3	0	0	3
6	OE	**Open Elective-II**	3	0	0	3
7	PC	Power Electronics Laboratory	0	0	3	1.5
8	ES	Linear & Digital IC Applications Laboratory	0	0	2	1
9	PR	Industry Oriented Mini Project/ Internship (MC)	0	0	0	0
	Total Credits		18	**0**	**5**	**20.5**

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B.Tech R19-COURSE STRUCTURE

IV Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	C
1	**PC**	Switchgear and Protection	3	0	0	3
2	PC	Utilization of Electrical Energy	3	0	0	3
3	PC	Electrical Distribution Systems	3	0	0	3
4	PE	**Program Elective – II**	3	0	0	3
5	PE	**Program Elective - III**	3	0	0	3
6	ES	Microprocessors & Microcontrollers lab	0	0	3	1.5
7	PC	Power Systems & Simulation Laboratory	0	0	3	1.5
8	PR	Project-I	0	0	8	4
	Total Credits		**15**	**0**	**14**	**22**

IV Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	C
1	PC	Power System Operation and Control	3	0	0	3
2	OE	**Open Elective-III**	3	0	0	3
3	PE	**Program Elective - IV**	3	0	0	3
4	PR	Project-II	0	0	16	8
	Total Credits		**9**	**0**	**16**	**17**

BS – Basic Sciences **HS – Humanity Sciences** **OE – Open Elective**
ES – Engineering Sciences **PE – Elective**
MC–Mandatory Course **PR-- Project**

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B.Tech R19-COURSE STRUCTURE

List of Program Elective Subjects

Program Elective -I: (III-II)

1. Computer Organization
2. AI Techniques and Applications in Electrical Engineering
3. JAVA Programming
4. Digital Signal Processing
5. Management and Organizational Behavior

Program Elective-II: (IV-I)

1. Electrical Machine Modeling and Analysis
2. Advanced Control Systems
3. Data Base Management Systems (D.B.M.S)
4. Control and Integration of Renewable Energy Sources
5. Swayam Course-I

Program Elective-III: (IV-I)

1. Data Structures
2. Special Electrical Machines
3. Digital Control Systems
4. Hybrid Electric Vehicles
5. Swayam Course-II

Program Elective-IV: (IV-II)

1. HVAC & DC Transmission
2. Smart Grids
3. Flexible Alternating Current Transmission Systems
4. IoT Applications in Electrical Engineering
5. Power Quality

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B.Tech R19-COURSE STRUCTURE

List of Open Elective Subjects offered by EEE Branch

Open Elective-I

1. Non-Conventional Energy Sources
2. Basics of Control systems
3. Principles of Electric Power Conversion

Open Elective-II

1. Programmable Logic Controller and Applications
2. Energy Storage Systems
3. Soft Computing Techniques

Open Elective-III

1. Electric Vehicles
2. Indian Electricity Act, 2003.
3. Power Systems for Data Centres

APPENDIX-E1

B.Tech (R19) UCEV (*Autonomous*) w.e.f 2019-20

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B.Tech I Year I Semester

L	T	P	C
3	0	0	3

Communicative English
(Common to all Branches)

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

Unit I:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",** Pearson Publications. (Non-detailed)

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

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

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

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

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

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

Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit II:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications. (Non-detailed)

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

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.

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

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

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

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

Unit III:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications. (Non-detailed**)**

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

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

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

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

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

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words

Unit IV:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.** (Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

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

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

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

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms
Pronunciation: Contrastive Stress

Unit V:
Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications
Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications. (Non-detailed)
Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

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

Reading for Writing: Writing academic proposals- writing research articles: format and style.

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

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Pronunciation: Stress in compound words

Course 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

Prescribed text books:

1. "Infotech English", Maruthi Publications. (Detailed)

2. "The Individual Society", Pearson Publications. (Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "Infotech English", Maruthi Publications. (with Compact Disc)

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.

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B.Tech I Year I Semester

Communicative English (Theory)-Structure
(Common to all Branches)

	Listening	Speaking	Reading	Reading for Writing	Vocabulary	Grammar	Pronunciation
Unit I	1. Listening to short audio texts and identifying the topic. Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing.	1. Asking and answering general questions on familiar topics such as home, family, work, studies and interests 2. Self introductions and introducing others	1. Skimming text to get the main idea 2. Scanning to look for specific pieces of information	Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters	Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.	Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences	Vowels Consonants Plural markers and their realizations
Unit II	Answering a series of questions about main idea and supporting ideas after listening to	Discussion in pairs/ small groups on specific topics followed by short structured talks.	Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.	Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.	Technical vocabulary from across technical branches (20 words)	Use of articles and zero article; prepositions.	Past tense markers, word stress-di-syllabic words

	audio texts, both in speaking and writing.	Functional English: Greetings and leave takings.			GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)		
Unit III	Listening for global comprehension and summarizing what is listened to, both in speaking and writing.	Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.	Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.	Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing- types, format and principles of letter writing. E-mail etiquette, Writing CV's.	Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words	Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.	word stress- poly-syllabic words
Unit IV	Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.	Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.	Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.	Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.	Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.	Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms	Contrastive Stress
Unit V	Identifying key terms, understandi	Formal oral presentations on topics from	Reading for comprehension.	Writing academic proposals- writing	Technical vocabulary from	Editing short texts –	Stress in compound words

	ng concepts and interpreting the concepts both in speaking and writing.	academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.	RAP Strategy Intensive reading and Extensive reading techniques.	research articles: format and style.	across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions	identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)	

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L	T	P	C
3	0	0	3

B.Tech I Year I Semester

Calculus
(Common to ALL branches)

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

UNIT I: Sequences, Series and Mean value theorems: (10 hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations: (15 hrs)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form – Non-homogeneous equations of higher order with constant coefficients with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method of Variation of parameters

Applications: Orthogonal trajectories – Electrical circuits (RL, RC, RLC) – Simple Harmonic motion.

UNIT III: Partial differentiation: (10 hrs)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT IV: Multiple integrals: (8 hrs)

Double and Triple integrals – Change of order of integration – Change of variables. Applications: Finding Areas and Volumes.

UNIT V: Special functions: (5 hrs)

Introduction to Improper Integrals-Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Course Outcomes:

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

- utilize mean value theorems to real life problems
- solve the differential equations related to various engineering fields
- familiarize with functions of several variables which is useful in optimization
- Apply double integration techniques in evaluating areas bounded by region
- students will also learn important tools of calculus in higher dimensions. Students will become

  familiar with 2- dimensional and 3-dimensional coordinate systems
- Conclude the use of special function in multiple integrals

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Reference Books:

1. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **Joel Hass, Christopher Heil and Maurice D. Weir,** Thomas calculus, 14th Edition, Pearson.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

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L	T	P	C
3	0	0	3

B.Tech I Year I or II Semester

APPLIED CHEMISTRY

(For Circuital branches ECE, EEE, CSE & IT)

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

Course Objectives:

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- ***Express*** the increase in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- ***Explain*** the crystal structures, and the preparation of semiconductors. Magnetic properties are also studied.
- ***Recall*** the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.

UNIT I: POLYMER TECHNOLOGY

Polymerisation:- Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION

Electrochemical Cells: Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells–Fuel cells: H_2-O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

Corrosion:-Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)-Protective coatings: Surface preparation, cathodic and

anodic coatings, electroplating, electroless plating (nickel). Paints (constituents, functions, special paints).

UNIT III: MATERIAL CHEMISTRY

Part I ***: Non-elemental semiconducting materials****:-* Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II:

Nano materials:- Introduction-sol-gel method- characterization by BET, SEM and TEM methods-applications of graphene-carbon nanotubes and fullerenes: Types, preparation and applications

Liquid crystals:- Introduction-types-applications.

Super conductors:-Type –I, Type II-characteristics and applications

UNIT IV: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

Computational chemistry: Introduction, Ab Initio studies, DFT; TD-DFT calculations using Guassian software

Molecular switches**:** characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

UNIT V: SPECTROSCOPIC TECHNIQUES & NON CONVENTIONAL ENERGY SOURCES

Spectroscopic Techniques: Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR (instrumentation and IR of some organic compounds, applications)-magnetic resonance imaging and CT scan (procedure & applications).

Non Conventional Energy Sources: Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, organic photo-voltaics, hydropower, geothermal power, wind power, tidal and wave power, ocean thermal energy conversion.

Course Outcomes:

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

- ***Outline*** preparation, properties and applications of some plastic materials and synthetic rubber explain the mechanism of conduction in conducting polymers.
- ***Explain*** the theory of construction of battery, fuel cells and categorize the reasons for corrosion and study some methods of corrosion control.
- ***Understand*** the importance of materials like nanomaterials and fullerenes and their uses,

  liquid crystals and superconductors.
- ***Obtain*** the knowledge of computational chemistry and understand the importance molecular machines, principles of different analytical instruments.
- **Explain** the different applications of analytical instruments and study the design sources of energy by different natural sources.

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co. Latest edition
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition

Reference Books:

1. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest edition
2. Engineering Chemistry by Shashi Chawla; Dhanpat Rai Publicating Co. Latest edition

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I Year – I SEMESTER		L	T	P	C
		3	0	0	3

FUNDAMENTALS OF COMPUTERS

Preamble:

The digital computers are playing a vital role in day to day life of human beings. The main aim of this course is to make the students to understand the working and applications of digital computers.

Course objectives:

- To study different types and working of a digital computer.
- To learn different number systems and representation of floating point numbers.
- To understand the need and working of memory and other peripheral devices.
- To be familiar with internal organization of a computer.
- To study the interconnection of computers and applications of computer.

Unit-I: Introduction:
History of digital computers, types of computers, block diagram of a digital computers, Various properties of a digital computer, computer programming-Machine language, assembly language and high-level language programming.

Unit-II: Number systems
Binary, octal, Decimal and Hexadecimal number systems. Conversion of numbers from one system to other system.Fixed point and floating-point representation of numbers, Addition and Subtraction, Multiplication Algorithms.Division Algorithms. Floating- point Arithmetic operations.

Unit-III: Memory and Peripherals
Memories: Need for memory, types of computer memories-magnetic, Dynamic and Static memories, RAM, ROM, EPROM and EEROM memories, cache memory, concept of virtual memory.
Peripheral Devices: Working of keyboard and Mouse, types of printers and its working, I/O ports, addressing I/O devices-Programmed I/O, Interrupt I/O, DMA.
Unit-IV: Computer Organization
Organization of a processor- Registers, ALU and Control Unit, Register transfer language, Micro operation, instruction codes, computer instruction, instruction formats, instruction cycle, memory reference instructions, Input-output instruction, control memory, address sequencing, design of control unit- micro programmed control, hard wired control.

Unit-V: Applications
Various applications of computers, networking of computers-LAN, WAN, MAN, Internet, internet of thing(IoT) applications to electrical engineering.

Course Outcomes:

- Understand the functioning and programming of computers.
- Convert numbers from one type of system to other type of system
- Distinguish between different types of memories and learn the mapping of I/O devices.
- Demonstrated the internal organization of digital computer.
- Apply digital computers for storing electrical engineering problems.

Text Books:

1. Computer fundamentals by PK sinha, 6th Edition, BPB publications.
2. Fundamentals of computers by E. Balaguruswamy. MCGraw Hill edition.
3. Computer fundamentals by AnithaGoel. Pearson education.

I BTech - II Semester

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

- To introduce the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales. The student will be able to understand the need to enlarge or reduce the size of objects in representing them.
- To introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other.
- To make the students draw the projections of the lines inclined to both the planes.
- To make the students draw the projections of the plane inclined to both the planes.
- To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
- To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

UNIT I

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Ellipse: construction by arcs of circles and Oblong methods;
Scales: Plain scales, Diagonal scales and Vernier scales

UNIT II

Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.
Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

UNIT III

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT IV

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

UNIT V

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

TEXT BOOKS:

1. Engineering Drawing, N. D. Bhatt, Chariot Publications
2. Engineering Drawing, K. L. Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics, P.I. Varghese, McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Graphics for Degree, K. C. John, PHI Publishers
2. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

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VIZAINAGARAM - 535 003, ANDHRA PRADESH, INDIA

B.Tech I Year I Semester

L	T	P	C
0	0	3	1.5

English Communicative Skills Lab-I
(Common to all Branches)

UNIT I:

Pronunciation-Vowels, Consonants

Oral Activity: JAM

UNIT II:

Pronunciation: Consonants

Oral Activity: Past tense markers

UNIT III:

Pronunciation: Word Stress

Oral Activity: Hypothetical Situations

UNIT IV:

Pronunciation: Disyllabic words, polysyllabic words

Oral Activity: Self /Peer profile

UNIT V: Common Errors in Pronunciation
Neutralizing Accent

Prescribed text book: Phonetic Transcription

1. "**Infotech English**", Maruthi Publications.

References Books :

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

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B.Tech I Year I or II Semester

L	T	P	C
0	0	3	1.5

APPLIED CHEMISTRY LAB

(For Circuital branches ECE, EEE, CSE & IT)

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

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of copper (II) using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of iron (III) by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of the concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of $CaCO_3$ present in an egg shell.
13. Estimation of Vitamin C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Preparation of nylon-6, 6 and Bakelite (demonstration only).

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

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

Reference Books

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

IT WORKSHOP

Objectives:

- **PC Hardware:** Identification of basic peripherals, Assembling a PC, Installation of system software like MS Windows, device drivers, etc. Troubleshooting of PC Hardware and Software issues.
- **Internet & World Wide Web:** Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.
- **Productivity Tools:** Understanding and practical approach of professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite office tools.

Course Outcomes:

List of Exercises:

(Faculty to consolidate the workshop manuals using the textbook and references)

Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

Task 2: Practicing disassembling and assembling components of a PC

Task 3: Installation of Device Drivers, MS windows, Linux Operating systems and Disk Partitioning

Task 4: Introduction to Memory and Storage Devices, I/O Port, Assemblers, Compilers, Interpreters, Linkers and Loaders.

Task 5: Demonstration of Hardware and Software Troubleshooting

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, and Dialup Connection.

Task 7: Awareness of various threats on the Internet and its solutions

Task 8: Demonstration and Practice on Microsoft Word

Task 9: Demonstration and Practice on Microsoft Excel

Task 10: Demonstration and Practice on Microsoft Power Point

Task 11: Demonstration and Practice on LaTeX

TEXT BOOK:

1. Computer Fundamentals, Anita Goel, Pearson India Education, 2017
2. PC Hardware Trouble Shooting Made Easy, TMH

REFERENCE BOOK:

1. Scott Mueller's Upgrading and Repairing PC's, 18/e, Scott. Mueller, QUE, Pearson,2008
2. Comdex Information Technology, Vikas Gupta, Dreamtech.
3. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu
4. Information Technology Workshop, 3e, G. Praveen Babu, M. V. Narayana, BS Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
I Year – I SEMESTER		**0**	**0**	**3**	**1.5**
ELECTRICAL ENGINEERING WORKSHOP					

Course Objectives:

- To demonstrate the usage of measuring equipment
- To train the students in setting up simple wiring circuits
- To impart methods in electrical machine wiring

Any 10 of the following experiments are to be conducted

1. Study of various electrical tools and symbols.
2. Identify different types of cable/wires and switches, fuses and fuse carries, MCCB ,ELCB/RCCB, with ratings and usage.
3. Identification types of resistors and capacitors.
4. Wiring of light/fan circuit using two way/ three way control (stair case wiring)
5. Go-down wiring/Tunnel wiring
6. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy.
7. Measurement of voltage, current, resistance in DC circuit.
8. Measurement of Voltage, Calculate the power factor of the circuit.
9. Wiring of backup power supply including inverter, battery and load for domestic.
10. Types of earthing, physical implementation.
11. Identification of terminals of different semiconductor devices.
12. Identification of peripherals of a computer. To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O devices, power rating of computers.
13. A practice on disassembling the components of a PC and assembling them to back to working condition.
14. Hardware trouble shooting (Demonstration): Identification of a problem and fixing a defective PC (improper assembly of peripherals)
15. Software troubleshooting (Demonstration): Identification of a problem and fixing the PC for any software issues.

Course Outcomes:

- Explain the limitations, tolerance, safety aspects of electrical systems and wiring.
- Select wires/cables and other accessories used in different types of wiring.
- Make simple lighting and power circuits.
- Measure current, voltage and power in a circuit.

APPENDIX-D4

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B.Tech I Year I or II Semester

L	T	P	C
3	0	0	0

Constitution of India
(Common to All Branches)

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative.

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

Local Administration - District's Administration Head - Role and Importance, Municipalities – Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level

Organizational Hierarchy - (Different departments). Village level - Role of Elected and Appointed officials - Importance of grass root democracy

UNIT-V

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

Course Outcomes:

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

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
    1. Know the sources, features and principles of Indian Constitution.
    2. Learn about Union Government, State government and its administration.
    3. Get acquainted with Local administration and Pachayati Raj.
    4. Be aware of basic concepts and developments of Human Rights.
    5. Gain knowledge on roles and functioning of Election Commission

References 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
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics

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

E-resources:

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

DEPARTMENT OF BS&HSS

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VIZIANAGARAM - 535 003, ANDHRA PRADESH, INDIA

B.Tech I Year II Semester

L	T	P	C
3	0	0	3

Linear algebra and Numerical Methods
(Common to ALL branches)

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Unit I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)

Rank of a matrix by echelon form and normal form- Gauss Jordan method to find inverse – Solving system of homogeneous and non-homogeneous equations linear equations — Eigen values and Eigen vectors and their properties.
Applications: Free vibration of a two-mass system.

Unit-II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)

Cayley-Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT III: Iterative methods: (8 hrs)

Introduction – Algebraic transcendental equations: Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations)

Solving system of linear equations: Gauss elimination- Diagonal dominance- Jacobi and Gauss-Seidel methods– Necessary and sufficient condition for convergence(only statement)-Power Method for finding Largest Eigenvalue –Eigenvector.

UNIT IV: Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton’s forward and backward formulae for interpolation – Interpolation with

unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

UNIT V: Numerical integration and solution of ordinary differential equations: (10 hrs)

Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order) – Milne's Predictor and Corrector Method.

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
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations

Text Books:

1. **M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
2. **B. S. Grewal,** Higher Engineering Mathematics, 43^{rd} Edition, Khanna Publishers.

Reference Books:

1. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **David Poole,** Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.
3. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
4. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.

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B.Tech I Year - II Semester or II Year - I Semester

L	T	P	C
3	0	0	3

Vector Calculus, Transforms and PDE

(Common to ECE, EEE of I B.Tech - II Semester & Civil, ME, MET of II B.Tech - I Semester)

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Unit –I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential. Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

Unit –II: Laplace Transforms: (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (with out proof).

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

Unit –III: Fourier series and Fourier Transforms: (10 hrs)

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

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

Unit –IV: PDE of first order: **(8 hrs)**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications: (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

Course Outcomes:

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

- interpret the physical meaning of different operators such as gradient, curl and divergence
- estimate the work done against a field, circulation and flux using vector calculus
- apply the Laplace transform for solving differential equations
- find or compute the Fourier series of periodic signals
- know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
- identify solution methods for partial differential equations that model physical processes

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Reference Books:

1. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **Dean. G. Duffy,** Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3. **Peter O' Neil,** Advanced Engineering Mathematics, Cengage.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

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B.Tech I Year - II Semester or II Year - I Semester

L	T	P	C
3	0	0	3

APPLIED PHYSICS

For Circuital Branches (EEE, ECE, CSE & IT)

The designed curriculum, encompassing the fundamental concepts of physical optics, electromagnetism and properties of materials, caters to the needs of ECE, CSE, EEE and IT students who require a basic understanding of the advanced courses in their respective branches.

Course Objectives:

- To **impart** knowledge in basic concepts of physics like physical optics, electromagnetism and optical fibres to understand the wave properties in the communication system.
- To **impart** knowledge concerning the electrical behaviour of dielectric materials.
- To **demonstrate** the properties of magnets.
- To **introduce** semiconductor physics to understand the charge carrier transport mechanism.

UNIT-I: Wave Optics (10hrs)

Interference: Principle of Superposition - Coherent Sources - Interference of Light - Interference in Thin Films (Reflected Geometry) - Newton's Rings.

Diffraction: Fraunhofer Diffraction - Fraunhofer Diffraction at a Single Slit (Qualitative) - Diffraction Grating - Grating Spectrum Analysis (Qualitative) - Resolving Power - Rayleigh's Criterion - Resolving Power of Grating.

Polarization: Polarization by Reflection - Double Refraction - Nicol Prism - Half Wave Plate and Quarter Wave Plate.

UNIT-II: Quantum Mechanics and Free Electron Theory (9hrs)

Quantum Mechanics: Introduction - de Broglie Hypothesis - Matter Waves and Properties - Interpretation of Wave Function - Schrödinger Time Independent and Time Dependent Wave Equations - Particle in a Box.

Free Electron Theory: Classical Free Electron Theory, Quantum Free Electron Theory and Band Theory of Solids (Postulates and Drawbacks) - Fermi Dirac Distribution Function and Temperature Dependence - Bloch's Theorem (Qualitative) **-** The Kronig – Penney Model (Qualitative) **-** Classification of Solids.

UNIT-III: Electromagnetism and Fibre Optics (9hrs)

Electromagnetism: Scalar and Vector Fields - Divergence and Curl of Electric and Magnetic fields - Gauss and Stokes Theorems (Statements) - Maxwell's Equations (Integral and Differential forms) - Electromagnetic Wave Propagation (Conducting and Non Conducting Media).

Fibre optics: Total Internal Reflection - Acceptance Angle - Numerical Aperture - Classification of Fibers Based on Refractive Index Profile and Modes - Block Diagram of Fiber Optic Communication.

UNIT-IV: Semiconductor Physics: (10hrs)

Intrinsic Semiconductors - Density of Charge Carriers - Electrical Conductivity - Extrinsic Semiconductors – P-type & N-type - Density of Charge Carriers - Dependence of Fermi Energy on Carrier Concentration and Temperature - Direct and Indirect Band Gap Semiconductors - Hall Effect - Hall Coefficient - Applications of Hall Effect - Drift and Diffusion Currents - Einstein's Relation.

UNIT-V: Magnetic and Dielectric Materials (10 hrs)

Magnetic Materials: Introduction - Magnetic Dipole Moment - Magnetization - Magnetic Susceptibility and Permeability - Origin of Permanent Magnetic Moment - Classification of Magnetic Materials - Domain Concept of Ferromagnetism - Hysteresis - Soft and Hard Magnetic Materials.

Dielectric Materials: Introduction - Dielectric Polarization **-** Dielectric Polarizability - Susceptibility and Dielectric Constant - Electronic and Ionic Polarizations (Quantitative) – Orientation Polarization (Qualitative) - Lorentz Field - Claussius–Mossotti Equation - Frequency Dependence of Polarization.

Course outcomes

The students will be able to

- **understand** the concepts of physical optics through the wave nature of light
- **analyze** the phenomenal differences between interference and diffraction through applications
- **apply** the fundamental laws of electricity and magnetism to currents and propagation of EM waves in different media
- **identify** the mechanisms of polarization in dielectrics and magnetic materials, conduction in semiconductors and propagation of light in optical fibers
- **explain** the principles of physics in dielectrics, magnetic materials and semiconductors useful to engineering applications
- **interpret** the effects of temperature on Fermi Dirac distribution function
- **summarize** various free electron theory models and classification of solids based on band theory

Text books

1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics", 11th ed., S. Chand Publications, 2019
2. S.O. Pillai, Solid State Physics 8th ed., New Age International, 2018

Reference books

1. Ajoy Ghatak, "Optics", 6th Edition McGraw Hill Educaiton, 2017
2. David J. Griffiths, "Introduction to Electrodynamics"- 4/e, Pearson Education, 2014
3. Charles Kittel "Introduction to Solid State Physics", Wiley Publications, 2011
4. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc Graw Hill, 2008
5. S.M. Sze "Semiconductor devices-Physics and Technology" - Wiley, 2008

Submitted to the Principal, VCE
28.06.2019

Problem Solving and Programming Using C

Objectives:

The objectives of this course are to make the student familiar with problem solving using computers, development of algorithms, usage of basic flowchart symbols and designing flowcharts.

The students can also understand programming language basic concepts, reading and displaying the data, earn the programming skills using selection, iterative control structures, functions, arrays, pointers and files. After completion of this course the student is expected to analyze the real life problem and write programs in C language to solve the problems.

Course Outcomes:

After completion of this course

- Student will be able to develop efficient algorithm for solving a problem.
- Use various constructs of C programming language efficiently.
- Student will be able to develop programs using modular approach such as functions. And also able to develop programs to perform matrix and mathematical applications.
- Student will be able to understand dynamic memory management and problems using pointers and solving the problems.
- Student will be able to develop programs for real life applications using structures and also learn about handling the files for storing the data permanently.

UNIT I: Problem Solving: Problem solving aspects, Problem solving techniques, Computer as a Problem solving tool, Algorithms-definition, features, criteria. Flowchart-definition, basic symbols, sample flowcharts. Top down design, Implementation of program verification, The efficiency of algorithms, Analysis of algorithms, computational complexity of algorithm, order(O) notation, Worst case & Average case Analysis.

UNIT II: Basics of C programming language: Introduction to C, structure of a C program, basic data types and sizes, constants, variables, unary, binary and ternary operators, expressions, type conversions, conditional expressions, precedence and order of evaluation, Input and Output statements, Sample Programs.

SELECTION-DECISION MAKING CONDITIONAL CONTROL STRUCTURES: simple-if, if-else, nested if-else, if-else ladder and switch-case.

ITERATIVE: while-loop, do-while loop and for loop control structures, goto, break and continue statements. Sample Programs.

UNIT III: FUNCTIONS-basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs

ARRAYS-concepts, declaration, definition, accessing elements, storing elements, 1-D arrays, 2-D arrays and character arrays, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix, Passing 1-D arrays, 2-D arrays to functions, Strings and String Manipulations

UNIT IV: POINTERS-pointers concepts, initialization of pointer variables, pointers and function arguments, passing by address-dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT V: ENUMERATED, STRUCTURE AND UNION TYPES: Derived types-structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications

FILEHANDLING: Concept of a file, text files and binary files, Formatted I/O, File I/O operations

Text Books:

1. How to Solve it by Computer, R. G. Dromey, Pearson Education, 2019
2. Programming in C, Ashok N Kamthane, Amit Ashok Kamthane, 3rd Edition, Pearson Education, 2019

Reference Books:

1. The C programming Language by Dennis Richie and Brian Kernighan
2. Programming in C, Reema Thareja, OXFORD
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, Cengage

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I Year – II SEMESTER		L	T	P	C
		3	0	0	3

ELECTRICAL CIRCUIT ANALYSIS-I

Preamble:
This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, network theorems, transient analysis and network topology.

Course Objectives:

- To study the concepts of passive elements, types of sources and various network reduction techniques and applications of network topology to electrical circuits.
- To study the concept of magnetic coupled circuit.
- To understand the behavior of RLC networks for sinusoidal excitations.
- To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- To understand the applications of network theorems for analysis of electrical networks.

UNIT-I
Introduction to Electrical Circuits and Network topology

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchhoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis.
Definitions of Graph and Tree, basic cutset and tieset matrices for planar networks, loop and nodal methods of analysis of networks with dependent and independent voltage and current sources, duality and dual networks.

UNIT-II
Magnetic Circuit
Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT-III
Single Phase A.C Systems
Periodic waveforms (determination of rms, average value and form factor), concept of phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations, steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power

UNIT-IV

Analysis of AC Networks

Extension of node and mesh analysis to AC networks, numerical problems on sinusoidal steady state analysis, series and parallel resonance, selectively band width and Quasi factor, introduction to locus diagram.

UNIT-V

Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

Course Outcomes:

The Student should be able to solve

- Various electrical networks in presence of active and passive elements and Electrical networks with network topology concepts.
- Any magnetic circuit with various dot conventions.
- Any R, L, C network with sinusoidal excitation.
- Any R, L, network with variation of any one of the parameters i.e R, L, C and f.
- Electrical networks by using principles of network theorems.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)
2. Linear Circuit Analysis by De Carlo, Lin, Oxford publications
3. Electric Circuits – (Schaum's outlines) by MahmoodNahvi& Joseph Edminister, Adapted by KumaRao, 5th Edition – McGraw Hill.
4. Electric Circuits by David A. Bell, Oxford publications
5. Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications
6. Circuit Theory(Analysis and Synthesis) by A.Chakrabarthi,DhanpatRai&Co.

UNIVERSITY COLLEGE OF ENGINEERING VIZAINAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
VIZAINAGARAM - 535 003, ANDHRA PRADESH, INDIA

B.Tech I Year II Semester

L	T	P	C
0	0	3	1.5

Advanced English Communicative Skills Lab
(Common to all Branches)

UNIT I:

Pronunciation: Contrastive stress (Homograph)

Oral Activity: Telephone Etiquette

UNIT II:

Pronunciation: Word stress – Weak and Strong forms

Oral Activity :Role plays

UNIT III:

Pronunciation: Phonetics Transcription Oral Activity :Data Interpretation, Oral presentation skills

Oral Activity: Oral presentation Skills

UNIT IV:

Pronunciation: Connected speech (Pausing ,Tempo, Tone, Fluency ,etc..)

Oral Activity: Public Speaking ,Poster Presentation

UNIT V:

Pronunciation: Stress in compound words ,Rhythm and Intonation

Oral Activity: Group discussions: Do's and Don'ts –Types ,Modalities

Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.

References:

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
7. Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
8. Technical Communication- Gajendrea Singh Chauhan, Smita Kashiramka, Cengage Publications.

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VIZIANAGARAM - 535 003, ANDHRA PRADESH, INDIA

B.Tech I Year I & II Semester

APPLIED PHYSICS LAB

L	T	P	C
0	0	3	1.5

(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

1. V-I Characteristics of a PN junction diode
2. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
3. Energy Band gap of a Semiconductor - PN junction diode
4. RC circuit – time constant
5. Newton's rings – Radius of Curvature of Plano - Convex Lens
6. V-I Characteristics of a Zener junction diode
7. Diffraction Grating - Normal Incidence
8. Dielectric Constant of different materials
9. Planck's constant using photocell
10. LCR- series resonance circuit
11. Thickness of a Spacer Using wedge Film and Parallel Interference Fringes
12. Resistivity of semiconductor by Four probe method
13. B-H curve
14. Dispersive power of diffraction grating
15. Hall Effect

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VIZIANAGARAM - 535 003, ANDHRA PRADESH, INDIA
B.Tech I Year I & II Semester

APPLIED PHYSICS VIRTUAL LAB

L T P C
0 0 2 0

LIST OF EXPERIMENTS:

1. Brewster's Angle
2. Stopping Potential using The Photo Electric Current
3. Hall Effect
4. Numerical Aperture and Acceptance Angle - Optical Fiber
5. Acoustic Grating
6. Resistivity of Semiconductors by Four Probe Method
7. To Understand The Barkhausen Effect
8. Reduction Factor of The Given Tangent Galvanometer
9. B-H Curve
10. Refractive Index of a Given Liquid using Newton’s Rings Experiment

Problem Solving and Programming using C Lab

Exercise 1

a) Write a C Program to calculate the area of a triangle.
b) Write a C program to find the largest of three numbers using ternary operator.
c) Write a C Program to swap two numbers without using a temporary variable.

Exercise 2

a) Write a C program to find the 2's complement of a binary number.
b) Write a C program to find the roots of a quadratic equation.
c) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 3

a) Write a C program to find the sum of individual digits of a positive integer and, also, find the reverse of the given number.
b) Write a C program to generate the first *n* terms of the Fibonacci sequence.
c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 4

a) Write a C Program to print the multiplication table of a given number.
b) Write a C Program to read a decimal number and find its equivalent binary number.
c) Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5

a) Write a C program to interchange the largest and smallest numbers in the given array.
b) Write a C program to implement a liner search on a given set of values.
c) Write a C program to implement binary search on a given set of values.

Exercise 6

a) Write a C program to implement sorting of an array of elements.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

Exercise 7

Write a C program that uses functions to perform the following operations:

i. To insert a sub-string into given main string at a given position.
ii. To delete n characters from a given position in a given string.
iii. To replace a character of string either from beginning or ending or at a specified location.

Exercise 8

Write a C program that uses functions to perform the following operations using Structure:

i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers

Exercise 9

Write C Programs for the following string operations without using the built in functions

- to concatenate two strings
- to append a string to another string
- to compare two strings

Exercise 10

a) Write C Program to find the number of characters in a given string including and excluding spaces.

b) Write C Program to copy the contents of one string to another string without using string handling functions.

c) Write C Program to find whether a given string is palindrome or not.

d) Write a C program to find both the largest and smallest number of an array of integers using call by value and call by reference.

Exercise 11

Write a C program using recursion for the following:

a) To display sum of digits of given number

b) To find the factorial of a given integer

c) To find the GCD (greatest common divisor) of two given integers.

d) To find Fibonacci sequence

Exercise 12

a) Write C Program to reverse a string using pointers

b) Write a C Program to compare two 2D arrays using pointers

c) Write a C program consisting of Pointer based function to exchange value of two integers using passing by address.

Exercise 13

Examples which explores the use of structures, union and other user defined variables

Exercise 14

a) Write a C program which copies one file to another.

b) Write a C program to count the number of characters and number of lines in a file.

c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

APPENDIX-D5

DEPARTMENT OF BS&HSS

UNIVERSITY COLLEGE OF ENGINEERING VIZAINAGARAM (Autonomous)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

VIZAINAGARAM - 535 003, ANDHRA PRADESH, INDIA

B.Tech I Year I or II Semester

L	T	P	C
3	0	0	0

Professional Ethics & Human Values

(Common to All Branches)

Course Objectives:

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

Unit I: Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation–Commitment – Empathy –Self Confidence Character –Spirituality.

Unit II: Engineering Ethics:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas –Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Unit III: Engineering as Social Experimentation

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

UNIT IV: Engineers Responsibility for Safety and Risk:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

UINIT V: Global Issues

Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics-Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous-

Computers-Computer codes of Ethics –Weapons Developenent -Ethics and Research –Analyzing Ethical Problems in research.

Course outcomes:

Students will be able to:

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

Books:

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill-2003.
4. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
5. "Professional Ethics and Human Values" by A Alavudeen, R.Kalil Rahman and M. Jayakumaran-LaxmiPublications.
6. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
7. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year – I SEMESTER		L	T	P	C
		3	0	0	3

ELECTRICAL CIRCUIT ANALYSIS-II

Preamble :
This course aims at study of three phase systems, transient analysis, network synthesis and fourier analysis for the future study and analysis of power systems.

Course Objectives:

- To study the concepts of balanced and unbalanced three-phase circuits.
- To study the transient behavior of electrical networks with DC, pulse and AC excitations.
- To study the performance of a network based on input and output excitation/response.
- To understand the realization of electrical network function into electrical equivalent passive elements.
- To understand the application of Fourier series and Fourier transforms for analysis of electrical circuits.

UNIT-I Balanced and Unbalanced Three phase circuits
Phase sequence, star and delta connection of sources and loads, relation between line and phase voltages and currents, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits: Loop method, Star-Delta transformation technique, two wattmeter method for measurement of three phase power.

UNIT-II Transient Analysis in DC and AC circuits
Transient response of R-L, R-C, R-L-C circuits for DC and AC excitations, solution using differential equations and Laplace transforms.

UNIT-III Two Port Networks
Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, cascaded networks, poles and zeros of network functions.

UNIT-IV Network synthesis
Positive real function – basic synthesis procedure – LC immittance functions – RC impedance functions and RL admittance function – RL impedance function and RC admittance function – Foster and Cauer methods.

UNIT-V Fourier analysis and 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 physical significance of the Fourier transform and its application to electrical circuits.

Course Outcomes:

The Student should be able to:

- Solve three- phase circuits under balanced and unbalanced condition
- Find the transient response of electrical networks for different types of excitations.
- Find parameters for different types of network.
- Realize electrical equivalent network for a given network transfer function.
- Extract different harmonics components from the response of an electrical network.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition
2. Network synthesis: Van Valkenburg: Prentice-Hall of India Private Ltd.

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)
2. Introduction to circuit analysis and design by TildonGlisson. Jr, Springer Publications.
3. Circuits by A.Bruce Carlson , Cengage Learning Publications
4. Network Theory Analysis and Synthesis by SmarajitGhosh, PHI publications
5. Networks and Systems by D. Roy Choudhury, New Age International publishers
6. Electric Circuits by David A. Bell, Oxford publications
7. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi,DhanpatRai&Co.

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UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year – I SEMESTER		L	T	P	C
		3	0	0	3

ELECTRICAL MACHINES – I

Preamble:
This is a basic course on rotating electrical machines. This course covers the topics related to principles, performance, applications and design considerations of dc machines and transformers.

Course objectives:

- Understand the construction, principle of operation and performance of DC machines.
- Learn the characteristics, performance, methods of speed control and testing methods of DC motors.
- To predetermine the performance of single phase transformers with equivalent circuit models.
- Understand the methods of testing of single-phase transformer.
- Analyze the three phase transformers and achieve three phase to two phase conversion.

UNIT–I:
Construction and Operation of DC machines
Construction and principle of operation of DC machine – EMF equation for generator – classification of DC machines based on excitation – OCC of DC shunt generator –applications of DC Generators

UNIT–II:
Performance of DC Machines
Torque and back-emf equations of dc motors – Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors – losses and efficiency – applications of dc motors.

UNIT-III:
Starting, Speed Control and Testing of DC Machines
Necessity of a starter – starting by 3 point and 4 point starters – speed control by armature voltage and field control – testing of DC machines – brake test, Swinburne's method – principle of regenerative or Hopkinson's method – retardation test – separation of losses.

UNIT–IV:
Single-phase Transformers
Types and constructional details – principle of operation –emf equation – operation on no load and on load – lagging, leading and unity power factors loads –phasor diagrams of transformers – equivalent circuit – regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency.

UNIT-V
Testing of Transformers and 3-Phase Transformers
Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test – separation of losses – parallel operation with equal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers.

Course outcomes:

The student should be able to:

- Mitigate the ill-effects of armature reaction and improve commutation in dc machines.
- Understand the torque production mechanism and control the speed of dc motors.
- Analyze the performance of single phase transformers.
- Predetermine regulation, losses and efficiency of single phase transformers.
- Parallel transformers, control voltages with tap changing methods and achieve three-phase to two-phase transformation.

Text Books:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald,Charleskingsley,StephenD.Umans, TMH

Reference Books:

1. Electrical Machines by D. P.Kothari, I .J .Nagarth,McGraw Hill Publications, 4th edition
2. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition.
3. Electrical Machinery by AbijithChakrabarthi and SudhiptaDebnath, McGraw Hill education 2015
4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2010
5. Electric Machines by Mulukutla S.Sarma & Mukeshk.Pathak, CENGAGE Learning.
6. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Objectives:

II Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
ELECTRONIC DEVICES AND CIRCUITS					

The main objectives of this course are:

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

Syllabus:

UNIT-I:

Semi Conductor Physics:

Insulators, Semi conductors, and Metals classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

UNIT- II:

Junction Diode Characteristics:

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

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

UNIT- III:

Rectifiers:

Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms.

Filters:

Introduction to Filters, Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT- IV:

Transistor Characteristics:

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

Small Signal Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

UNIT- V:

Transistor Biasing and Thermal Stabilization:

Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S, S$'$, S$''$), Bias compensation, Thermal runaway, Thermal stability.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET. Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers and FET Biasing- methods and stabilization.

Text Books:

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

References:

1. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition
2. Electronic Devices and Circuits – Bell, Oxford

Outcomes:

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

- Understand the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year – I SEMESTER		L	T	P	C
		3	0	0	3

ELECTROMAGNETIC FIELDS

Preamble:

Electromagnetic field theory is the pre-requisite for most of the subjects in the gamut of electrical engineering. The study of this subject enables students to understand and interpret the phenomenon pertinent to electrical engineering using microscopic quantities such as electric and magnetic field intensities, scalar and vector potentials.

Course objectives:

- To study the production of electric field and potentials due to different configurations of static charges.
- To study the properties of conductors and dielectrics, calculate the capacitance of different configurations. Understand the concept of conduction and convection current densities.
- To study the magnetic fields produced by currents in different configurations, application of Ampere's law and the Maxwell's second and third equations and to study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
- To develop the concept of self and mutual inductances and the energy stored.
- To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced EMF

UNIT – I Electrostatics:
Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge, work done in moving a point charge in an electrostatic field, electric potential – properties of potential function – potential gradient,Guass's law – Maxwell's first law, div(D)=ρ_v Laplace's and Poison's equations and solution of Laplace's equation in one variable.

UNIT – II Conductors – Dielectrics and Capacitance:
Electric dipole – dipole moment – potential and EFI due to an electric dipole, Torque on an Electric dipole in an electric field conductors and Insulators – their behaviour in electric field. Polarization, boundary conditions between conduction to dielectric and dielectric to dielectrics. Capacitance of parallel plates, spherical and coaxial cables with composite dielectrics, 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

UNIT – III Magneto statics, Ampere's Law and Force in magnetic fields:
Static magnetic field – Biot-Savart's law – Oesterd's experiment, Magnetic Field Intensity (MFI) – MFI due to a straight current carrying filament, MFI due to circular, square and solenoid current – carrying wire – relation between magnetic flux, magnetic flux density and MFI.Maxwell's second Equation, div(B)=0, Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long filament carrying conductor, point form of Ampere's circuital law, field due to a circular loop, rectangular and square loops, Maxwell's third equation, Curl (H)=J.

Magnetic force,moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long 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.

UNIT – IV Self and mutual inductance:
Self and mutual inductance – 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 density in a magnetic field.

UNIT – V Time Varying Fields:
Time varying fields: Faraday's laws of electromagnetic induction – its integral and point forms, Maxwell's fourth equation, Curl (E)=-∂B/∂t, statically and dynamically induced EMF – simple problems, modification of Maxwell's equations for time varying fields, displacement current,Poynting theorem and Poynting vector.

Course outcomes:
The student should be able to:

- Determine electric fields and potentials using Guass's lawor solving Laplace's or Possion's equations, for various electric charge distributions.
- Calculate and design capacitance, energy stored in dielectrics.
- Calculate the magnetic field intensity due to current, the application of Ampere's law and the Maxwell's second and third equations and determine the magnetic forces and torque produced by currents in magnetic field.
- Determine self and mutual inductances and the energy stored in the magnetic field.
- Calculate induced EMF, understand the concepts of displacement current and Poynting vector.

Text Books:
1. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2006.

Reference Books:
1." Principles of Electro Magnetics" by Sadiku, Oxford Publications,4th edition
2."Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd edition
3. "Electromagnetic Field Theory" by YaduvirSingh,Pearson.
4.Fundamentals of Engineering Electromagnetics by Sunil Bhooshan,Oxford higher Education.

II B.Tech I Semester

THERMAL & HYDRO PRIME MOVERS

Course Objectives: To make the student understand the types of prime movers, which can be connected to generators for power production and should obtain the skills of performing the necessary calculations with respect to the functioning of the prime movers.

.UNIT I:

STEAM POWER
Properties of Steam and use of Steam Tables- T-S and H-S Diagrams. Analysis of Various Thermodynamic Processes under gone by Steam.
Vapor Power Cycles: Camot Cycle-Rankine Cycle- Thermodynamic Variables Effecting Efficiency and output of Rankine Cycle-. Analysis of simple Rankine Cycle and Re-heat cycle
Steam Turbines: Schematic layout of steam power plant. Classification of Steam Turbines- Impulse Turbine and Reaction Turbine- Compounding in Turbines- Velocity Diagrams for simple Impulse and Reaction Turbines- Work done & efficiency

UNIT II:

I.C ENGINES: Classification, working principles – valve and port timing diagrams – air standard cycles- Otto, Diesel and Dual cycles – Engine systems, fuel injection, carburetion, ignition, cooling and lubrication – Engine performance evaluation.

GAS TURBINES: Simple gas turbine plant-ideal cycle, closed cycle -open cycle-. Efficiency, Work ratio and optimum pressure ratio for simple gas turbine cycle. Actual cycle, analysis of simple cycles & cycles with inter cooling, reheating and Regeneration

UNIT III:

IMPACT OF JETS : Impulse momentum equation, Impact of Jet on stationary and moving vanes (flat and curved).
PUMPS: Types of pumps, Centrifugal pumps: Main components, Working principle, Multi stage pumps, Performance and characteristic curves

UNIT IV:
HYDRAULIC TURBINES: Classification of turbines; Working principle, Efficiency calculation and Design principles for Pelton Wheel, Francis and for Kaplan turbines; Governing of turbines; Performance and characteristic curves.

UNIT V:

HYDRO POWER: Components of Hydro electric power plant: pumped storage systems, Estimation of water power potential; Estimation of load on turbines: load curve, load factor, capacity factor, utilization factor, diversity factor, load – duration curve, firm power, secondary power, prediction of load.

Text Books:

1. Thermal Engineering by Rajput, Lakshmi publications
2. Thermal engineering by M.L.Mathur and F.S.Mehta, Jain Brothers.
3. "Hydraulics & Fluid Mechanics", P.N. Modi and S.M. Seth, TEXT BOOKS House, Delhi
4. "Fluid Mechanics & Hydraulic Machinery" A.K.Jain, , Khanna Publishers, Delhi.

Reference Books:

1. "Fluid Mechanics" by Victor.L.Streeter
2. "Introduction to Fluid Mechanics" Edward .J. Shaughnessy Jr.
3. "Fluid Mechanics & Its Applications", Vijay Gupta, Santhosh.k.Gupta
4. "Fluid Mechanics & Fluid power Engineering, Dr D.S.Kumar
5. "Water Power Engineering" M.M Desumukh

COURSE OUTCOMES:

After undergoing the course the student is expected to learn

CO1: Student can learn the working of steam power cycles and also should be able to analyse and evaluate the performance of steam turbines

CO2: Student is able to learn the basic working of IC engines, different systems in IC engines and performance evaluation of engines and also able to learn the working of gas turbines and methods to improve its performance

CO3: Student can able to calculate hydrodynamic forces of jets on vanes in different positions and working principles and performance evaluation of hydraulic pumps and turbines

CO4: Student can obtain the knowledge on working principles of different hydraulic turbines and their performances.

CO5:The student gain the knowledge on components of hydro electric power plants and their functions, estimation and calculation of different loads by considering various factors.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
VIZIANAGARAM - 535 003, ANDHRA PRADESH, INDIA

B.Tech II Year - I or II Semester

L	T	P	C
3	0	0	3

Complex Variables and Statistical Methods
(Common to ECE, EEE of II B.Tech-I Semester & Civil, ME, MET of II B.Tech-II Semester)

Course Objectives:

- To familiarize the complex variables.
- To familiarize the students with the foundations of probability and statistical methods.
- To equip the students to solve application problems in their disciplines.

UNIT-I: Functions of a complex variable and Complex integration: (10 hrs)

Introduction – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method.

Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs).

UNIT-II: Series expansions and Residue Theorem: (10 hrs)

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series.

Types of Singularities: Isolated – pole of order m – Essential – Residues – Residue theorem (without proof) – Evaluation of real integral of the type $\int_{-\infty}^{\infty} f(x)dx$

UNIT – III: Probability and Distributions: (10 hrs)
Review of probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory: (8 hrs)
Introduction – Population and samples – Sampling distribution of Means and Variance (definition
only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT – V: Tests of Hypothesis:
(10 hrs)

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

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

- apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic
- find the differentiation and integration of complex functions used in engineering problems
- make use of the Cauchy residue theorem to evaluate certain integrals
- apply discrete and continuous probability distributions
- design the components of a classical hypothesis test
- infer the statistical inferential methods based on small and large sampling tests

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **Miller and Freund's,** Probability and Statistics for Engineers, 7/e, Pearson, 2008.

Reference Books:

1. **S. C. Gupta and V. K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
2. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
4. **Sheldon, M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011

THERMAL & HYDRO PRIME MOVERS LAB

Course Objective: To impart practical knowledge on the performance evaluation methods of various internal combustion engines, flow measuring equipment and hydraulic turbines and pumps.

NOTE: TO CONDUCT A MINIMUM OF 12 EXPERIMENTS BY CONDUCTING A MINIMUM OF SIX FROM EACH SECTION.

SECTION A - THERMAL ENGINEERING LAB

1. I.C. Engines valve / port timing diagrams.
2. I.C. Engines performance test on 4 -stroke Diesel engine.
3. I.C. Engines performance test on 2-stroke petrol engine.
4. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine
5. Determination of FHP by retardation and motoring test on IC engine
6. I.C. Engines heat balance on petrol / Diesel engines.
7. Economical speed test of an IC engine
8. Study of boilers

SECTION B – HYDRAULIC MACHINES LAB

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Reciprocating Pump.
7. Calibration of Venturimeter.
8. Calibration of Orifice meter.
9. Determination of loss of head due to sudden contraction in a pipeline.
10. Performance Test on Multi Stage Centrifugal Pump.

Course Outcome: The students can operate and analyse various performance evaluation of internal combustion engines, different flow measuring equipment, Hydraulic turbines and Pumps.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year – I Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
ELECTRICAL CIRCUITS LAB					

Course objectives:

To verify and demonstrate various theorems, locus diagrams, resonance and two port networks.To determine self and mutual inductance of a magnetic circuit, parameters of a given coil and measurement of 3- phase power.

Any 10 of the following experiments are to be conducted:

1) Verification of Thevenin's and Norton's Theoremss
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) Determination of impedance (Z) and Admittance (Y) Parameters
9) Determination of Transmissionand hybrid parameters
10) Determination of Parameters of a choke coil.
11) Determination of cold and hot resistance of an electric lamp.
12) Measurement of 3-phase power by two Wattmeter method for unbalanced loads

Course outcomes:

The Student should be able to apply various theorems, determination of self and mutual inductances, two port parameters of a given electric circuits. Able to draw locus diagrams, waveforms and phasor diagrams for lagging and leading networks.

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B.Tech II Year I or II Semester

L	T	P	C
3	0	0	0

Environmental Science

(Common to all Branches)

Course Objectives:

- 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, BIODIVERSITY AND ITS CONSERVATION

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 ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation : 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 and Solid Waste Management

Environmental Pollution: Definition, Cause, effects and control measures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, 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

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

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 – Case studies.

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..

Course Outcomes:

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

- Gain a higher level of personal involvement and interest in understanding and solving environmental problems
- Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
- Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century

- Influence their society in proper utilization of goods and services
- Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices.
- Recognize the interconnectedness of human dependence on the earth's ecosystems

TEXT BOOKS :

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

REFERENCES :

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year –IISEMESTER		L	T	P	C
		3	0	0	3
ELECTRICAL MEASUREMENTS AND INSTRUMENTATION					

Preamble:

This course introduces the principle of operation of basic analog and digital measuring instruments for measurement of current, voltage, power, energy etc. Measurement of resistance, inductance and capacitance by using bridge circuits will be discussed in detail. It is expected that student will be thorough with various measuring techniques that are required for an electrical engineer.

Course objectives:

- To study the principle of operation and working of different types of instruments for measurement of electrical quantities.
- To study the working principle of operation of different types of instruments for measurement of power and power factor.
- To understand the principle of operation and working of various types of bridges for measurement of parameters –resistance, inductance, capacitance and frequency.
- To understand the principle of operation and working of transducers.
- To study the principle of operation and working of DVMS, power analyzer and applications of CRO.

UNIT–I:

Analog ammeter and voltmeters.

Classification – deflecting, control and damping torques,– PMMC, moving iron type and electrostatic instruments, construction, torque equation, range extension, effect of temperature, errors and compensations, advantages and disadvantages.Instrument transformers: Current transformer and Potential transformer-construction, theory errors, numerical problems.

UNIT –II:

Analogwattcmeters and power factor meters

Electrodynamometer type wattmeter (LPF and UPF), power factor meters: Dynamometer and M.I. type (single phase and three phase), construction, theory, torque equation, advantages and disadvantages – Numerical problems.

UNIT – III:

Measurements of Electrical parameters

DC Bridges: Method of measuring low, medium and high resistance – sensitivity of Wheat stone's bridge, Kelvin's double bridge for measuring low resistance, Loss of charge method for measurement of high resistance, megger – measurement of earth resistance– Numerical problems.

AC Bridges: Measurement of inductance – quality factor, Maxwell's bridge, Hay's bridge, Anderson's bridge, measurement of capacitance and loss angle,Desautybridge, Schering Bridge, Wagner's earthing device, Wien's bridge– Numerical problems.

UNIT – IV:

Transducers:

Definition, classification, resistive , inductive, and capacitive transducer, LVDT, straingauge ,Thermistors, thermo-couples, Pieozo electric and photo diode transducers, digital shaft encoders, Hall effect sensors- Numerical problems

UNIT – V:

Digital meters

Digital voltmeter– successive approximation, DVM, ramp type DVM and integrating type DVM- Digital frequency meter, digital multi meter, digital tachometer, digital energy meter, LCR-Q meter, Power Analyzer, measurement of phase difference, frequency, hysteresis loop using lissajious patterns in CRO- Numerical Problems.

Course Outcomes:

The student should be able to:

- Choose right type of instrument for measurement of ac and dc Electrical quantities.
- Choose right type of instrument for measurement of power and power factor
- Select right type for measurement of R,L,C.
- Understand the effectiveness of transducer.
- Able to understand digital meter.

Text Books:

1. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis, fifth Edition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney DhanpatRai&Co.Publications.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand.
3. Electrical Measurements by Buckingham and Price, Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons
5. Electrical Measurements: Fundamentals, Concepts, Applications by Reissland, M.U, New Age International (P) Limited, Publishers.
6. Electrical and Electronic Measurements by G.K.Banerjee, PHI Learning Private Ltd, New Delhi–2012.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
II Year – II SEMESTER		**3**	**0**	**0**	**3**

ELECTRICAL MACHINES – II

Preamble:
This course covers the topics on 3-phase induction motor, 1-phase induction motor and synchronous machines which have wide application in power systems. The main aim of the course is to provide a detailed analysis of operation and performance of 3-phase induction motor, 1-phase induction motor and synchronous machines. In addition, it also covers voltage regulation and parallel operation of synchronous generators.

Course objectives:
- Understand the principle of operation and performance of 3-phase induction motor.
- Quantify the performance of induction motor and induction generator in terms of torque and slip.
- To understand the torque producing mechanism of a single phase induction motor.
- To understand the principle of emf generation, the effect of armature reaction, predetermination of voltage regulation in synchronous generators and parallel operation and control of real and reactive powers for synchronous generators.
- To understand the operation, performance and starting methods of synchronous motors.

UNIT-I
3-phase induction motors
Construction details of cage and wound rotor machines – production of rotating magnetic field – principle of operation – rotor emf and rotor frequency – rotor current and pf at standstill and during running conditions – rotor power input, rotor copper loss and mechanical power developed and their interrelationship – equivalent circuit – phasor diagram

UNIT-II
Characteristics, starting and testing methods of induction motors
Torque equation – expressions for maximum torque and starting torque – torque slip characteristic – double cage and deep bar rotors – crawling and cogging – speed control of induction motor with V/f control method – no load and blocked rotor tests – circle diagram for predetermination of performance – methods of starting – starting current and torque calculations – induction generator operation (Qualitative treatment only)

UNIT – III:
Single Phase Motors:
Single phase induction motors – constructional features and equivalent circuit – problem of starting – double revolving field theory – starting methods, AC series motor.

UNIT–IV:
Construction, operation, voltage regulation and parallel operation of synchronous generator:
Constructional features of non-salient and salient pole type armature windings – distributed and concentrated windings – distribution, pitch and winding factors – E.M.F equation – improvements of waveform and armature reaction – voltage regulation by synchronous impedance method – MMF method and Potier triangle method – phasor diagrams – two reaction analysis of salient pole machines and phasor diagram.

Parallel operation with infinite bus and other alternators – synchronizing power – load sharing – control of real and reactive power – numerical problems.

UNIT–V:

Synchronous motor – operation, starting and performance

Synchronous motor principle and theory of operation – phasor diagram – starting torque – variation of current and power factor with excitation – synchronous condenser – mathematical analysis for power developed – hunting and its suppression – methods of starting – applications.

Course Outcomes:

The student should be able to:

- Explain the operation and performance of three phase induction motor.
- Analyze the torque-speed relation, performance of induction motor and induction generator.
- Implement the starting of single phase induction motors.
- To perform winding design and predetermine the regulation of synchronous generators.
- Avoid hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor.

Text Books:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, TMH

Reference Books:

1. Electrical Machines by D. P.Kothari, I .J .Nagarth, McGraw Hill Publications, 4th edition
2. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition
3. Electrical Machinery by AbijithChakrabarthi and SudhiptaDebnath, McGraw Hill education 2015
4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2010
5. Electric Machines by MulukutlaS.Sarma&Mukeshk.Pathak, CENGAGE Learning.
6. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons
7. Alternating Current Machines by A.F.Puchstein, T.C. Lloyd, A.G. Conrad, ASIA Publishing House
8. Performance and design of AC machines – M.G. Say.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
II Year-II Semester		**3**	**0**	**0**	**3**
DIGITAL ELECTRONICS					

Objectives:

- To solve a typical number base conversions and analyze new error coding techniques
- To optimize logic gates for digital circuits using various techniques
- To understand concepts of Adders and Subtractors.
- To analyze different types of decoders, encoders, code converters, multiplexers and comparators
- To develop advanced sequential circuits

UNIT – I:

Review of Number Systems:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, problem solving. 4 bit codes, BCD, Excess-3, 2421, 84-2-1 $9^{'s}$ compliment code etc.

Boolean functions and logic operations:

Logic operations and error detection & correction codes; Basic logic operations -NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR - Gates, Standard SOP and POS, Forms, Gray code, error detection, error correction codes (parity checking, even parity, odd parity, Hamming code) NAND-NAND and NOR-NOR realizations.

UNIT – II:

Minimization Techniques:

Boolean theorems, principle of complementation & duality, De-morgan theorems, minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 6 variables, tabular minimization, problem solving (code-converters using K-Map etc..).

UNIT-III:

Combinational Logic Circuits Design-I

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit,

Combinational Logic Circuits Design-II

Introduction to Encoder and Decoder , Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, multiplexer, higher order multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, 4-bit digital comparator.

UNIT-IV:

Introduction to Flip Flops and Conversions:

Classification of sequential circuits (synchronous and asynchronous); basic flip-flops, truth tables and excitation tables (nand RS latch, nor RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals). Conversion from one flip-flop to flip-flop.

Sequential Circuits I: Introduction to counters and registers, Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

UNIT – V:

Sequential Circuits II

Finite state machine; Analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignment, design procedures. Realization of circuits using various flip-flops. Mealy to Moore conversion and vice-versa.

Introduction Of PLD's:

PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

TEXT BOOKS:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
2. Switching Theory and Logic Design by A. Anand Kumar
3. Digital Design by Mano PHI.

REFERENCE BOOKS:

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

Outcomes:

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

- Classify different number systems and apply to generate various codes.
- Use the concept of Boolean algebra in minimization of switching functions
- Design different types of Adders and Subtractors
- Design different types of decoders, encoders, code converters, multiplexers and comparators
- Apply knowledge of flip-flops in designing of Registers and Counters

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II Year – II SEMESTER		L	T	P	C
		3	0	0	3

CONTROL SYSTEMS

Preamble :

This course introduces the elements of linear control systems and their analysis. Classical methods of design using frequency response. The state space approach for design, modeling and analysis of simple PD,PID controllers.

Course objectives:

- To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
- To analyze the time response of first and second order systems and improvement of performance by proportional plus derivative and proportional plus integral controllers and to investigate the stability of closed loop systems using Routh's stability criterion and the analysis by root locus method.
- To present the Frequency Response approaches for the analysis of linear time invariant (LTI) systems using Bode plots, polar plots and Nyquist stability criterion.
- To discuss basic aspects of design and compensation of linear control systems using Bode plots.
- Ability to formulate state models and analyze the systems. To learn the concepts of Controllability and Observability.

UNIT – I:

Mathematical modeling of control systems

Classification of control systems, open loop and closed loop control systems and their differences, Feedback characteristics, transfer function of linear system, differential equations of electrical networks, translational and rotational mechanical systems, transfer function of DC servo motor – AC servo motor – synchro, transmitter and receiver – block diagram algebra – representation by signal flow graph – reduction using Mason's gain formula.

UNIT-II:

Time response analysis

Standard test signals – time response of first and second order systems – time domain specifications, steady state errors and error constants, effects of proportional (P), proportionalintegral (PI),proportional integralderivative (PID) systems.

Stability and root locus technique

The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems), Effect of addition of Poles and zeros to the transfer function.

UNIT–III:

Frequency response analysis

Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram – phase margin and gain margin – stability analysis from Bode plots, Polar plots, Nyquist stability criterion.

UNIT–IV:

Classical control design techniques

Lag, lead, lag-lead compensators, design of compensators using Bode plots.

UNIT–V:

State space analysis of LTI systems

Concepts of state, state variables and state model, state space representation of transfer function, diagonalization, solving the time invariant state equations, State Transition Matrix and it's Properties, concepts of controllability and observability.

Learning Outcome:

The student should be able to:

- Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
- Determine time response specifications of second order systems and absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
- Analyze the stability of LTI systems using frequency response methods.
- Design Lag, Lead, Lag-Lead compensators to improve system performance from Bode diagrams.
- Represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.

Text Books:

1. Control Systems principles and design by M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

Reference Books:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems by ManikDhanesh N, Cengage publications.
3. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
4. Control Systems Engineering by S.Palani, Tata McGraw Hill Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year – II SEMESTER		L	T	P	C
		3	0	0	3
POWER SYSTEMS-I					

Preamble:
Electrical Power plays significant role in day to day life of entire mankind. The aim of this course is to allow the students to understand the concepts of the generation and distribution of power along with economic aspects.

Course objectives:

- To study the principle of operation of different components of a thermal power stations.
- To study the principle of operation of different components of a Nuclear power stations.
- To study the constructional and operation of different components of an Air and Gas Insulated substations.
- To study the constructional details of different types of cables.
- To study different types of load curves and tariffs applicable to consumers.

UNIT-I Thermal Power Stations
Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: boilers, super heaters, economizers, electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT-II Nuclear Power Stations
Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT-III Substations
Classification of substations:
Air Insulated Substations– indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment.
Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.
Gas Insulated Substations (GIS) – advantages of gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations.

UNIT-IV Underground Cables

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable.

capacitance of single and 3-Core belted Cables: Grading of cables – capacitance grading and intersheath grading.

UNIT-V Economic Aspects of Power Generation & Tariff

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, base and peak load plants.

Tariff Methods– costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

Course Outcomes:

The student should be able to

- Identify the different components of thermal power plants.
- Identify the different components of nuclear Power plants.
- Identifythe different components of air and gas insulated substations.
- Identifysingle core and three core cables with different insulating materials.
- Analyse the different economic factors of power generation and tariffs.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand A. Chakrabarti, DhanpatRai& Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers.

Reference Books:

1. Electrical Power Distribution Systems by V. Kamaraju, TataMcGraw Hill, New Delhi.
2. Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi.

UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
VIZAINAGARAM - 535 003, ANDHRA PRADESH, INDIA

B. Tech II or III Year II Semester

L	T	P	C
3	0	0	3

MANAGEMENT AND ORGANISATIONAL BEHAVIOUR
(Common to Civil, EEE, ECE, CSE, IT)

Course Objectives:

- To familiarize with the process of management and to provide basic insight into select contemporary management practices
- To provide conceptual knowledge on functional management Human resource management, strategic management and Organizational Behavior.

Unit I

Introduction: Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

Unit II

Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. - Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

Unit III

Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking, Balanced Score Card and other Contemporary Business Strategies.

Unit IV

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation,

Unit V

Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Course Outcomes:

- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
- Will familiarize with the concepts of functional management and strategic management.

Reference Books:

1. Subba Rao P., *Organizational Behaviour,* Himalaya Publishing House. Mumbai.
2. Fred Luthans *Organizational Behaviour*, TMH, New Delhi.
3. Robins, Stephen P., *Fundamentals of Management,* Pearson, India.
4. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
5. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH, 2007
6. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year – II SEMESTER		L	T	P	C
		0	0	3	1.5
ELECTRICAL MACHINES – I LABORATORY					

Course objectives:

- To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
- To control the speed of DC motors.
- To determine and predetermine the performance of DC machines.
- To predetermine the efficiency and regulation of transformers and assess their performance.

Any 10 of the following experiments are to be conducted

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Brake test on DC shunt motor. Draw the performance characteristics
3. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
4. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
5. Speed control of DC shunt motor by Field and Armature Control.
6. Retardation test on DC shunt motor. Determination of losses at rated speed.
7. Separation of losses in DC shunt motor.
8. OC & SC test on single phase transformer.
9. Sumpner's test on single phase transformer.
10. Scott connection of transformers
11. Parallel operation of Single phase Transformers
12. Separation of core losses of a single phase transformer
13. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers

Course Outcomes:

The Student should be able to

- Determine and predetermine the performance of DC machines and Transformers.
- Control the speed of DC motor.
- Obtain three phase to two phase transformation.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year - II Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
ELECTRONIC DEVICES AND CIRCUITS LAB					

Course Objectives

- To measure the voltage, current and frequency using CRO.
- To observe experimentally the V-I characteristics of PN junction diode & zener diode.
- To observe experimentally the V-I characteristics of BJT in CB,CE and CC configuration.
- To observe experimentally the V-I characteristics of FET.

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

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

i. P-N Junction Diode Characteristics (Forward bias& Reverse bias)

Part A: Germanium Diode

Part B: Silicon Diode

2. Zener Diode Characteristics

Part A: V-I Characteristics

Part B: Zener Diode as Voltage Regulator

3. Rectifiers (without and with c-filter)

Part A: Half-wave Rectifier

Part B: Full-wave Rectifier

4. BJT Characteristics(CE Configuration)

Part A: Input Characteristics

Part B: Output Characteristics

5. FET Characteristics(CS Configuration)

Part A: Drain Characteristics

Part B: Transfer Characteristics

6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required:

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

Course Outcomes

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

- Determine the voltage, current and frequency using CRO.
- Draw the characteristics of PN Diode and Zener Diode.
- Explain the characteristics of transistor in CB, CE and CC configurations.
- Compute the V-I characteristics of JFET.

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VIZAINAGARAM - 535 003, ANDHRA PRADESH, INDIA

B.Tech II Year I or II Semester

L	T	P	C
3	0	0	0

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

(Common to All Branches)

Course Objectives:

- To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.
- Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.

Unit I: Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

Unit II: Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III: Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations

UNIT IV: Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities

Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V: Trade Secrets & Cyber Law and Cyber Crime

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets –

Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions –

E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

Course Outcomes:

- IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.
- Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E. Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. Prabhuddha Ganguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and Mohdlqbal Ali: Intellectual Property Rights, Serials Pub.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3
POWER SYSTEMS-II					

Course Objectives:
The objective of this course is to acquire knowledge to

i. compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR.
ii. study the Short and Medium length transmission lines, their models and performance.
iii. study the performance and modeling of long transmission lines.
iv. study the effect of travelling waves on transmission lines and study the factors affecting the performance of transmission lines and power factor improvement methods.
v. discuss sag and tension computation of transmission lines as well as to study the performance of overhead insulators

UNIT - I: Transmission Line Parameters
Conductor materials - 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 and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors-Numerical Problems–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- Bundled conductors–Numerical Problems.

UNIT - II: Performance of Short and Medium Transmission Lines
Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-π and A, B, C, D Constants for symmetrical and Asymmetrical Networks– Numerical Problems– Mathematical Solutions to estimate regulation and efficiency of all types of lines – Numerical Problems.

UNIT - III: Performance of Long Transmission Lines
Long Transmission Line–Rigorous Solution – Evaluation of A,B,C,D Constants–Interpretation of the Long Line Equations, regulation and efficiency– Incident, Reflected and Refracted Waves –Surge Impedance and SIL of Long Lines–Wave Length and Velocity of Propagation of Waves – Representation of Long Lines – Equivalent-T and Equivalent πnetwork models-Numerical Problems.

UNIT - IV: Power System Transients &Factors governing the Performance of Transmission line
Types of System Transients – Travelling or Propagation of Surges – Attenuation–Distortion– Reflection and Refraction Coefficients – Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction– Lumped Reactive Junctions.Skin and Proximity effects – Description and effect on Resistance of Solid Conductors –Ferranti effect – Charging Current –Shunt Compensation –Corona – Description of the phenomenon– Factors affecting corona–Critical voltages and power loss – Radio Interference.

UNIT - V: Sag and Tension Calculations and Overhead Line Insulators

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–Types of Insulators – String efficiency and Methods for improvement–Numerical Problems – Voltage distribution–Calculation of string efficiency–Capacitance grading and Static Shielding.

Course Outcomes:

The students should be able to

i. know various transmission line parameters during different operating conditions.
ii. Know the performance of short and medium transmission lines.
iii. analyze the performance of long transmission line.
iv. discuss about corona phenomenon and compute the power loss due to corona.
v. calculate sag of overhead transmission lines and string efficiency of insulators.

Text Books:

i. Electrical power systems – by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.
ii. Modern Power System Analysis by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition.

Reference Books:

i. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition.
ii. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.
iii. A Text Book on Power System Engineering by L.Soni,P.V.Gupta,U.S.Bhatnagar,A.Chakrabarthy, DhanpatRai&Co.Pvt. Ltd.
iv. Power System Analysis, Arthur R. Bergen, Pearson
v. Electrical Power Systems by P.S.R. Murthy, B.S.Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3
POWER ELECTRONICS					

Course Objectives:
The objectives of this course is to acquire knowledge on

i. characteristics of various power semiconductor devices and analyze the operation of silicon-controlled rectifier.
ii. operation of half-wave and full-wave phase-controlled rectifiers and analyze harmonics in the input current.
iii. operation of three phase full-wave converter and dual converter.
iv. operation of ac voltage controller, single phase cyclo converters and high frequency dc-dc converters.
v. working of inverters and application of pwm techniques for voltage control and harmonic mitigation.

UNIT - I: Power Semi-Conductor Devices

Power transistors- Basic structure and working of power MOSFET and power IGBT. Characteristics of power MOSFET and power IGBT-Silicon controlled rectifiers (SCR's)-Basic theory of operation of SCR-Static & Dynamic characteristics of SCR- Turn on and turn off methods of SCR-Snubber circuit Design.

UNIT - II: **Single Phase - Phase Controlled Rectifiers and Harmonic Analysis**

Half wave converters with R, RL and RLE loads- Derivation of average output voltage and output current- Effect of freewheeling diode for RL load. Fully controlled converters with R, RL and RLE loads-Derivation of output voltage and current - Effect of source Inductance. Semi Converters (Half Controlled) operation with R, RL and RLE loads - Harmonic analysis for input/source current waveform in a system with a large load inductance -Calculation of input power factor.

UNIT-III: Three Phase - Phase Controlled Rectifiers
Three Phase Half wave and Full wave converters with R and RL loads-Semi converter (Half Controlled) with R and RL loads- Derivation of average and rms output voltages-Line commutated Inverter operation-Dual converters with non-circulating and circulating currents.

UNIT - IV: AC-AC and DC-DC Converters

Single phase AC voltage controller with R and RL load- Single phase Bridge type Cyclo converter with R and RL load (Principle of operation) -High frequency DC-DC converters: Buck Converter operation, Time ratio control and current limit control strategies-Voltage and current waveforms-Derivation of output voltage-Boost converter operation-Voltage and current waveforms-Derivation of output voltage - Buck-Boost converter operation -Voltage and current waveforms.

UNIT - V: **DC-AC Inverters**

Single phase half bridge and full bridge inverters - Three phase Inverters (120^0 and 180^0 modes of operation) -PWM techniques- Single Pulse, Multiple Pulse and Sinusoidal PWM, amplitude and frequency modulation Indices -Harmonic analysis.

Course Outcomes:

The students should be able to:

i. draw the characteristics of various power semiconductor devices and analyze the operation of silicon-controlled rectifier.
ii. Analyze the operation of half-wave and full-wave phase-controlled rectifiers and harmonics in the input current.
iii. explain the operation of three phase full converter and dual converter.
iv. explain the operation of AC voltage controller, single phase cyclo converter and high frequency dc-dc converters.
v. Apply PWM technique for voltage control and harmonic mitigation.

Text Books:

i. Power Electronics - by P.S.Bhimbra, Khanna Publishers.
ii. Power Electronics: Circuits, Devices and Applications - by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998.
iii. Power Electronics: converters, applications &Design –byNedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
iv. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

Reference Books:

i. Power Electronics handbook by Muhammad H. Rashid, Elsevier
ii. Elements of Power Electronics-Philip T.Krein. Oxford.
iii. Thyristorised Power Controllers - by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3
LINEAR AND DIGITAL IC APPLICATIONS					

OBJECTIVES

i. To introduce the basic building blocks of linear integrated circuits.
ii. To teach the linear and non-linear applications of operational amplifiers.
iii. To introduce the theory and applications of analog multipliers and PLL.
iv. To teach the theory of ADC and DAC.
v. To introduce the concepts of waveform generation and introduce some special function ICs.
vi. To understand and implement the working of basic digital circuits.
vii. VHDL fundamentals were discussed to modeling the digital system design blocks.
viii. VHDL compilers, simulators and synthesis tools are described, which are used to verify digital systems in a technology-independent fashion.

UNIT - I: Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, 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.

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.

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 Approxiamtion ADC and Dual Slope ADC, DAC and ADC Specifications.
Introduction to VHDL: Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers. Packages, Libraries and Bindings, Subprograms. VHDL Programming using structural and data flow modelling.

UNIT-IV: Behavioural Modelling: Process statement, variable assignment statement, signal assignment statement, wait statement , if statement, case statement ,null statement, loop statement, exit statement, next statement ,assertion statement, more on signal assignment statement ,Inertial Delay Model, Transport Delay Model ,Creating Signal Waveforms, Signal Drivers , Other Sequential Statements , Multiple Processes. Logic Synthesis, Inside a logic Synthesizer.

UNIT - V: Combinational Logic Design: Binary Adder-Sub tractor, Ripple Adder, Look Ahead Carry Generator, ALU, Decoders, encoders, multiplexers and de multiplexers, parity circuits, comparators, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder, Design considerations of the above combinational logic circuits with relevant Digital ICs, modelling of above ICs using VHDL.

Sequential Logic Design: SSI Latches and flip flops, Ring Counter, Johnson Counter, Design of Modulus N Synchronous Counters, Shift Registers, Universal Shift Registers, Design considerations of the above sequential logic circuits with relevant Digital ICs, modelling of above ICs using VHDL.

TEXTBOOKS :

1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
3. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia 3rd Ed., 2005.
4. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.
5. Circuit design with VHDL- Volnei A.pedroni,MIT press Cambridge

REFERENCES BOOKS:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.
2. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.
3. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin& Fredrick Driscoll, PHI, 6th Edition.
4. Operational Amplifiers – C.G. Clayton, Butterworth & Company Publ.Ltd./ Elsevier, 1971.
5. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, ZvonkoVranesic, McGrawHill, 3rd Edition.

OUTCOMES:

After going through this course the student will be able to

i. Design circuits using operational amplifiers for various applications.
ii. Analyze and design amplifiers and active filters using Op-amp.
iii. Acquire skills required for designing and testing integrated circuits
iv. Understand the structure of commercially available digital integrated circuit families.
v. Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
vi. Model complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.
vii. Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3
SIGNALS AND SYSTEMS					

Course Objectives:

The objectives of this course is to acquire knowledge on

i. different types of signals and systems.
ii. properties of Fourier series and Fourier transform
iii. idea of sampling and reconstruction of signals.
iv. analysisof linear time invariant systems in time and frequency domains.
v. z-transform as mathematical tool to analyze discrete-time signals and systems.

UNIT – I:

INTRODUCTION TO SIGNALS AND SYSTEMS

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

UNIT –II:

FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series,Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, ComplexFourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform ofarbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals,properties of Fourier transforms.

UNIT –III:

SAMPLING

Sampling theorem, Types of sampling-Impulse sampling, Natural and flat top sampling; aperture effect due to flat- top sampling, Reconstruction of signal from its samples using interpolation, Sampling of DT signals (Down & Up Sampling)

UNIT – IV

ANALYSIS OF LTI SYSTEMS

Concept of convolution in time domain and frequency domain, Graphicalrepresentation of convolution, Transfer function of a LTI system. Cross-correlation and auto-correlation of functions, properties of correlation function, Energydensity spectrum, Parseval's theorem, Power density spectrum, Relation between autocorrelation function and energy/power spectral density function. Relation betweenconvolution and correlation.

UNIT – V:

LAPLACE TRANSFORMS&Z–TRANSFORMS

Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, Properties of L.T's, Relation between L.T's, and F.T. of a signal. Fundamental difference between continuous-time and discrete-time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z-Transforms. Region of convergence in Z-Transform, Inverse Z-transform, properties of Z-transforms.

Course Outcomes:

The students should be able to

i. characterize the signals and systems.
ii. apply Fourier tools on standard and periodic signals
iii. apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
iv. perceive the ideas of convolution, correlation, energy and power density spectrum and their relationships.
v. applylaplaceand z-transforms to analyze discrete-time signals and systems.

TEXT BOOKS:

i. A.V. Oppenheim, AS Willsky and S.H. Nawab, "Signals and Systems", Pearson.
ii. S.Haykin and B.V Veen, "Signals and Systems", John Wiley

REFERENCE BOOKS:

i. P. Ramakrishna Rao and Shankar Prakriya, "Signals and Systems", second addition, McGraw Hill (India) pvt Ltd. 2013
ii. NagoorKani. "Signals and Systems", McGraw Hill
iii. E.W Kamen and B.S.Heck, "Fundamentals of Signals and Systems", using the Web and Matlab, Pearson.
iv. P. Ramesh Babu and R. Anandanatarajan, "Signals and Systems" 4/e, Scitech.
v. K. Raja Rajeswari and B. VisveswaraRao, "Signals and Systems", PHI.

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III Year - I Semester		L	T	P	C
		3	0	0	3

NON-CONVENTIONAL ENERGY SOURCES

(OPEN ELECTIVE-I)

Course Objectives

The objectives of this course is to acquire knowledge

i. To study the solar radiation data, extraterrestrial radiation, radiation on earth's surface.
ii. To study maximum power point techniques in solar pv and wind.
iii. To study wind energy conversion systems, Betz coefficient , tip speed ratio.
iv. To study basic principle and working of hydro, tidal sytems
v. To study basic principle and working biomass, fuel cell and geothermal systems.

UNIT–I:

Fundamentals of Energy Systems

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

UNIT–II:

Solar Thermal Systems

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

UNIT–III:

Solar Photovoltaic Systems

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

Wind Energy

Wind patterns, Types of turbines, Kinetic energy of wind, Betz coefficient, Tip–speed ratio, efficiency, Power output of wind turbine, Selection of generator (synchronous, induction), Maximum power point tracking.

UNIT–IV:

Hydro and Tidal power systems

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

Tidal power-Basics, Kinetic energy equation, Numerical problems, Wave power-basics, Kinetic energy equation.

UNIT–V:

Biomass, fuel cells and geothermal systems

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

Learning Outcomes:

The students should be able to

i. analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface.
ii. develop maximum power point techniques in solar PV and wind.
iii. explain wind energy conversion systems, Betz coefficient , tip speed ratio.
iv. explain basic principle and working of hydro, tidal systems
v. explain the basic principle of biomass ,fuel cell and geothermal systems.

Text Books:

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis Electrical and Electronics Engineering 163
3. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford.

Reference Books:

1. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal,World scientific, Singapore.
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
3. Renewable energy technologies – A practical guide for beginners –Chetong Singh Solanki, PHI.

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III Year - I Semester		L	T	P	C
		3	0	0	3

ELECTRICAL ESTIMATING AND COSTING

(OPEN ELETCIVE-I)

Course Objectives:
The objectives of this course is to acquire knowledge on

i. electrical symbols and simple electrical circuits
ii. design of electrical installations and physical components.
iii. design of electrical installation for different types of buildings and small industries.
iv. basic components of electrical substations.
v. basic control circuits and protection of motors

UNIT –I:
Electrical Symbols and Simple Electrical Circuits
Need of electrical symbols, list of symbols, Electrical Diagrams, Methods of representation for wiring diagrams, introduction to simple light and fan circuits, system of connection of appliances and accessories, simple examples on light and fan circuits-stair case lighting using 2-way switches.

Unit-II:
Design Considerations of Electrical Installations
Electric supply system, Three-phase four-wire distribution system, protection of electric installation against overload, short circuit and earth fault, earthing, neutral and earth wire, types of loads, systems of wiring, permissible voltage drops and sizes of wires , estimating and costing of electrical installations

Unit-III:
Electrical Installation for Different Types of Buildings and Small Industries
Electrical installations for electrical buildings, estimating and costing of material, simple examples on electrical installation for residential buildings, electrical estimation of connected load installations for residential and commercial buildings, electrical installation for small industries

Unit-IV:
Substations
Introduction, types of substations, outdoor substations-pole mounted type-, indoor substations-floor mounted type, simple examples on quantity estimation- substation grounding.

Unit-V:

Motor control circuits

Introduction to AC motors, starting of three phase squirrel cage induction motors, starting of wound rotor motors, starting of synchronous motors, panel wiring circuits for various motors - contactor control circuit components, basic control circuits, motor protection.

Course Outcomes:

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

i. identify the various electrical apparatus and their interconnections.
ii. select suitable electrical supply system and design earthing systems of various electric loads.
iii. estimate the cost for installation of wiring for different types of building and small industries.
iv. identify the components of electrical substations.
v. design suitable control circuit for starting of three phase induction motor and synchronous motor.

Text Books:

1. Electrical Design and Estimation Costing –K. B. Raina and S.K.Bhattacharya – New AgeInternational Publishers.

References Books:

1. Electrical wiring estimating and costing – S.L.Uppal and G.C.Garg – Khanna publishers,

sixth edition, 1987.

2. A course in electrical installation estimating and costing – J.B.Gupta –Kataria SK & Sons.

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III Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRINCIPLES OF ELECTRIC POWER CONVERSION (OPEN ELECTIVE-I)					

Course Objectives:
The objectives of this course is to acquire knowledge to

i. understand the basics in the electric power conversion using power switching devices
ii. evaluate the conversion with the help of available electrical machines drives
iii. evaluate the conversion for range of renewable energy sources
iv. analyses the different energy storage systems
v. identify the various industrial and domestic applications

UNIT-I: POWER ELECTRONIC DEVICES AND CONVERTERS:

V-I Characteristics of SCR, MOSFET and IGBT. Phase controlled rectifiers, DC-DC converters and Inverters.

UNIT-II: APPLICATIONS TO ELECTRIC DRIVES:

Speed control of DC motor, Induction motors, PMSM and BLDC drives

UNIT-III: APPLICATIONS TO RENEWABLE ENERGY:

Introduction to solar cell, solar panels, MPPT, wind and other renewable energy sources, Integration of renewable energy sources to the grid.

UNIT-IV: ENERGY STORAGE SYSTEMS:

Study of automotive batteries, SMF, pumped storage systems, super-capacitors; fly wheels – applications, Li-ion batteries and applications to electric vehicles.

UNIT-V: DOMESTIC AND INDUSTRIAL APPLICATIONS:

Induction heating, welding, melting, hardening, lighting applications and their control, UPS, battery chargers

Course Outcomes:
The students will able to

i. learn the basic principles of power electronic devices and converters
ii. apply the power electronic converters for electrical machines
iii. apply the power electronic converters for renewable energy sources
iv. learn the different energy storage systems and its applications
v. know the different domestic and industrial applications of power electronic converters

Text Books:

i. M.H.Rashid: Power Electronics-circuits, Devices and applications, Prentice Hall India, New Delhi,2009
ii. P.S.Bhimbra: Power Electronics, Khanna publishers, New Delhi,2012
iii. Ned Mohan, Undeland and Robbin: Power electronics converters, applications and design, John Willey & Sons, Inc. NewYork, 2006.
iv. Utilization of Electrical Energy and Traction, J.B.Gupta, Rajeev Manglik, RohithManglik, KATSON Books

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III Year - I Semester		L	T	P	C
		0	0	3	1.5
ELECTRICAL MACHINES-II LABORATORY					

Course Objectives:

The objectives of this course is to acquire knowledge

i. on speed control of three phase induction motors.
ii. to determine /predetermine the performance three phase and single-phase induction motors.
iii. to improve the power factor of single-phase induction motor.
iv. to predetermine the regulation of three–phase alternator by various methods, find X_d/X_qratio of alternator and assess the performance of three–phase synchronous motor.

Any 10 experiments of the following are required to be conducted as compulsory experiments:

1. Brake test on three phase Induction Motor
2. Equivalent circuit diagram of three phase Induction motor
3. circle diagram of three phase induction motor
4. Regulation of a three –phase alternator by synchronous impedance method
5. Regulation of a three –phase alternator bym.m.f method
6. Regulation of three–phase alternator by Potier triangle method
7. V and Inverted V curves of a three—phase synchronous motor.
8. Determination of X_d and X_q of a salient pole synchronous machine
9. Equivalent circuit of single-phase induction motor
10. Speed control of induction motor by V/f method.
11. Determination of efficiency of three phase alternator by loading with three phase induction motor.
12. Power factor improvement of single-phase induction motor by using capacitors and load test on single phase induction motor.
13. Heat run test on three phase transformer.

Course Outcomes:

The students should be able to

i. assess the performance of single phase and three phase induction motors.
ii. control the speed of three phase induction motor.
iii. predetermine the regulation of three–phase alternator by various methods.
iv. find the X_d/X_qratio of alternator and asses the performance of three–phase synchronous motor.

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III Year - I Semester		L	T	P	C
		0	0	3	1.5
CONTROL SYSTEMS LABORATORY					

Course Objectives:
The objectives of this course is to acquire knowledge

i. on understanding the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, stepper motor and potentiometer.
ii. to analyze time and frequency responses of control system with and without controllers and compensators.
iii. to understand the time and frequency response plots.
iv. on stability analysis of LTI system

Any 10 of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchro pair
3. Potentiometer as an error detector
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. Characteristics of DC servo motor
8. Transfer function of DC motor
9. Characteristics of AC servo motor
10. Characteristics of magnetic amplifiers
11. Temperature controller using PID
12. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
13. State space model for classical transfer function using MATLAB.

Course Outcomes
The students should beable to

i. analyze the performance and working magnetic amplifier, D.C and A.C. servo motors and synchronous motors.
ii. design P, PI,PD and PID controllers
iii. determine the transfer function of D.C motor
iv. assess system stability using different plots with the help of simulation

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III Year - I Semester		L	T	P	C
		0	0	3	1.5
ELECTRICAL MEASUREMENTS & INSTRUMENTATION LABORATORY					

Course Objectives:

The objectives of this course is to acquire knowledge on

i. correct function of electrical parameters and calibration of voltage, current, single phase and three phase power and energy,
ii. measurement of electrical characteristics of resistance, inductance and capacitance of a circuits through appropriate methods.
iii. testing of transformer oil.
iv. the calibration and working of energy meter

List of experiments

Any 10 of the following experiments are to be conducted

1. Calibration and Testing of single-phase energy Meter
2. Calibration of dynamometer wattmeter using phantom loading
3.Calibration of PMMC ammeter and voltmeter using Crompton D.C. Potentiometer
4.Measurement of resistance and Determination of Tolerance using Kelvin's double Bridge.
5. Capacitance Measurement using Schering bridge.
6. Inductance Measurement using Anderson bridge.
7. Measurement of 3 phase reactive power with single phase wattmeter for balanced loading.
8. Calibration of LPF wattmeter by direct loading.
9. Measurement of 3 phase power with single watt meter and using two C.Ts.
10. Testing of C.T. using mutual inductance method.
11. Testing of P.T. using absolute null method.
12. Dielectric oil testing using H.T test Kit.
13.Calibration of AC voltmeter and measurement of choke parameters using AC Potentiometer in polarform.

Course Outcomes:

The students should be able to:

i. measure the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.
ii. test transformer oil for its effectiveness.
iii. measure the parameters of inductive coil
iv. Calibrate wattmeter, voltmeter and energy meter.
v. test C.T and P.T using various methods

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III Year - II Semester		L	T	P	C
		3	0	0	3
ELECTRIC DRIVES					

Course Objectives:
The objectives of this course is to acquire knowledge on

i. fundamentals of electric drive and different electric braking methods.
ii. operation of single-phase controlled converter dc motors and four quadrant operation of dc motors using dual converters.
iii. choppers for speed control of dc motors.
iv. concept of speed control of induction motor drive with variable voltage and v/f control.
v. speed control mechanism of synchronous motors

UNIT - I:
Fundamentals of Electric Drives
Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods**:** Dynamic – Plugging – Regenerative methods.

UNIT - II:
Controlled Converter Fed DC Motor Drives
Single phase half and fully controlled converter fed separately and self-excited DC motor drive – three phase fully controlled converter fed separately excited DC motor drive-Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics — Principle of operation of dual converters and dual converter fed DC motor drives -Numerical problems.

UNIT - III:
DC–DC Converters Fed DC Motor Drives
Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics –Four quadrant operation – Closed loop operation (qualitative treatment only).

UNIT - IV:
Control of Induction Motor Drives
Stator side control: Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop v/f control of induction motor drives (qualitative treatment only).
Rotor side control: Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages –Applications.

UNIT - V:

Control of Synchronous Motor Drives

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives (qualitative treatment only).–Variable frequency control–Pulse width modulation.

Course Outcomes:

The students should be able to

- **i.** know about the fundamentals of electric drive and different electric braking methods.
- **ii.** operation of single-phase controlled converter fed dc motors and four quadrant operations of dc motors using dual converters.
- **iii.** apply the knowledge of choppers for speed control of DC Motors.
- **iv.** know the analysis of speed control of induction motor with variable voltage and v/f control.
- **v.** know the analysis of speed control mechanism of synchronous motors

Text Books:

i. Fundamentals of Electric Drives – by G K DubeyNarosa Publications
ii. Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition

Reference Books:

i. Electric Motors and Drives Fundamentals, Types and Applications, by Austin Hughes and Bill Drury, Newnes.
ii. Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications.
iii. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI
iv. Power Electronics handbook by Muhammad H.Rashid, Elsevier.

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III Year - II Semester		L	T	P	C
		3	0	0	3
POWER SYSTEM ANALYSIS					

Course Objectives:
The objectives of this course is to acquire knowledge

i. on formulation of Y–bus matrix
ii. on power system load flow studies.
iii. on Z–Bus building algorithm and also to perform short circuit calculation for symmetrical faults.
iv. on unsymmetrical faults and their effects on power system.
v. on power system stability and methods to improve it.

UNIT –I:
Per Unit Representation & Topology
Per Unit Quantities–Single line diagram– Impedance diagram of a power system–Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y–bus matrix by singular transformation and direct inspection methods.

UNIT –II:
Power Flow Studies
Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) –Decoupled and Fast Decoupled methods – Algorithmic approach – Problems on 3–bus system only.

UNIT –III:
Z–Bus formulation
Formation of Z–Bus**:** Partial network– Algorithm for the Modification of Z_{bus}**:** 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 buses.– Modification of Z–Bus for the changes in network (Problems).

Symmetrical Fault Analysis
Transients on a Transmission line-Short circuit of synchronous machine(on no-load) - 3–Phase short circuit currents and reactance's of synchronous machine–Short circuit MVA calculations -Series reactors – selection of reactors.

UNIT –IV:
Symmetrical Components & Fault analysis
Definition of symmetrical components - symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances – Synchronous generator – Transmission line and transformers – Sequence networks –Various types of faults LG– LL– LLG and LLL on unloaded alternator–unsymmetrical faults on power system.

UNIT – V:

Power System Stability Analysis

Elementary concepts of Steady state– Dynamic and Transient Stabilities– Description of Steady State Stability Power Limit–Transfer Reactance–Synchronizing Power Coefficient – Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation–Determination of Transient Stability by Equal Area Criterion–Applications of Equal Area Criterion–Methods to improve steady state and transient stability.

`Course Outcomes:

The students should be able to

i. draw the impedance diagram for a power system network and compute per unit quantities.
ii. Find the load flow solution of a power system using different methods.
iii. Form Z–Bus in order to calculate fault current for all types of faults to design protective devices.
iv. Find the sequence components of currents for unbalanced power system network.
v. analyze the steady state, transient and dynamic stability concepts of a power system.

Text Books:

i. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
ii. Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata McGraw–Hill Publishing Company, 2nd edition.

Reference Books:

i. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
ii. Power System Analysis by Hadi Saadat – TMH Edition.
iii. Power System Analysis by B.R.Gupta, Wheeler Publications.
iv. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J.Overbye – Cengage Learning publications.

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III Year - II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
MICROPROCESSORS AND MICROCONTROLLERS					

COURSE OBJECTIVES:

i. To understand learn concepts of microprocessor, different addressing modes and programming of 8086.
ii. Understand interfacing of 8086, with memory and other peripherals.
iii. To learn concepts of PPI, DMA and programmable interrupt controller.
iv. Study the features of advanced processors, Pentium processors.
v. Study the features of 8051 Microcontroller, its instruction set and also other controllers like PIC controllers.

UNIT-I:

8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration.

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

UNIT-II:

8086 INTERFACING : Semiconductor memories interfacing (RAM,ROM), 8254 software programmable timer/counter, Intel 8259 programmable interrupt controller, software and hardware interrupt applications, Intel 8237a DMA controller, Intel 8255 programmable peripheral interface, keyboard interfacing, alphanumeric displays (LED,7-segment display, multiplexed 7-segment display, LCD), Intel 8279 programmable keyboard/display controller, stepper motor, A/D and D/A converters.

UNIT-III:

80386 and 80486 MICROPROCESSORS: Introduction, programming concepts, special purpose registers, memory organization, moving to protected mode, virtual mode, memory paging mechanism, architectural differences between 80386 and 80486 microprocessors. Introduction to Pentium and ARM Processors.

UNIT-IV:

Intel 8051 MICROCONTROLLER: Architecture, hardware concepts, input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.

Assembly language programming: Instructions, addressing modes, simple programs. Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.

UNIT-V:

PIC MICROCONTROLLER: Introduction, characteristics of PIC microcontroller, PIC microcontroller families, memory organization, parallel and serial input and output, timers, Interrupts, PIC 16F877 architecture, instruction set of the PIC 16F877.

TEXT BOOKS:

i. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata Mc GrawHill Education Private Limited, 3rd Edition.
ii. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, Dhananjay V. Gadre, Cengage Learninbg , India Edition.

REFERENCES:

i. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey,Pearson, Eighth Edition-2012.
ii. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.

COURSE OUTCOMES:

On successful completion of the course module students will be able to

i. Develop the assembly language programs for different addressing modes.
ii. Perform 8086 interfacing with different peripherals and implement programs.
iii. Describe the key features serial and parallel communication.
iv. Design Microcontroller for simple Applications.
v. Distinguish between architectures of various processors and controllers.

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III Year - II Semester		L	T	P	C
		3	0	0	3
RENEWABLE ENERGY SYSTEMS					

Course Objectives:
The objectives of this course is to acquire knowledge on

i. basicsof energy systems, solar energy and solar thermal Systems.
ii. solar photo voltaic systems construction characteristics and design.
iii. wind energy conversion systems, Betz coefficient, tip speed ratio and maximum power point techniques of wind energy.
iv. basic principle and working of hydro, tidal.
v. basic principle and working of different fuel cells,biomass digesters and geothermal systems.

UNIT – I Fundamentals of Energy Systems, Solar Energy and Solar Thermal Systems
Energy conservation principle – Energy scenario (world and India) – various forms of renewable energy - Solar radiation**:** Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces -Liquid flat plate collectors**:** Performance analysis –Transmissivity– Absorptivity product collector efficiency factor – Collector heat removal factor. Introduction to solar air heaters – Concentrating collectors, solar pond and solar still – solar thermal plants

UNIT - II Solar Photovoltaic Systems
Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Equivalent circuit of solar cell – Series resistance – Shunt resistance – Applications and systems – Balance of system components - System Design**:** storage sizing – PV system sizing – Maximum power point techniques**:** Perturb and observe (P&O) technique – Hill climbing technique.

UNIT - III: Wind Energy
Sources of wind energy - Wind patterns – Types of turbines –Horizontal axis and vertical axis machines - Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking – wind farms – Power generation for utility grids.

UNIT - IV: Hydro and Tidal power systems
Basic working principle – Classification of hydro systems**:** Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems.
Tidal power – Basics – Kinetic energy equation – Turbines for tidal power - Numerical problems – Wave power – Basics – Kinetic energy equation – Wave power devices – Linear generators.

UNIT - V: Biomass, fuel cells and geothermal systems

Biomass Energy**:** Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing.

Fuel cell**:** Classification of fuel for fuel cells – Fuel cell voltage– Efficiency – V-I characteristics.

Geothermal**:** Classification – Dry rock and hot acquifer – Energy analysis – Geothermal based electric power generation

Course Outcomes:

The students should be able to

i. analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface solar thermal collectors, solar thermal plants.
ii. design solar photo voltaic systems, maximum power point techniques in solar pv
iii. develop wind energy conversion systems, wind generators, power generation and wind energy systems.
iv. explain basic principle and working of hydro, tidal energy sytems.
v. explain biomass, fuel cell and geothermal systems.

Text Books:

i. Solar Energy**:** Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
ii. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis - second edition,2013.

Reference Books:

i. Energy Science**:** Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press.
ii. Renewable Energy- Edited by Godfrey Boyle-oxford university. press,3rd edition,2013.
iii. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
iv. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
v. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
vi. Non-conventional energy source –B.H.khan- TMH-2nd edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
COMPUTER ORGANIZATION (PROGRAM ELECTIVE-I)					

Course Objectives:

i. Gives a view of computer system from user's perspective, representation of data.
ii. Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
iii. Describes the means of interaction devices with CPU, their characteristics, modes.
iv. Description of different parameters of a memory system, organization and mapping of various types of memories.
v. Illustration of data paths and control flow for sequencing in CPUs, Microprogramming of control unit of CPU.

UNIT -I:

Basic Structure of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.
Data Representation: Data types, Complements, Fixed Point Representation, Floating – Point Representation, Other Binary Codes, Error Detection codes.

UNIT -II:

Machine Instruction and Programs:
Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types, Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions.

UNIT -III:

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations.
Input/Output Organization: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB).

UNIT -IV:

The Memory Systems: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING **Secondary Storage:** Magnetic Hard Disks, Optical Disks.

UNIT -V:

Processing Unit: Fundamental Concepts: Register Transfers, Performing an Arithmetic or Logic Operation, Fetching A Word from Memory, Execution of Complete Instruction, Hardwired Control, **Micro programmed Control:** Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next – Address Field.

Course Outcomes:

i. Understand the architecture of modern computer.
ii. Able to calculate the effective address of an operand by addressing modes.
iii. Apply different instruction types.
iv. Determine the importance of memory management system of computer.
v. Design the roles and functions of processing unit and micro programmed control.

Text Books:

i. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.

ii. Computer Architecture and Organization, John P. Hayes, 4th Edition, McGraw Hill.

Reference Books:

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

ii.Structured Computer Organization –Andrew S.Tanenbaum, 4th Edition PHI/Pearson.

iii. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.

iv. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy.

vi. J.P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

E-Resources:

i. https://nptel.ac.in/courses/106/106/106106092/
ii. https://nptel.ac.in/courses/106/105/106105163/

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III Year - II Semester		L	T	P	C
		3	0	0	3
AI TECHNIQUES AND APPLICATIONS IN ELECTRICAL ENGINEERING (PROGRAM ELECTIVE-II)					

Course Objectives:
The objectives of this course is to acquire knowledge on

i. basics of Artificial Intelligence system, ANN architectures and learning strategies.
ii. learning rules and algorithms
iii. properties, operations and relations of fuzzy sets.
iv. Fuzzification and defuzzification methods to develops fuzzy logic system.
v. Various applications of AI in electrical engineering such as Load frequency control, Economic load dispatch, stability and speed control of DC motor etc.

UNIT - I: Introduction to AI techniques
Introduction of AI system, Historical Developments, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Characteristics of ANN.

UNIT - II: ANN paradigm
McCulloch-Pitts Model, Learning Rules, Generalized Delta Rule, Single-layer feed-forward networks: – Perceptron, learning algorithm for perceptron- limitations of Perceptron model, Multi-layer feed-forward network (based on Back propagation algorithm)– Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Radial-basis function networks- Recurrent networks (Hopfield networks).

UNIT - III: Classical & Fuzzy Sets
Introduction to classical sets – operations, properties and relations of Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT - IV: Components of Fuzzy Logic System
Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT - V: Applications of AI Techniques
Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area and two area power system, Small Signal Stability, Reactive power control, speed control of DC and AC Motors.

Course Outcomes:

The students should be able to:

i discuss about the Artificial Neuron Models, ANN architectures and learning strategies
ii acquire knowledge on various learning algorithm of ANN.
iii differentiate classical and fuzzy sets.
iv apply the Fuzzification and defuzzification methods to design a Fuzzy logic controller.
v apply of AI Technique to Electrical engineering applications such as Load frequency control, Economic load dispatch, stability and speed control of DC motor etc.

Text Books:

i. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publication.
ii. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH,2006
iii. Fuzzy Logic with Engineering Applications by Timothy J. Ross

Reference Books:

i. Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002. Klir G.J. &Folger T.A., "Fuzzy sets, Uncertainty and Information", Prentice –Hall of India Pvt. Ltd., New Delhi, 2008.
ii. Zimmerman H.J., "Fuzzy set theory and its Applications", Kluwer Academic Publishers Dordrecht, 2001.
iii. Driankov, Hellendroonb, "Introduction to fuzzy control", Narosa Publishers, 2001.
iv. Neural Networks – Simon Hakins , Pearson Education
v. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
vi. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

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III Year - II Semester		L	T	P	C
		3	0	0	3
JAVA PROGRAMMING (PROGRAM ELECTIVE-I)					

Course Objectives:

i. Implementing programs for user interface and application development using core java principles
ii. Focus on object oriented concepts and java program structure and its installation
iii. Comprehension of java programming constructs, control structures in Java Programming Constructs
iv. Understanding of Thread concepts and I/O in Java
v. Being able to build dynamic user interfaces using applets and Event handling in java

UNIT -I:

Introduction to OOP

Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Program structures, Installation of JDK1.6

UNIT -II:

Variables, Primitive Data types, Identifiers- Naming Conventions, Keywords, Literals, Operators-Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control-Branching, Conditional, loops.

Classes and Objects- Classes, Objects, Creating Objects, Methods, constructors-Constructor overloading, cleaning up unused objects-Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments.

UNIT -III:

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class.

Interfaces, Packages and Enumeration: Interface-Extending interface, Interface Vs Abstract classes, Packages-Creating packages, using Packages, Access protection, java.lang package.

Exceptions & Assertions - Introduction, Exception handling techniques-try...catch, throw, throws, finally block, user defined exception, Exception Encapsulation and Enrichment, Assertions.

UNIT -IV:

Multi-Threading: java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading- Using isAlive() and join(), Synchronization, suspending and Resuming threads, Communication between Threads.

Input/output: Reading and writing data, java.io package

Applet: Applet class, Applet structure, Applet life cycle, sample Applet programs.

UNIT -V:

Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

Abstract Window Toolkit : Importance of AWT, Java.awt.package, Components and Containers, Button, Label, Check Box, Radio Buttons ,List Boxes, Choice Boxes, Text Field and Text Area, Container Classes, LayOuts, Menu, Scroll bar.

Swing: Introduction, JFrame, JApplet, JPanel, Components in Swings, Layout Managers, List and JScroll Pane, SplitPane, JTabbedPane, JTree, DialogBox, Pluggable Look and Feel.

Course Outcomes:

i. Understand Java programming concepts and utilize Java Graphical User Interface inProgram writing.
ii. Write, compile, execute and troubleshoot Java programming for networking concepts.
iii. Build Java Application for distributed environment.
iv. Design and Develop multi-tier applications.
v. Identify and Analyze Enterprise applications.

Text Books:

i. The Complete Reference Java, 8ed, Herbert Schildt, TMH
ii. Programming in JAVA, Sachin Malhotra, Saurabh Choudhary, Oxford.
iii. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.

Reference Books:

1. JAVA Programming, K.Rajkumar, Pearson
2. Core JAVA, Black Book, Nageswara Rao, Wiley, Dream Tech
3. Core JAVA for Beginners, Rashmi Kanta Das, Vikas.
4. Object Oriented Programming through JAVA , P Radha Krishna , University Press.
5. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar Bhuyya, Selvi, Chu TMH
6. Introduction to Java Programming, 7th ed, Y Daniel Liang, Pearson

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III Year - II Semester		L	T	P	C
		3	0	0	3

DIGITAL SIGNAL PROCESSING
(PROGRAM ELECTIVE-I)

OBJECTIVES

The student will be able to

i. Analyze the Discrete Time Signals and Systems
ii. Know the importance of FFT algorithm for computation of Discrete Fourier Transform
iii. Understand the various implementations of digital filter structures and Learn the FIR and IIR Filter design procedures
iv. Know the need of Multirate Processing
v. Learn the concepts of DSP Processors

UNIT I :

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

UNIT II:

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

UNIT III:

DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:

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

UNIT IV:

MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction, Decimation , Interpolation Sampling rate conversion ,Implementation of sampling rate converters

UNIT V:

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs ,Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis,Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI
3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002
4. Digital Signal Processing – K Raja Rajeswari, I.K. International Publishing House
5. **digital signal processing- Tarun Kumar Rawat Oxford university press**

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
5. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006
6. Digital Signal Processing – Ramesh babu, Sci Tech publications

OUTCOMES:

After going through this course the student will be able to

i. Apply the difference equations concept in the anayziation of Discrete time systems
ii. Use the FFT algorithm for solving the DFT of a given signal
iii. Design a Digital filter (FIR&IIR) from the given specifications and Realize the FIR and IIR structures from the designed digital filter.
iv. Use the Multirate Processing concepts in various applications (eg: Design of phase shifters, interfacing of digital systems…)
v. Apply the signal processing concepts on DSP Processor.

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III Year – II Semester		L	T	P	C
		3	0	0	3
MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR (PROGRAM ELECTIVE-I)					

Course Objectives:

i. To familiarize with the process of management, principles, leadership styles and basic concepts on Organization.
ii. To provide conceptual knowledge on functional management that is on Human resource management and Marketing management.
iii. To provide basic insight into select contemporary management practices and Strategic Management.
iv. To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.
v. To understand about organizations groups that affect the climate of an entire organizations which helps employees in stress management.

Unit I

Introduction: Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

Unit II

Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. - Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

Unit III

Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking, Balanced Score Card and other Contemporary Business Strategies

Unit IV

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation,

Unit V

Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Course Outcomes:

After completion of the Course the student will .

i. acquire the knowledge on management functions, global leadership and organizational structure.
ii. Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments.
iii. The learner is able to think in strategically through contemporary management practices.
iv. The learner can develop positive attitude through personality development and can equip with motivational theories.
v. The student can attain the group performance and grievance handling in managing the organizational culture.

Reference Books:

i. SubbaRao P., *Organizational Behaviour,* Himalaya Publishing House. Mumbai.
ii. Fred Luthans*OrganizationalBehaviour*, TMH, New Delhi.
iii. Robins, Stephen P., *Fundamentals of Management,* Pearson, India.
iv. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
v. Koontz &Weihrich: *Essentials of Management*, 6/e, TMH, 2007
vi. KanishkaBedi, *Production and Operations Management*, Oxford University Press, 2007

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year - II Semester		L	T	P	C
		0	0	3	1.5
POWER ELECTRONICS LABORATORY					

Course Objectives:

The objectives of this course is to acquire knowledge on

i. characteristics of various power electronic devices.
ii. performance of single-phase half controlled and fully controlled bridge converters with both resistive and inductive loads.
iii. operation of three phase half controlled and fully controlled bridge converters with both resistive and inductive loads.
iv. working of single phase and three phase inverters.
v. performance of AC Voltage controller and DC-DC Converters.

List of experiments

Any 10 of the Following Experiments are to be conducted

1. Study of Characteristics of Thyristor, MOSFET & IGBT.
2. Design and development of a firing circuit for Thyristor.
3. Design and development of gate drive circuits for IGBT.
4. Single Phase half wave-controlled converter with R and RL load.
5. Single Phase half-controlled converter with R and RL load.
6. Single Phase fully controlled bridge converter with R and RL load.
7. Three Phasehalf-controlled converter with R and RL load.
8. Three Phase fully controlled converter with R and RL load.
9. Single Phase AC Voltage controller with R and RL Load.
10. single phase half bridge and full bridge inverter with R and RL load.
11. Three Phase inverter with R-load (120^0 and 180^0 modes).
12. Buck and Boost converter in CCM operation.
13. Simulation of single-phase full converter with R and RL Load using MAT LAB/P-spice /PSIM.
14. Simulation of three phase full converter with R and RL Load using MAT LAB/P-spice /PSIM.
15. Simulation of Buck-Boost converter in CCM operation using MAT LAB/P-spice /PSIM.

Course Outcomes:

The students should be able to:

i. draw the characteristics of various power electronic devices.
ii. analyze the performance of single phase and three phase half and full bridge converters with both resistive and inductive loads.
iii. understand the working of Buck converter, Boost converter, single–phase and three phase inverters.

iv. understand the operation of single-phase AC voltage regulator with resistive and inductive loads.
v. Simulate various power electronic converters.

Text Books:

i. Simulation of Power Electronic Circuit,byM.B.patil, V.Ramanarayan, V.T.Ranganathan.Narosha,2009.
ii. P-spice for circuits and electronics using PSPICE – by M.H.Rashid, M/s PHI Publications
iii. Power Electronics: Circuits, Devices and Applications - by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998

Reference Books:

i. P-spice A/D user`s manual – Microsim, USA
ii. P-spice reference guide – Microsim, USA
iii. MATLAB user`s manual – Mathworks, USA
iv. SIMULINK user`s manual – Mathworks, USA

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III Year - II Semester		L	T	P	C
		0	0	3	1.5
LINEAR & DIGITAL IC APPLICATIONS LABORATORY					

Note: To perform any Twelve experiments (choosing at least six from each part).

Part - I: Linear IC Experiments

1. OP AMP Applications – Adder, Subtractor, Comparators.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. IC 741 Waveform Generators - Sine, Squarewave and Triangular waves.
5. IC 555 Timer - Monostable and Astable Multivibrator Circuits.
6. Schmitt Trigger Circuits - Using IC 741
7. IC 565 - PLL Applications.
8. Voltage Regulator using IC 723, Three Terminal Voltage Regulators - 7805, 7809, 7912.

EQUIPMENT REQUIRED:

1. 20 MHz / 40 MHz / 60 MHz Oscilloscope.
2. 1 MHz Function Generator (Sine, Square, Traingular and TTL).
3. Regulated Power Supply.
4. Multimeter / Volt Meter.

Part - II: HDL Simulation programs:

Programming can be done using any compiler. Download the programs on FPGA / CPLD boards and performance testing may be done using pattern generator / logic analyzer apart from verification by simulation using Cadence / Mentor Graphics / Synopsys / Equivalentfront end CAD tools.

1. HDL code to realize all the logic gates
2. Design of 2-to-4 decoder
3. Design of 8-to-3 encoder (without and with Priority)
4. Design of 8-to-1 multiplexer and 1 x 8 demuliplexer.
5. Design of 4 bit binary to gray code converter
6. Design of 4 bit comparator
7. Design of Full adder using 3 modelling styles
8. Design of flip flops: SR, JK, T
9. Design of 4-bit binary, BCD counters (synchronous/ asunchronous reset)
10. Finite State Machine Design

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IV Year - I Semester		L	T	P	C
		3	0	0	3
SWITCHGEAR AND PROTECTION					

Course Objectives:
The objectives of this course is to acquire knowledge on

i. basic principles and operation of various circuit breakers.
ii. Working of different electromagnetic and static relays.
iii. protective schemes for generator and transformers.
iv. protective schemes used for feeders and bus bars.
v. principles of different protective schemes for insulation co–ordination.

UNIT - I:
Switchgear:
Circuit breaker – basic principle of operation – arc phenomenon – initiation and maintenance of arc – arc interruption methods – arc voltage and current waveform in AC circuit breaking – re-striking and recovery voltage – current chopping – DC breakers – rating of circuit breakers – breaking capacity – making capacity – short time rating – working principle and important features of oil CB, minimum oil CB, air blast CB, vacuum CB and SF6 CB – auto high speed re-closing.

UNIT - II:
Protective relaying:
Main and back up protection – basic requirements of protective relaying – classification of relays – induction type – principle – inverse time characteristics – directional over-current and power relays – distance relays – definite distance and distance time relays – differential relays – negative phase sequence relay – static relays – basic static relay – block diagram of static over-current, static directional, static distance and static differential relays.

UNIT - III:
Generator Protection: External and internal faults – differential protection – biased circulating current protection – self balance system – over-current and earth fault protection – protection against failure of excitation.

Transformer protection: Differential protection – self-balance system of protection – over-current and earth fault protection – Buchholz's relay and its operation.

UNIT - IV:
Feeder protection: Protection of radial feeders – protection of parallel feeders – protection of ring mains – differential pilot protection for feeders – Merz Price voltage balance system – translay system.

Transmission Line Protection: Definite distance and time distance protection – phase and earth fault protection – carrier current protection

UNIT - V:

Protection against over voltage and grounding

Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc oxide lighting arresters– Insulation coordination– BIL– impulse ratio– Standard impulse test wave– volt-time characteristics– Grounded and ungrounded neutral systems–Effects of ungrounded neutral on system performance– Methods of neutral grounding**:** Solid–resistance–Reactance–Arcing grounds and grounding Practices.

Course Outcomes:

The students should be able to

i. know the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF_6 gas type
ii. explain the working and operation of different types of electromagnetic and static relays.
iii. acquire knowledge of faults and protective schemes for high power generator and transformers.
iv. acquire knowledge of protective schemes for feeders and transmission lines.
v. analyse different types of over voltages and protective schemes required for insulation co–ordination

Text Books:

i. Power System Protection and Switchgear by Badari Ram and D.N Viswakarma, TMH Publications
ii. Power system protection- Static Relays with microprocessor applications.by T.S. Madhava Rao, TMH

Reference Books:

i. Fundamentals of Power System Protection by Paithankar and S.R.Bhide.,PHI, 2003.
ii. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.
iii. Protection and Switch Gear by Bhavesh Bhalja, R.P. Maheshwari, Nilesh G.Chothani, Oxford University Press, 2013.

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UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3
UTILIZATION OF ELECTRICAL ENERGY					

Course Objectives:

The objectives of this course is to acquire knowledge on

i. operating principles and characteristics of electric drives.
ii. different types of electric heating and welding techniques.
iii. basics of illumination and design of lightning system.
iv. features of traction motor and speed time curves.
v. basic principle and method of calculation for tractive effort

UNIT – I:

Selection of Motors

Choice of motor, type of electric drives, starting and running characteristics–Speed control–Temperature rise–Applications of electric drives–Types of industrial loads–continuous–Intermittent and variable loads–Load equalization.

UNIT – II:

Electric Heating

Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating – Arc furnaces – Direct and indirect arc furnaces

Electric Welding

Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT – III:

Illumination fundamentals

Introduction, terms used in illumination–Laws of illumination–Polar curves–Integrating sphere–Lux meter–Discharge lamps, MV and SV lamps – Lumen or flux method of calculation - Sources of light.

Various Illumination Methods

Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and Design of lighting and flood lighting–LED lighting, principle of operation, street lighting and domestic lighting.

UNIT – IV:

Electric Traction – I

System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves-High speed transportation trains.

UNIT – V:

Electric Traction – II

Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking, retardation adhesive weight and coefficient of adhesion–Principles of energy efficient motors-Modern traction motors.

Course Outcomes:
The students should be able to

i. identify a suitable motor for electric drives and industrial applications
ii. identify most appropriate heating or welding techniques for suitable applications.
iii. estimate the illumination levels and design
iv. determine the speed/time characteristics of different types of traction motors.
v. estimate energy consumption levels at various modes of operation.

Text Books:
i. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
ii. Art & Science of Utilization of electrical Energy – by Partab, DhanpatRai & Sons.

Reference Books:

i. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
ii. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

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IV Year - I Semester		L	T	P	C
		3	0	0	3
ELECTRICAL DISTRIBUTION SYSTEMS					

Course Objectives
The objectives of this course is to acquire knowledge on

i. different factors of Distribution system.
ii. designing the substations and distribution systems.
iii. concepts of voltage drop and power loss in a distribution system.
iv. distribution system protection and its coordination.
v. effect of compensation for power factor improvement and effect of voltage control on distribution system.

UNIT – I:
General Concepts
Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor-loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

UNIT – II:
Substations & Distribution Feeders
Location of substations**:** Rating of distribution substation – Service area with'n'primary feeders – Benefits and methods of optimal location of substations..
Design Considerations of distribution feeders**:** Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic Design practice of the secondary distribution system.

UNIT – III:
System Analysis
Voltage drop and power–loss calculations**:** Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems - Three phase balanced primary lines.

UNIT – IV:
Protective devices and Coordination
Objectives of distribution system protection – Types of common faults and procedure for fault calculations for distribution system – Protective devices**:** Principle of operation of fuses – Circuit reclosures – Line sectionalizers and circuit breakers, Coordination of protective devices**,** General coordination procedures - Various types of co-ordinated operation of protective devices - Residual Current Circuit Breaker

UNIT – V:
Compensation for Power Factor Improvement and Voltage Control
Capacitive compensation for power factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location. Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.

Learning Outcomes:

The students should be able to

- **i.** discuss about various factors of distribution system.
- **ii.** design the substation and feeders.
- **iii.** determine the voltage drop and power loss
- **iv.** apply the protection and coordination of distribution system.
- **v.** apply compensation techniques forpower factor improvement in a distribution system

Text Book:

i. "Electric Power Distribution system, Engineering" – by Turan Gonen, McGraw–hill Book Company.

Reference Books:

- **i.** Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
- **ii.** Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4^{th} edition, 1997.
- **iii.** Electrical Power Distribution Systems by V.Kamaraju, Right Publishers

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IV Year - I Semester		L	T	P	C
		3	0	0	3
ELECTRICAL MACHINE MODELLING AND ANAYSIS (PROGRAM ELECTIVE-II)					

Course Objectives

i. unified theory of rotating machines.
ii. the concept of phase transformation.
iii. mathematical modeling of machines single phase induction .
iv. develop concepts on mathematical modeling of electrical machines.
v. analyze BLDC Machine and switched reluctance machine based on mathematical modeling of BLDCM and SRM.

UNIT – I
Basic concepts of modeling
Basic Two-pole Machine representation of Commutator machines, 3-phase synchronous machine with and without damper bars and 3-phase induction machine, Kron's primitive Machine-voltage, current and Torque equations.

UNIT – II
DC machine modeling
Mathematical model of separately excited D.C Motor – Steady State analysis-Transient State analysis-Sudden application of Inertia Load-Transfer function of Separately excited D.C Motor- Mathematical model of D.C Series motor, Shunt motor-Linearization Techniques for small perturbations.

UNIT- III
Reference frame theory & Modeling of single phase Induction Machines
Linear transformation-Phase transformation - three phase to two phase transformation (abc to dq0) and two phase to three phase transformation dq0 to abc -Power equivalence- Mathematical modeling of single phase induction machines.

UNIT – IV
Modeling of three phase Induction Machine
Generalized model in arbitrary reference frame-Electromagnetic torque-Derivation of commonly used Induction machine models- Stator reference frame model-Rotor reference frame model-Synchronously rotating reference frame model-state space model with flux linkages as variables.

UNIT –V

Modeling of Synchronous Machine

Synchronous machine inductances–voltage equations in the rotor's dq0 reference frame-electromagnetic torque-current in terms of flux linkages-three phase synchronous machine model.

Modeling of Special Machines

Modeling of PM Synchronous motor, modeling of BLDC motor and modeling of Switched Reluctance motor.

Course Outcomes:

After completion of this course, students will be able to

i. discuss about the basic concepts of machine modeling
ii. develop mathematical model of dc motor
iii. acquire knowledge on the abc to dq0 and dq0 to abc transformations to develop mathematical model of single-phase induction machine
iv. design control strategies based on dynamic modeling of 3-ph Induction machines and 3-phase synchronous machine.
v. model synchronous machine and special electrical machines

Text Books:

1. Generalized theory of Electrical Machinery –P.S.Bimbra- Khanna Publishers.
2. Electric Motor Drives - Modeling, Analysis& control -R.Krishnan- Pearson Publications-1st edition -2002.

Reference Books:

1. Analysis of Electrical Machinery and Drive systems – P.C.Krause, OlegWasynczuk, Scott D.Sudhoff – Second Edition-IEEE Press.
2. Dynamic simulation of Electric machinery using Matlab / Simulink –CheeMunOng-PHl.
3. Modern Power Electronics and AC Drives-B.K. Bose - PHI

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IV Year - I Semester		L	T	P	C
		3	0	0	3
ADVANCED CONTROL SYSTEMS (PROGRAM ELECTIVE-II)					

Course Objectives:
The objectives of this course is to acquire knowledge on
i. formulation of different models using state space analysis
ii. analysis of state feedback control through pole placement technique.
iii. analysis of a nonlinear system using Lypanov's method of stability
iv. formulation of Euler Laugrange equation to optimize typical functional and solutions
v. optimal controller design using LQG framework

UNIT – I:
State space analysis
State Space Representation – Solution of state equation – State transition matrix, –Canonical forms – Controllable canonical form – Observable canonical form, Jordan Canonical Form.

UNIT – II:
Controllability, observability and Design of pole placement
Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT – III:
Describing function and stability analysis
Introduction to nonlinear systems, Types of nonlinearities, describing functions, Introduction to phase–plane analysis.
Stability in the sense of Lyapunov – Lyapunov's stability and Lypanov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

UNIT–IV:
Calculus of variations
Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints – Euler lagrangine equation.

UNIT –V:
Optimal control
Linear Quadratic Optimal Regulator (LQR) problem formulation – Optimal regulator Design by parameter adjustment (Lyapunov method) – Optimal regulator Design by Continuous Time Algebraic Riccatti equation (CARE) - Optimal controller Design using LQG framework.

Course Outcomes:

The students should be able to

i. design the state space model of control system and formulate different state models

ii. design state feedback control using the pole placement technique

iii. analyse the stability using Lyapunov's method.

iv. minimize the functions using calculus of variation method.

v. design optimal controller using LQG framework

Text Books:

i. Modern Control Engineering by K. Ogata, Prentice Hall of India, 3rd edition, 1998

ii.Automatic Control Systems by B.C. Kuo, Prentice Hall Publication

Reference Books:

i. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition,1996

ii. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.

iii. Digital Control and State Variable Methods – by M. Gopal, Tata McGraw–Hill Companies, 1997.

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IV Year - I Semester		L	T	P	C
		3	0	0	3
DATA BASE MANAGEMENT SYSTEMS (D.B.M.S) **(PROGRAM ELECTIVE-II)**					

Course Objectives:

i. Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL, and System implementation techniques.
ii. Enable students to model ER diagram for any customized applications
iii. Provide knowledge on concurrency techniques
iv. Understand normalization theory and apply such knowledge to the normalization of a database.
v. To learn the principles of systematically designing and using large scale Database Management Systems for various applications.

UNIT-I:

An Overview of Database Management: Introduction- Importance of Database System, Data Independence- Relation Systems and Others- Summary, Database system architecture, Introduction- The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator-The Database Management Systems-Client/Server Architecture.

UNIT-II:

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

The Relational Model: Integrity Constraints Over Relations- Key Constraints –Foreign Key Constraints-General Constraints, Relational Algebra and Calculus, Relational Algebra-Selection and Projection- Set Operation, Renaming – Joins- Division- More Examples of Queries, Relational Calculus - Tuple Relational Calculus, Domain Relational Calculus.

UNIT-III:

Queries, Constraints, Triggers: The Form of Basic SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database.

Schema Refinement (Normalization) : Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT-IV:

Transaction Management and Concurrency Control:

Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and save point, Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler.

Concurrency control with locking methods : lock granularity, lock types, two phase locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering : Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

UNIT-V:

Overview of Storages and Indexing: Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based

Indexing – Tree- Based Indexing, Comparison of File Organization.

Course Outcomes:

i. Understand File System Vs Databases.
ii. Understand the usage of Key Constraints on Database.
iii. Create, maintain and manipulate a relational database using SQL
iv. Describe ER model and normalization for database design.
v. Understand efficient data storage and retrieval mechanism, recovery techniques

Text Books:

i. Introduction to Database Systems, CJ Date, Pearson
ii. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition

References Books:

i. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
ii. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
iii. Database Systems - The Complete Book, H G Molina, J D Ullman, J Widom Pearson
iv. Data base System Concepts,5/e, Silberschatz, Korth, TMH

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

CONTROL AND INTEGRATION OF RENEWABLE ENERGY SOURCES

(PROGRAM ELECTIVE-II)

Course Objectives:

The objectives of this course is to acquire knowledge on

i. technical challenges in renewable energy
ii. characteristics of induction generators
iii. wind energy conversion systems and their applications
iv. solar energy conversion systems and their applications
v. power control and different systems for grid integration.

UNIT– I: Introduction

Renewable Sources of Energy, Distributed Generation, Renewable Energy Economics - Calculation of Electricity Generation Costs, Demand-Side Management Options, Supply-Side Management Options, Control of renewable energy-based power Systems

UNIT– II: Induction Generators:

Principles of Operation; Representation of Steady-State Operation, Power and Losses Generated - Self-Excited Induction Generator; Magnetizing Curves and Self-Excitation - Mathematical Description of the Self-Excitation Process; Interconnected and Stand-alone operation - Speed and Voltage Control on electronic conversion system and its application to renewable energy generation -the issues involved in integration of renewable energy systems

UNIT– III: Wind Energy Conversion System

Site Selection; Evaluation of Wind Intensity; Topography; Purpose of the Energy Generation-General Classification of Wind Turbines; Rotor Turbines; Multiple-Blade Turbines; Drag Turbines; Lifting Turbines - Generators and Speed Control Used in Wind Power Energy; Analysis of Small wind energy conversion system.

UNIT– IV: Solar Energy Conversion System

Solar Energy; Generation of Electricity by Photovoltaic Effect; Dependence of a PV Cell on Temperature and irradiance input-output Characteristics - Equivalent Models and Parameters for Photovoltaic Panels, Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy

UNIT– V: Integration of Alternate Sources of Energy

Introduction-Principles of power injection: converting technologies, power flow, Instantaneous Active and Reactive power control approach; Integration of multiple Renewable Energy Sources; DC link integration, AC link integration, HFAC link integration, Islanding and Interconnection control.

Course Outcomes:
The students should be able to

i. know the technical challenges in renewable energy
ii. know the characteristics of induction generators
iii. acquire knowledge on wind energy conversion systems and their applications
iv. acquire knowledge on solar energy conversion systems and their applications.
v. analyze power control and types of different integration systems.

Text Books:

1. Felix A. Farret, M. Godoy Simoes, Integration of Alternative Sources of Energy, John Wiley and Sons, 2006.
2. Solanki: Renewable Energy Technologies: Practical Guide for Beginners, PHI Learning Pvt. Ltd., 2008.
3. Bollen M. H. and Hassan F. (2011); Integration of Distributed Generation in the Power System, Wiley-IEEE Press

Reference Books:

1. D. Mukherjee: Fundamentals of Renewable Energy Systems, New Age International publishers, 2007.
2. Remus Teodorescu, Marco Liserre, Pedro Rodriguez: Grid Converters for Photovoltaic and Wind Power Systems, John Wiley and Sons, 2011.
3. Gilbert M. Masters: Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004
4. Muhammad H. R. (2004); Power Electronics: Circuits, Devices and Applications,Pearson Prentice Hall

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3
DATA STRUCTURES (PROGRAM ELECTIVE-III)					

Course Objectives:

i. Solve problems using data structures such as linear lists, stacks, queues, hash tables.
ii. To understand concepts about searching and sorting techniques.
iii. Be familiar with non-linear data structures such as Trees, Search Trees, Threaded trees, and Graphs.
iv. Solve problems using data structures such as Efficient Search Structures.

UNIT-I: Linear Data Structures:

Linked Lists: Linear List, Ordered and Unordered Lists, Singly Linked List, Doubly Linked List, Circular Linked List Implementations and List Applications.
Stacks: Stacks using Arrays and Linked List, Applications of Stacks.
Queues: Queues using Arrays and Linked List, Circular Queues, DeQueues, Applications of Queues.

UNIT-II:

Searching and Sorting:

Linear Search, Binary Search, Fibonacci Search, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort.
Dictionaries: Indexing, Hashing, and Hash Functions, Collision Resolution - Separate Chaining, Open Addressing, Hashing with Buckets.

UNIT-III: Trees

Basic Terminology, Applications, Types of Trees, Tree Representations, Binary Tree Traversals, Threaded Binary Trees.
Priority queues: Min Vs Max Heaps, Binomial Queues.

UNIT-IV: Efficient Search Structures

BSTs: Binary Search Tree, Skewed Trees, BST implementation and its Applications. AVL
B, B+ Trees: Self Balanced Trees, Height o1'an AVL Trees, AVL Tree Rotations and M-Way Search Trees.

UNIT-V: Graphs

Introduction to Graphs, Basic Terminology, and Types, Applications, Connectivity,
Shortest Paths: Single-Source Shortest Path Problem, Transitive Closure, All Pairs Shortest Path Problem,
Spanning Trees: Prim's Algorithm and Kruskal's Algorithm.

Course Outcomes:

i. Distinguish between Linear and Non-Linear Data structures.Apply advanced data structure strategies for exploring complex data structures.
ii. Compare and contrast various Sorting and searching techniques in the area of Performance.
iii. Exploring basic non-linear data structures and their applications
iv. Incorporate data structures into applications such as Binary Search Trees, Heaps.
v. Implement Graphs and applications and compare their Performance and trade-offs.

Textbooks:

i. Data structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
ii. Data Structures & Algorithms, Alfred V Aho, John E Hopcraft, Jeffery D Ullman, Pearson Education. Ltd., First Edition.
iii. Fundamentals of Data Structures in C, S.Sahni, Second Edition, Universities Press, Pvt. Ltd.

Reference Books:

i. Data Structures and Algorithms using C by R. S. Salari, Fifth Edition, KHANNA Publishing.
ii. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
iii. Data Structures and Algorithms Made Easy: Second Edition: Data Structure and
iv. Algorithm c Puzzles, Narasimha Karumanchi, Fifth Edition, Career Monk.
v. Data Structures Using C, Reema Thareja, Second Edition, Oxford.
vi. Problem-solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

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IV Year - I Semester		L	T	P	C
		3	0	0	3

SPECIAL ELECTRICAL MACHINES

(PROGRAM ELECTIVE-III)

Course Objectives:

The objectives of this course is to acquire knowledge on the

i. properties of magnetic materials and the operation of PMDC motors.

ii.performance and control of stepper motors and their applications.

iii.theory of operation and control of switched reluctance motor.

iv. characteristics and performance of PM BLDC motors.

v. principle of operation of linear induction motor.

UNIT - I: Permanent magnet materials and PMDC motors

Introduction-classification of permanent magnet materials used in electrical machines-minor hysteresis loop and recoil line-Stator frames of conventional dc machines-Development of electronically commutated dc motor from conventional dc motor-Permanent-magnet materials and characteristics-B-H loop and demagnetization characteristics-Temperature effects: reversible and irreversible losses-high temperature effects-reversible losses-Irreversible losses recoverable by magnetization-Mechanical properties, handling and magnetization-Application of permanent magnets in motors-power density-operating temperature range-severity of operation duty.

UNIT - II: Stepper Motors

Classification of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of 2-phase hybrid stepping motor. Construction and principle of operation of Variable Reluctance Motor (VRM) – Single stack and multiple stack – Open loop control of 3-phase VR Stepper Motor- Applications.

UNIT - III: Switched Reluctance Motors

Construction – Comparison of conventional and switched reluctance motors – Design of stator and rotor pole arcs – Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

UNIT - IV: Permanent Magnet Brushless DC Motor

Types of constructions – Surface mounted and interior type permanent magnet – Principle of operation of BLDC motor. Torque and EMF equations of square permanent magnet brushless motor – Torque speed characteristics – Performance and efficiency- Square wave brushless motors with 120^0 and 180^0 magnetic areas commutation.

Torque and EMF equations of sine wave permanent magnet brushless motor – Phasor Diagram – Circle diagram – Torque/speed characteristics – Comparison between square wave and sine wave permanent magnet motors - Applications.

UNIT - V: Linear Induction Motors (LIM)

Construction– principle of operation–Double sided LIM from rotating type Induction Motor – Schematic of LIM drive for traction – Development of one-sided LIM with back iron-equivalent circuit of LIM.

Course Outcomes:

The students should be able to:

i. acquire knowledge on the characteristics and application of PMDC motors.
ii. explore different types, construction and principle of operation of different types of stepper motors and their applications.
iii. explain theory of operation of switched reluctance motor and its control.
iv. analyse the performance of PMBLDC motors.
v. explains the operation of linear induction motor drive for traction purpose.

Text Books:

i. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.
ii. Special electrical Machines, K.Venkata Ratnam, University press, 2009, NewDelhi.

Reference Books:

i. Special electrical machines, E.G. Janardhanan, PHI learning private limited, 2014.

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IV Year - I Semester		L	T	P	C
		3	0	0	3
DIGITAL CONTROL SYSTEMS (PROGRAM ELECTIVE-III)					

Course Objectives:
The objectives of this course is to acquire knowledge on

i. basic concepts of digital control systems and its associate components.
ii. z–transformation theory and its application for the mathematical analysis of digital control systems.
iii. discrete–time systems in state–space model and evaluation of state transition matrix.
iv. testing of stability criteria using different stability tests.
v. design of state feedback control by the pole placement method.

UNIT – I:
Introduction and signal processing
Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT–II:
Z–transformations
Z–Transforms – Theorems – Finding inverse z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT–III:
State space analysis and the concepts of Controllability and observability
State space representation of discrete time systems – State transition matrix and methods of evaluation – Discretization of continuous – Time state equations – Concepts of controllability and observability – Tests (without proof).

UNIT – IV:
Stability analysis
Mapping between the s–Plane and the z–Plane – Primary strips and Complementary strips – Stability criterion – Modified Routh's stability criterion and Jury's stability test.

UNIT – V:
Design of discrete–time control systems and state feedback controllers
Transient and steady state specifications – Design using frequency response in the w–plane for lag and lead compensators – Root locus technique in the z–plane

State feedback controllers:
Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Course Outcomes:

The students should be able to

i. know the various components of digital control systems and its advantages compared to analog systems.
ii. Apply z–transformation theory for the mathematical analysis of digital control systems.
iii. represent the state–space model of discrete–time systems and determination of state transition matrix.
iv. examine the Stability of the system using Routh's and Jury's stability test.
v. apply root locus technique in the z–plane and also able to design state feedback controller through pole placement method.

Text Books:

i. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
ii. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

Reference Books:

i. Digital Control Systems, B.C Kuo, Oxford University Press, 2nd Edition, 2003.

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IV Year - I Semester		L	T	P	C
		3	0	0	3

HYBRID ELECTRIC VEHICLES

(PROGRAM ELECTIVE-III)

Course Objectives:

The objectives of this course is to acquire knowledge on

i. advantages of electric and hybrid electric vehicles.
ii. various architectures of hybrid electric vehicles.
iii. power management of plug in electric vehicles.
iv. different power converters used in electrical vehicles.
v. different batteries and other storage systems

UNIT– I:

Introduction

Fundamentals of vehicle, components of conventional vehicle and propulsion load; Drive cycles and drive terrain; Concept of electric vehicle and hybrid electric vehicle; History of hybrid vehicles, advantages and applications of Electric and Hybrid Electric Vehicles, principle of magnetic levitation, different Motors suitable for of Electric and Hybrid Electric Vehicles.

UNIT–II:

Hybridization of Automobile

Architectures of HEVs, series and parallel HEVs, complex HEVs. Plug-in hybrid vehicle, constituents of PHEV, comparison of HEV and PHEV; Fuel Cell vehicles and its constituents.

UNIT–III:

Plug-in Hybrid Electric Vehicle

PHEVs and EREVs blended PHEVs, PHEV Architectures, equivalent electric range of blended PHEVs; Fuel economy of PHEVs, power management of PHEVs, end-of-life battery for electric power grid support, vehicle to grid technology, PHEV battery charging.

UNIT–IV:

Power Electronics in HEVs

Rectifiers used in HEVs, voltage ripples; Buck converter used in HEVs, non-isolated bidirectional DC-DC converter, voltage source inverter, current source inverter, isolated bidirectional DC-DC converter, PWM rectifier in HEVs, EV and PHEV battery chargers.

UNIT– V:

Battery and Storage Systems

Energy Storage Parameters; Lead–Acid Batteries; Lithium-ion batteries-Ultra capacitors; Flywheels - Superconducting Magnetic Storage System; Pumped Hydroelectric Energy Storage; Compressed Air Energy Storage - Storage Heat; Energy Storage as an Economic Resource

Course Outcomes:

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

i. know the concept of electric vehicles and hybrid electric vehicles.
ii. familiar with different configuration of hybrid electric vehicles.
iii. apply the power management used in hybrid electric vehicles
iv. apply the power converters used in hybrid electric vehicles
v. know different batteries and other energy storage systems.

Text Books

1. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2014.
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

Reference Books:

1. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
3. H. Partab: Modern Electric Traction – Dhanpat Rai& Co, 2007.

ResearchBooks:

1. Pistooa G., “Power Sources , Models, Sustanability, Infrstructure and the market”, Elsevier 2008
2. Mi Chris, Masrur A., and Gao D.W., “ Hybrid Electric Vehicle: Principles and Applications with Practical Perspectives” 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - I Semester		L	T	P	C
		0	0	3	1.5
MICROPROCESSORS AND MICROCONTROLLERS LAB					

LIST OF EXPERIMENTS

PART- A: (Minimum of 5 Experiments has to be performed)
8086 Assembly Language Programming using Assembler Directives

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

PART- B: (Minimum of 3 Experiments has to be performed)
8086 Interfacing

1. Hardware/Software Interrupt Application
2. A/D Interface through Intel 8255
3. D/A Interface through Intel 8255
4. Keyboard and Display Interface through Intel 8279
5. Generation of waveforms using Intel 8253/8254

PART- C: (Minimum of 3 Experiments has to be performed)
8051 Assembly Language Programs

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

PART-D: (Minimum of 3 Experiments has to be performed)
8051 Interfacing

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

Equipment Required:

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

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IV Year - I Semester		L	T	P	C
		0	0	3	1.5
POWER SYSTEMS AND SIMULATION LABORATORY					

Course Objectives:

The objectives of this course is to acquire knowledge to

i. Determination of the parameters of various power system components
ii. Determination of parameters of transmission line
iii. Execution of load flow analysis
iv. Execution of transient stability analysis
v. Execution of energy management systems functions at load dispatch center and design the controller for AGC of a thermal power plant.

List of experiments

Any 10 experiments of the following are required to be conducted as compulsory experiments

1. Sequence impedances of 3 phase Transformer.
2. Sequence impedances of 3 phase Alternator by Fault Analysis.
3. Sequence impedances of 3 phase Alternator by Direct method.
4. ABCD parameters of Transmission line.
5. Power Angle Characteristics of 3phase Alternator with infinite bus bars.
6. Dielectric strength of Transformer oil.
7. Calibration of Tong Tester.
8. Load flow studies using Gauss-seidel method
9. Load flow studies using Fast De-coupled method
10. Load flow studies using N-R method..
11. Transient Stability Analysis
12. Load frequency control with &without integral controller
13. Economic load dispatch with & without losses

Course Outcomes:

The students should be able to

i. Understand the parameters of various power system components
ii. Determine parameters of transmission line
iii. Examine load flow in a power system network
iv. Assess the transient and steady state behavior of electrical machines
v. Execution of energy management systems functions at load dispatch center and develop controller for AGC of a thermal power plant

Text Books:

i. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
ii. Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari Tata McGraw–Hill Publishing Company, 2nd edition.

Reference Books:

i. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
ii. Power System Analysis by HadiSaadat – TMH Edition.
iii. Power System Analysis by B.R.Gupta, Wheeler Publications.
iv. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J.Overbye – Cengage Learning publications

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
POWER SYSTEMS OPERATION AND CONTROL					

Course Objectives:
The objectives of this course is to acquire knowledge on

i. optimal dispatch of generation with and without losses.
ii. optimal scheduling of hydro thermal systems.
iii. optimal unit commitment problem.
iv. load frequency control for single and two area systems with and without controllers
v. reactive power control and compensation of transmission lines.

UNIT–I:
Economic Operation of Power Systems
Optimal operation of Generators in Thermal power stations, – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

UNIT–II:
Hydrothermal Scheduling
Optimal scheduling of Hydrothermal System**:** Hydroelectric power plant models – Scheduling problems – Short term hydrothermal scheduling problem.

UNIT–III:
Unit Commitment
Optimal unit commitment problem – Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

UNIT–IV:
Load Frequency Control
Modeling of steam turbine - Modeling of Hydro turbine – Generator – Mathematical modeling of speed governing system – Transfer function –Necessity of keeping frequency constant – Control area – Single area power system – Block diagram representation of an isolated power system – Steady state analysis - Dynamic response of Uncontrolled case. Proportional plus Integral control of single area- Steady State Response .Tie-line bias control, Block diagram development of Load Frequency Control of two area system- uncontrolled case and controlled case, Economic dispatch control.

UNIT–V:

Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – Uncompensated and compensated transmission lines**:** Shunt and series compensation – Need for FACTS controllers.

Course Outcomes:

The students should be able to

i. compute optimal scheduling of Generators.
ii. Compute hydrothermal scheduling.
iii. solve unit commitment problem.
iv. design PID controllers in single area and two area systems.
v. Apply reactive power control and compensation for transmission line.

Text Books:

i. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–Hill Publishing Company Ltd., Second edition.
ii. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata McGraw Hill Publishing Company Ltd, 2nd edition.

Reference Books:

i. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., Thompson,3rdEdition.
ii. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
iii. Power System Analysis by Hadi Saadat – TMH Edition.
iv. Power System stability & control, Prabha Kundur, TMH

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
ELECTRIC VEHICLES (OPEN ELECTIVE-III)					

Course Objectives:

The objectives of this course is to acquire knowledge on

i. basics concepts related to mechanics, kinetics and dynamics of electric vehicles.
ii. technical characteristics and properties of batteries.
iii. Different ratings of motor and engine to design an electric vehicle.
iv. various components of electric vehicle drive.
v. different configurations of drive train.

UNIT I ELECTRIC VEHICLES
Introduction, Components, vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion - Propulsion System Design.

UNIT II BATTERY
Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Technical characteristics, Battery pack Design, Properties of Batteries.

UNIT III DC & AC ELECTRICAL MACHINES
Motor and Engine rating, Requirements, DC machines, Three phase A.C machines, Induction machines, permanent magnet machines, switched reluctance machines.

UNIT IV ELECTRIC VEHICLE DRIVE TRAIN
Transmission configuration, Components – gears, differential, clutch, brakes regenerative braking, motor sizing.

UNIT V HYBRID ELECTRIC VEHICLES
Types – series, parallel and series, parallel configuration – Design – Drive train, sizing of components.

Course Outcomes:

the students should be able to,

i. design propulsion system for an electric vehicle.
ii. know technical characteristics and properties of batteries and also to design battery pack.
iii. know the ratings and requirements of electrical machines.

iv. apply the regenerative braking and sizing of motors.

v. configure and design the components of hybrid electric vehicles.

Text book(s) and/or required materials

i. Iqbal Hussain, “Electric & Hybrid Vehicles – Design Fundamentals”, Second Edition, CRC Press, 2011.
ii. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003.

Reference Books:

i. Mehrdad Ehsani, Yimin Gao, Ali Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals”, CRC Press, 2010.
ii. Sandeep Dhameja, “Electric Vehicle Battery Systems”, New nes, 2000
http://nptel.ac.in/courses/108103009/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3

INDIAN ELECTRICITY ACT, 2003
(OPEN ELECTIVE-III)

Course Objectives:

The objectives of this course is to acquire knowledge on

i. national policy and plan and the joint responsibilities of state and central governments

ii. licensing and the provisions related to transmission and distribution of electricity

iii. regulatory commissions and cea

iv. appellate tribunal for electricity

v. special courts and dispute resolution

UNIT - I: National electricity policy and plan, generation of electricity

Electricity Act: commencement, definitions, comments; national policy on standalone systems, non-conventional energy systems, electrification and local distribution for rural areas; joint responsibilities of state and central governments in rural electrification, requirement for setting up of generating station, hydro-electric generation, captive generation; duties of generating companies.

UNIT - II: Licensing, transmission and distribution of electricity

Licensing: powers, procedures, conditions, amendments, revocation, provisions, directions, suspension and sale; inter-state and intra-state transmission; other provisions relating to transmission; provisions with respect to distribution licenses, electricity traders, supply - consumer protection: standard performance

UNIT - III: Tariff, works, CEA and Regulatory commissions

Works of licenses, provisions relating to overhead lines; Constitution and functions of Central Electricity Authority (CEA), directions and certain powers; Constitution, powers and functions of state and central commissions, other provisions, proceedings and powers of appropriate commission, Grants, Fund, Accounts Audit and Report

UNIT - IV: Appellate Tribunal, Reorganisation of boards, offences and penalty

Appellate Tribunal for electricity; investigation and assessment; reorganisation of boards; Offences and penalties

UNIT - V: Special courts, Dispute resolution, other provisions and Miscellaneous

Constitution of special courts, procedures, powers, appeal, revision; arbitration; protective clauses; miscellaneous and enactments.

Course Outcomes:

The students should be able to

i. learns about national policy and plan and the joint responsibilities of state and central governments

ii. knowledge on licensing and the provisions related to transmission and distribution of electricity

iii. regulatory commissions and cea

iv. appellate tribunal for electricity

v. special courts and dispute resolution

Text Books:

i. The Electricity Act, 2003 {Act 36 of 2003, dt.2-6-2003, w.e.f. 10-6-2003 vide S.O. No. 669(E), dt. 10-6-2003] published by Commercial Law Publishers (I) Pvt. Ltd.

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IV Year - II Semester		L	T	P	C
		3	0	0	3
POWER SYSTEMS FOR DATA CENTERS (OPEN ELECTIVE-III)					

Course Objectives:

The objectives of this course is to acquire knowledge on

i. the primary power problems
ii. working of ups
iii. power distribution in the data centers
iv. power consumption in the data centers
v. impacts of energy efficiency

UNIT -I: Fundamentals of Power

Power basics and key terms, Power calculations, Grounding Power problems, Power protection system equipment

UNIT -II: Uninterruptible Power Supply (UPS)

UPS basics, UPS topologies, UPS redundancy and efficiency, Modular UPS, UPS batteries Flywheel UPS

UNIT –III: Generators and Other Power Devices

Generators, Automatic and static transfer switches, Power distribution units, Circuit Breakers Circuit Breaker Coordination, Circuit Breaker Protection, Circuit Breaker Sizing

UNIT –IV: Power Distribution in the Rack

Rack power redundancy, Server power calculations, Power cabling, calculating power requirements, Power consumption in the data centre, Reducing Wasted Power in the Data Centre: reducing server power

UNIT –V: Data Center Energy Efficiency and practices

Data centre power growth, Barriers to data centre energy efficiency, Power consumption in the data centre, Power Usage effectiveness (PUE), Measuring PUE, Other data centre efficiency metrics

Energy Efficiency Best Practices
Reducing the support infrastructure load, Systematic approach to improving energy efficiency.

Course Outcomes:

The students should be able to

i. describe the power infrastructure in the data centre
ii. describe the UPS systems and components
iii. discuss about the electrical equipment, systems and their controls
iv. calculate power required in the data centre
v. describe methods to improve data centre energy efficiency

Text Books:

i. Data Center Handbook, by HwaiyuGeng,**Publisher(s): Wiley ISBN: 9781118436639**

Reference Books:

i. Designing Data Centers - Book 1: Power: Specifying the requirements, power generation, power distribution, power efficiency, and fault tolerance for data centers, by B.A.Ayomaya, ISBN-13 : 979-8695727715

ii. Guide to Data Centre Power Systems, Publication Year: 2021,Pages: 278 ISBN-13: 978-1-78561-828-4

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
HVAC & DC TRANSMISSION (PROGRAM ELECTIVE-IV)					

Course Objectives:
The objectives of this course is to acquire knowledge on

i. phenomena associated with transmission lines,
ii. phenomena of hvdc equipment and the latest state of art in hvdc transmission.
iii. perform various level of pulse conversion and its control characteristics.
iv. requirements of reactive power control and filtering techniques.
v. harmonics and design of filters for various levels of pulse conversion.

Unit – I:

Introduction of EHV AC transmission
Necessity of EHV AC transmission – Advantages and problems – Power handling capacity and line losses – Mechanical considerations – Resistance of conductors –Electrostatics – Field of sphere gap – Field of line charges and properties – Charge ~ potential relations for multi–conductors – Surface voltage gradient on conductors – Bundle spacing and bundle radius – Examples – Distribution of voltage gradient on sub conductors of bundle –Examples.

UNIT – II:
Basic Concepts of DC Transmission
Economics & Terminal equipment of HVDC transmission systems**:** Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC transmission – Application of DC Transmission System – Planning &Modern trends in DC transmission.

UNIT – III:
Analysis of HVDC Converters and System Control
Choice of Converter configuration: Analysis of Rectifier circuits– Characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star – Star mode and their performance – Equivalent circuit of HVDC Converter, Principle of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system – Starting and stopping of DC link – Power Control.
UNIT–IV:
Reactive Power Control in HVDC
Reactive Power Requirements in steady state – Conventional control strategies –Alternate control strategies- sources of reactive power – AC Filters– Shunt capacitors – Synchronous condensers.

UNIT – V:

Harmonics and Filters

Generation of Harmonics – Characteristics harmonics – Calculation of AC Harmonics – Non–Characteristics harmonics – Adverse effects of harmonics – Calculation of voltage & current harmonics – Effect of Pulse number on harmonics. Types of AC filters, Design of Single and double tuned filters – Design of High pass filters.

Course Outcomes:

The students should be able to

i. know the concepts of power handling capacity, losses, mechanical considerations and also bundle spacing.
ii. know types of HVDC Links and apparatus required for HVDC Systems.
iii. obtain the Characteristics of 6 Pulse & 12 Pulse converters and to familiarize with control techniques.
iv. acquire knowledge on reactive power requirements and control strategies.
v. design single tuned and high pass filters.

Text Books:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley &Sons.
3. EHVAC Transmission Engineering by R. D. Begamudre, New Age International (P) Ltd.

Reference Books:

1. EHVAC and HVDC Transmission Engineering and Practice –S.Rao, khanna publishers.
2. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications
3. HVDC Transmission – J. Arrillaga.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
SMART GRIDS **(PROGRAM ELECTIVE-IV)**					

Course Objectives:

The objectives of this course is to acquire knowledge

i. on the challenging issues and architecture of smart grid
ii. on the communication and wide area monitoring in smart grid
iii. on the rudimentary energy management issues in smart grid
iv. in computational intelligence and security issues in smart grid
v. on the role of Power electronics and energy storage in smart grid

UNIT - I: SMART GRID ARCHITECTURE

Challenges in power grid, Advantages of building integrated and distributed power systems concept of smart grid, need for smart grid, smart grid components and their limitations, grid vision based on the intelligent architecture, Whole sale energy market in smart grid, Stake holders roles and function, Approach to smart grid interoperability standards.

UNIT - II: COMMUNICATIONS AND MEASUREMENTS

Latest wired and wireless technologies, Characteristics of smart grid communications technology and communication techniques, Switching techniques and communication channels, Wide area monitoring systems, Phasor measurements units, Key components of smart metering, Communication infrastructure and protocols for smart metering, Advanced metering infrastructure, Multi agent systems for smart grid implementation

UNIT - III: PERFORMANCE ANALYSIS TOOLS

Load flow studies for smart grid, extended formulations and algorithms, Security assessment in smart grid, Contingency studies for smart grid, Voltage stability in smart grid, and Energy management in smart grid.

UNIT - IV: COMPUTATIONAL TOOLS AND SECURITY

Introduction to computational tools, Optimization techniques and applications to smart grid, Evolutionary computation techniques and computational challenges, Network security: Encryption and decryption, cyber-attacks, Authentication and cyber security standards

UNIT - V: RENEWABLE ENERGY AND STORAGE

Benefits of renewable generation, Importance of micro grid, Demand response issues, PHEV technology, Energy storage technologies, Grid integration issues of renewable energy sources.

Course Outcomes:

The students should be able to:

i. discuss about the challenging issues and architecture of smart grid
ii. acquire knowledge on the communication and wide area monitoring in smart grid
iii. analyse energy management issues in smart grid
iv. acquire the knowledge in computational intelligence and security issues in smart grid
v. know the role of Power electronics and energy storage in smart grid

Text Books:

i. James Momoh, "Smart Grid – fundamentals of design and analysis", John Wiley and Sons, 2012
ii. Stuart Borlase," Smart Grids, Infratructure, technology and solutions", CRC press, 2013
iii. Clark W. Gellings, "The Smart Grid- Enabling energy efficiency and demand response", CRC press, 2009

Reference Books:

i. Janaka Ekanayake, "Smart Grid-Technology and Applications", John Wiley and Sons, 2012
ii.Fereidoon P.Sioshansi, "Smart grid- integrating renewable, distributed and efficient energy", Elsevier, 2012

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS
(PROGRAM ELECTIVE-IV)

Course Objectives:

The objectives of this course is to acquire knowledge on

i. basics of power flow control in transmission lines using FACTS controllers.
ii. operation and control of voltage and current source converter.
iii. shunt compensation using static VAR compensators.
iv. series compensation methods.
v. operation of Unified Power Flow Controller (UPFC).

Unit–I:
Introduction to FACTS
Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high-power devices – Voltage and current rating – Losses and speed of switching – Parameter trade–off devices.

Unit–II:
Voltage source and Current source converters
Concept of voltage source converter (VSC) – Single phase bridge converter – Square–wave voltage harmonics for a single–phase bridge converter – Three–phase full wave bridge converter– Three–phase current source converter – Comparison of current source converter with voltage source converter.

Unit–III:
Shunt Compensators
Objectives of shunt compensation – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.
Thyristor Switched Capacitor (TSC)–Thyristor Switched Capacitor – Thyristor Controlled Reactor (TSC–TCR). Static VAR compensator (SVC) and Static Compensator (STATCOM)**:** The regulation and slope transfer function and dynamic performance – Transient stability enhancement and power oscillation damping– Operating point control and summary of compensation control.

Unit–IV:
Series Compensators
Static series compensators**:** Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements.
Static Synchronous Series Compensator (SSSC) - GTO thyristor-controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC).

Unit–V:
Combined Controllers
Schematic and basic operating principles of Unified Power Flow Controller (UPFC) -Interline Power Flow Controller (IPFC)– Application.

Course Outcomes:
The students should be able to

i. understand power flow control in transmission lines using facts controllers.
ii. explain the operation and control of voltage and current source converter
iii. analyze method of shunt compensation using static var compensators.
iv. understand the methods of compensations using series compensators.
v. apply unified power flow controller (UPFC) on transmission systems.

Text Books:

i. "Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press. Indian Edition is available:—Standard Publications, 2001.
ii. Padiyar.K.R, " FACTS Controllers in Power Transmission and Distribution" New Age Int. Publishers, 2007

Reference Books:

i. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
ii. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.Mohan Mathur and Rajiv k.Varma, Wiley

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IV Year - II Semester		L	T	P	C
		3	0	0	3

IoT APPLICATIONS IN ELECTRICAL ENGINEERING
(PROGRAM ELECTIVE-IV)

Course Objectives:

The objectives of this course is to acquire knowledge on

i. architecture and various technologies of Internet of Things.
ii. communication technologies used in the Internet of Things.
iii. connectivity of devices using web and internet in the IoT environment.
iv. various data acquisition methods and data handling using cloud for IoT applications.
v. IoT implementation for Smart Home, Smart city, etc.

UNIT - I:
The Internet of Things: An Overview of Internet of Things (IoT) – IoT framework – Architecture – Technology behind IoT – Sources of the IoT – M2M Communication – Examples of IoT.

UNIT – II:
Design Principles for Connected Devices: Introduction –IoT/M2M systems, Layers and Designs Standardization – Communication Technologies – Data Enrichment, Consolidation and Device Management at Gateway – Ease of designing and affordability.

UNIT – III:
Design Principles for the Web Connectivity: Introduction – Web Communication protocols for Connected Devices - Message Communication protocols for Connected Devices – Web Connectivity for connected devices network.
Introduction to Internet Connectivity Principles, Internet connectivity, Internet based communication – IP addressing in the IoT – Application Layer Protocols: HTTP, HTTPS, FTP, Telnet, WAP (Wireless Application Protocol).

UNIT–IV:
Data Acquiring, Organizing, Processing and Analytics: Introduction – Data Acquiring and Storage – Organizing the Data – Analytics.
Data Collection, Storage and Computing Using a Cloud Platform: Introduction – Cloud computing paradigm for data collection, storage and computing – IoTas a service and Cloud Service Models - IoT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms.

UNIT– V:

Sensor technology: Actuator, Sensor data communication protocols, Radio Frequency Identification technology, Wireless Sensor Network Technology.

IoT application case studies: Smart Home, Smart Cities, Environment monitoring and Agriculture practices.

Course Outcomes:

the students should be able to:

i. know the various fundamentals, architectures and technologies of Internet of Things.
ii. discuss about various communication technologies used in the Internet of Things.
iii. acquire knowledge on the various device connectivity methods using web and internet in the IoT environment.
iv. Explore various data acquisition methods, data handling using cloud for IoT applications.
v. apply IoT to design Smart Home, Smart city, agriculture practices etc.

Text Books:

1. Internet of Things: Architecture, Design Principles, Raj Kamal, McGraw Hill Education (India) Pvt. Limited, 2017.

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, First edition, 2013.
2. Getting Started with the Internet of Things, Cuno Pfister, O'reilly, 2011.
3. Internet of Things: A Hands-on Approach, Arshdeep Bahga, and Vijay Madisetti, 2014

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IV Year - II Semester		L	T	P	C
		3	0	0	3
POWER QUALITY (PROGRAM ELECTIVE-IV)					

Course Objectives:

The objectives of this course is to acquire knowledge on

i. different types of power quality phenomena and identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
ii. power quality terms and study power quality standards.
iii. the principle of voltage regulation, power factor improvement methods and study the effect the harmonic distortion and its solutions.
iv. the relationship between distributed generation and power quality.
v. the power quality monitoring concepts and the usage of measuring instruments

UNIT – I: Introduction and Voltage imperfections in power systems

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long–duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations- Power quality terms – Voltage sags, Voltage swells, harmonics interruptions, voltage flicker and voltage spikes – Sources of voltage sag, swell and interruptions – Nonlinear loads. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.

UNIT – II: Voltage Regulation and power factor improvement:

Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

UNIT - III: Harmonic distortion and solutions

Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems

UNIT - IV: Distributed Generation and Power Quality

Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks.

UNIT - V: Monitoring and Instrumentation

Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards

Course Outcomes:

The students should be able to

i. know the different types of power quality problems and analyze power quality terms and power quality standards
ii. explain the principle of voltage regulation and power factor improvement methods.
iii. analyze the effect the harmonic distortion and its solutions.
iv. demonstrate the relationship between distributed generation and power quality.
v. know the power quality monitoring concepts and the usage of measuring instruments.

Text Books:

i. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
ii. Electric power quality problems –M.H.J.Bollen IEEE series-Wiley India publications,2011

Reference Books:

i. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
ii. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
iii. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley& Sons, 2003.
iv. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
v. Power Quality C.Shankaran, CRC Press, 2001
vi. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor &Francis