Department of Electrical and Electronics Engineering

INDUCTION PROGRAM (MANDATORY)	THREE WEEKS DURATION
Induction program for students to be offered right at the start of the first year.	• Physical activity • CreativeArts • Universal Human Values • Literary • ProficiencyModules • Lectures by EminentPeople • Visits to local Areas • Familiarization to Dept./Branch & Innovations

I B. Tech. – I Semester (EEE)

S.No.	Course Code	Subject	L	T	P/Drg	C
1.	20HS0830	Algebra and Calculus	3	0	0	3
2.	20HS0802	Applied Chemistry	3	0	0	3
3.	20HS0810	Communicative English	3	0	0	3
4.	20ME0353	Thermal and Fluid Engineering	3	0	0	3
5.	20ME0301	Engineering Graphics	1	0	4	3
6.	20HS0803	Applied Chemistry Lab	0	0	3	1.5
7.	20HS0811	Communicative English Lab	0	0	3	1.5
8.	20ME0354	Thermal and Fluid Engineering Lab	0	0	3	1.5
			Total credits			19.5

I B. Tech. – II Semester (EEE)

S.No.	Course Code	Subject	L	T	P/Drg	C
1.	20HS0831	Differential Equations and Complex Analysis	3	0	0	3
2.	20HS0849	Applied Physics	3	0	0	3
3.	20CS0501	C Programming and Data Structures	3	0	0	3
4.	20EE0201	Fundamentals of Electrical Circuits	3	0	0	3
5.	20EC0402	Electronic Devices and Circuits	3	0	0	3
6.	20HS0851	Applied Physics Lab	0	0	3	1.5
7.	20CS0502	C Programming and Data Structures Lab	0	0	3	1.5
8.	20ME0302	Workshop practice Lab	0	0	3	1.5
9.	20HS0816	Indian Constitution	2	0	0	0
			Total credits			**19.5**

II B. Tech. – I Semester (EEE)

S.No.	Course Code	Subject	L	T	P	C
1.	20HS0832	Probability. Numerical Methods and Transforms	3	-	-	3
2.	20EC0446	Analog Electronic Circuits	3	-	-	3
3.	20EE0202	Electrical Machines-I	3	-	-	3
4.	20EE0203	Generation of Electrical Power	3	-	-	3
5.	20EE0204	Electromagnetic Fields	3	-	-	3
6.	20EC0447	Analog Electronic Circuits Lab	-	-	3	1.5
7.	20EE0205	Electrical Machines-I Lab	-	-	3	1.5
8.	20EE0206	Electrical circuits and Simulation Lab	-	-	3	1.5
Skill Oriented Course						
9.	20EC0455	PCB Designing Lab	1	-	2	2
Mandatory Course						
10.	20HS0801	Environmental Science	2	-	-	0
Contact Periods/Week			18	-	11	**21.5**
			Total/Week **29**			

II B. Tech. – II Semester (EEE)

S.No.	Course Code	Subject	L	T	P	C
1.	20EC0448	Digital Electronics	3	-	-	3
2.	20HS0815	Entrepreneurship Development	3	-	-	3
3.	20EE0208	Electrical Power Transmission Systems	3	-	-	3
4.	20EE0209	Power Electronics	3	-	-	3
5.	20EE0210	Electrical Machines –II	3	-	-	3
6.	20EC0449	Digital Electronics Lab	-	-	3	1.5
7.	20EE0211	Power Electronics Lab	-	-	3	1.5
8.	20EE0212	Electrical machines-II lab	-	-	3	1.5
Skill Oriented Course						
9.	20EE0213	Sensors Modelling and Simulation Lab (Virtual Lab)	1	-	2	2
Contact Periods/Week			16	-	11	21.5
			Total/Week 27			

***Internship 2 Months (Mandatory) during summer vacation**

III B.Tech– I Semester (EEE)

S.No.	Course Code	Subject	L	T	P	C
1	20EE0214	Control Systems	3	-	-	3
2	20EE0215	Electrical Machines-III	3	-	-	3
3	20EE0216	Electrical Measurements and Instrumentation	3	-	-	3
Open Elective-I						
4	20CE0170	Fundamentals of Civil Engineering	3	-	-	3
	20ME0322	Non- Conventional Energy Resources				
	20EC0451	Introduction to Communication Systems				
	20CS0550	Relational Data Base Management Systems				
	20HS0813	Management Science				
Professional Elective courses-I						
5	20EE0217	Power Quality	3	-	-	3
	20EE0218	Flexible AC Transmission systems				
	20EE0219	Electrical Distribution and Automation				
6	20EE0220	Electrical Measurements Lab	-	-	3	1.5
7	20EE0221	Control Systems and Simulation Lab	-	-	3	1.5
8	20HS0859	English for Corporate Communication Skills Lab	1	-	2	2
Mandatory Course						
9	20HS0817	Essence of Indian Traditional Knowledge	2	-	-	0
10	20EE0222	Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester	-	-	-	1.5
Contact periods/Week			18	0	8	21.5
			Total/Week 26			

III B. Tech – II Semester (EEE)

S.No.	Course Code	Subject	L	T	P	C
1	20EC0416	Microprocessors and Microcontrollers	3	-	-	3
2	20EE0223	Power System Analysis	3	-	-	3
3	20EE0224	Power System Operation and Control	3	-	-	3
Professional Elective courses-II						
4	20EE0225	Power Semiconductor Drives	3	-	-	3
	20EE0226	High Voltage Engineering				
	20EE0227	Generation of Energy from Waste				
Open Elective-II						
5	20CE0147	Fundamentals of Urban Planning	3	-	-	3
	20ME0354	General Mechanical Engineering				
	20EC0452	Elements of Embedded Systems				
	20CS0551	Java Programming				
	20HS0814	Intellectual Property Rights				
6	20EC0418	Microprocessors and Microcontrollers Lab	-	-	3	1.5
7	20EE0228	Power Systems and Simulation Lab	-	-	3	1.5
8	20EE0229	Substation and Automation Lab (Virtual lab)	-	-	3	1.5
Skill Oriented Course						
9	20EE0230	PLC and Automation Lab	1	-	2	2
Mandatory Course						
10	20HS0864	Human Values and Professional Ethics	3	-	-	0/3*
		Industrial/Research Internship (Mandatory) 2 Months during summer vacation				
Contact periods/Week			19	-	11	21.5/24.5*
			Total/Week 30			

*Human values and professional Ethics is a credit course from 2021-22 admitted batches

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I B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(20HS0830) ALGEBRA AND CALCULUS

(Common to All branches)

COURSE OBJECTIVES

The objectives of this course:

1. *To illuminate the students in the concepts of calculus and linear algebra.*
2. *To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.*
3. *To estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.*

COURSE OUTCOMES

On successful completion of this course, the student will be able to

1. *Develop the use of matrix algebra techniques that is needed by engineers for practical applications.*
2. *Utilize mean value theorems to real life problems.*
3. *Familiarize with functions of several variables which is useful in optimization.*
4. *Learn important tools of calculus in higher dimensions. Students will become familiar with2- dimensional coordinate systems.*
5. *Interpret the physical meaning of different operators such as gradient, curl and divergence.*
6. *Apply Fundamental Theorem of Line Integrals, Green"s Theorem, Stokes" Theorem, or Divergence Theorem to evaluate integrals.*

UNIT I

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

UNIT II

Mean value theorems: Rolle's theorem-Lagrange's Mean value theorem-Taylor's and Maclaurin's theorems (without proof);

Partial Differentiation: Chain rule, Total derivatives,Jacobians, functional dependence, Maxima and Minima of functions of two variables, method of Lagrange multipliers with three variables only.

UNIT III

Integral Calculus:Evaluation of definite and improper integrals (single variable), Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Evaluation of Triple integrals (Cartesian).

UNIT IV

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

UNIT V

Vector integration: Line integral-circulation-work done, surface and volume integrals.

Integral theorems: Green's theorem in the plane (without proof), Stoke's theorem (without proof), Divergence theorem (without proof) and applications of these theorems.

TEXT BOOKS

1. *Grewal B S, Higher Engineering Mathematics, 44th Edition, Khanna Publishers,2017.*
2. *Ramana B V, Higher Engineering Mathematics, McGraw Hill Education, 2010.*

REFERENCES

1. *Rukmangadachari.E&Keshava Reddy E, Engineering Mathematics, Volume-I,II&III, Pearson Publishers, 2010.*
2. *SatyanarayanaBh, Pradeep Kumar T.V &Srinivasulu D,Linear Algebra and Vector Calculus, Studera Press, New Delhi, 2017, ISBN: 978-81-930333-8-8.*
3. *Iyengar T.K.V, Krishna Gandhi B, Ranganatham S & Prasad M.V.S.S.N,Engineering Mathematics,Volume-I,II&III, 12th Edition,S.Chand publication, 2014.*

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I B.Tech – I Sem.

L	T	P	C
3	-	-	3

(20HS0802)APPLIED CHEMISTRY

Course Objectives

1. *To familiarize engineering chemistry and its applications.*
2. *To train the concepts of molecular structures and bonding.*
3. *To understand the physical and mechanical properties of polymers helps in selecting suitable materials for different purpose.*
4. *Learn the principles of spectroscopies to analyse them.*
5. *Be exposed to the importance of nano and engineering materials used in their daily life and Industry.*

Course Outcomes

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

1. *Apply Nernst equation for calculating electrode and cell potentials*
2. *Illustrate the molecular orbital energy level diagram of different molecular species*
3. *Explain the different types of polymers and their synthesis.*
4. *Synthesise of plastics ,elastomers, conducting polymers and their applications in our daily life*
5. *Comprehend the principles and applications of spectroscopies.*
6. *Acquire spotlight to the nanomaterial"s and basic engineering materials used in academics, industry and daily life.*

UNIT I: Electrochemistry and Applications

Introduction to electrochemistry, Electrochemical cell - Nernst equation, Cell potential calculations and Numerical problems - Potentiometric - Potentiometric Titrations (Redox Titrations), Conduct metric Titrations (Acid-Base titrations), Photovoltaic cell working and its applications, Photo galvanic cells electrochemical sensors.

Primary cells –Zinc-air battery, Secondary cells –Lead acid, NICAD batteries, and Lithium ion cells (Rechargeable) - working of the batteries including cell reactions Fuel cells - Hydrogen-Oxygen, Methanol-Oxygen fuel cell - working of the cells and application.

UNIT II: Structure and Bonding Models

Planck's Quantum Theory, Dual Nature of matter - Schrodinger Equation, Significance of Ψ and Ψ^2, Molecular Orbital Theory –Bonding in Homo and Hetero nuclear Diatomic molecules - Calculation of Bond Order. Energy level diagrams of O_2, F_2, N_2 and CO, etc. π-molecular orbital's Energy Level Diagram of Butadiene and Benzene. Crystal Field Theory – Salient features –Splitting in Octahedral and Tetrahedral geometry, Magnetic properties and Colour

.

UNIT III: Polymer Chemistry

Introduction to Polymers, Functionality of Monomers, Nomenclature of Polymers. Chain growth and Step growth Polymerization, Co-ordination Polymerization, Co-Polymerization with specific examples and mechanisms of polymer formation

Plastics - Thermoplastics and Thermosetting, Preparation, Properties and Applications of – Bakelite, Nylon-6,6 , Carbon fibers.
Elastomers: Preparation, Properties and applications of Buna-S, Buna-N. Preparation, Properties and applications of Conducting Polymers – Classification, Synthesis and applications of polyacetylene, polyaniline.

UNIT IV: Instrumental Methods and Applications
Regions of Electromagnetic Spectrum, Absorption of radiation: Beer-Lambert's Law., UV-spectroscopy, Infra red Spectroscopy (IR) and Atomic absorption Spectroscopy (AAS).
Chromatography Techniques: Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC),Thin layer chromatography(TLC), Separation of Gaseous mixtures and Liquid mixtures.

UNIT V: Modern Engineering Materials
Semiconducting and Super Conducting materials- basic concept, band diagrams for conductors, semiconductors and insulators, effect of doping on band structures.
Electrical Insulators or Dielectric materials: Definition and classification, Characteristics of electrical insulators and applications of electrical Insulating materials.
Concepts and terms of Supra molecular chemistry, Complementarity, Basic Lock and Key principle, examples of Supramolecules, Applications of Supra molecules (Sensors, Catalysts, Gas storage, Medical and Molecular switches).
Nano Chemistry: Introduction, Classification, Properties of Nano materials. Fullerenes, Carbon Nano tubes.

TEXT BOOKS:

1. *Jain and Jain, Engineering Chemistry, 16 Ed., Dhanpat Rai Publishers, 2013.*
2. *Peter Atkins, Julio de Paula and James Keeler, Atkins'' Physical Chemistry, 10 Ed., Oxford University Press, 2010*

REFERENCES:

1. *Engineering Chemistry by GVSubba Reddy, KNJayaveera and C. Ramachandraiah, McGraw Hill Higher Education,, New Delhi 2019.*
2. *K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, 1 Ed., Pearson India Education Services Pvt. Ltd, 2016.*
3. *Dr. S.S. Dara and Dr S.S Umare, A Text book of Engineering Chemistry, 1 Ed., Chand & Company Ltd., 2000*
4. *D. J. Shaw, Introduction to Colloids and Surface Chemistry, 4 Ed., Butterworth-Heineman, 2013.*

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I B.Tech. – I Sem.

(20HS0810) COMMUNICATIVE ENGLISH

CIA	TIV	E	EN	GL	SH
3	-	-	3		

COURSE OBJECTIVES

The objectives of this course:

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

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able

1. *To understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information.*
2. *To ask and answer general questions on familiar topics and introduce oneself/others.*
3. *To employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information.*
4. *To recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs.*
5. *To form sentences using proper grammatical structures and correct word forms.*
6. *To use effective sentence structure for their professional activities.*

UNIT – I

Part 1

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.**Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Writing:** Beginnings and endings of paragraphs - introducing the topic; Letter writing. **Grammar and Vocabulary:** Parts of speech, Function words, Content words; Tenses**. Soft Skills:** Attitude is Everything; Positive attitudePositive thinking- thought provoking ideas–creative thinking.

Part 2
Half a Rupee Worth by R K Narayan from Engage with English.

UNIT –II
Part 1
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.**Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks.**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Mechanics of writing –punctuations.**Grammar and Vocabulary:** Voice; Cohesive devices; Articles.Types of sentences– Simple, Complex, and Compound.
Soft skills: The factors of human mindset; self-confidence- self-belief, self-learning- self motivation.
Part 2
The Thakur"s Well byPremchand from Paths to Skills in English

UNIT – III
Part 1
Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing Report Writing. **Grammar and Vocabulary: S**ubject-verb agreement; If- clauses; Direct and Indirect speech. wh-questions.
Soft skills: Emotional intelligence; Work efficiency- peace of mind- Broad nature in ideas- having patience in multiple ways.
Part 2
I am not that Woman by KishwarNaheed.

UNIT – IV
Part 1
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** conversational English in academic contexts (formal and informal).**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Information transfer **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of synonyms and antonyms.
Soft skills: Time management; the priority of the task– the task you take- Urgent and importance- not urgent, important- not important, urgent- Not important, not urgent.
Part 2
*What is my name?*BySathyavathi from Paths to Skills in English.

UNIT – V
Part 1
Listening: Identifying key terms.**Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.**Reading:** Reading for comprehension. **Writing:** Writing

structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:** Editing short texts identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement).
Soft skills: Goal setting; Immediate goal –Short goal- midterm goal –Life goal.
Part 2
The Power of Prayer by A P J Abdul Kalam from Paths to Skills in English.

TEXT BOOK

1. *PushpaRelia .P & Sanjay Mihhra .K EnglishAll Round: Communication Skills for UndergraduationLearnersVol. I, OrientBlackSwan Publishers, First Edition, 2019.*
2. *Prof.Sundaravalli.G et al.Paths to Skills in English, Orient Blackswan,Publishers, First Edition2015*

REFERENCES

1. *Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.*
2. *Chase, Becky Tarver.Pathways: Listening, Speaking and Critical Thinking. HeinleyELT;2nd Edition, 2018.*
3. *Hewings, Martin. Cambridge Academic English (B2).CUP, 2012.*
4. *Eric H. Glendinning et al Study Reading: A Course in Reading Skills for AcademicPurposes,Cambridge University Press; 2 edition, 14 October 2004.*
5. *Pattabiram, B.V, Soft Skills, Sonmez Publication, 2011(2nd Edition).*
6. *VirendranathYandamuri, Soft Skills for Engineer, Yaswin Publication, 2nd Edition, 2009.*

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I B.Tech – I Sem.

L	T	P	C
3	-	-	3

(20ME0353) THERMAL AND FLUID ENGINEERING

COURSE OBJECTIVES

Objective of this course is to

1. *Understand the working of thermal & hydroelectric power plants.*
2. *Learn the concepts of work and heat transfer in thermodynamics*
3. *Know the Fluid properties and their engineering significance*
4. *Know the* Bernoulli's energy equation
5. *Gain knowledge on different types Hydraulic Turbines.*

COURSE OUTCOMES

On successful Completion of this course the student willbe able to

1. *Describe the different types of power plants.*
2. *Explain the various properties thermodynamic system.*
3. *Recognize the importance of Boiler mountings & Boiler accessories for the power generation*
4. *List the different types of fluid flows.*
5. *Understand various types of Pressure and pressure measuring instruments.*
6. *Describe various types in Hydraulic Turbines..*

UNIT – I

Power Plants: Layout of a Thermal Power Plant, cooling towers, Coal handling, Chimney- types. Thermal power plants in India. Elements of hydroelectric power station - concept of pumped storage plants. Hydroelectric Power Stations power plants in India.

Basic Concepts: Definitions of system, boundary, surrounding control volume. Types of thermodynamic systems, Properties of system, definitions for properties like pressure, volume, temperature, enthalpy, internal energy, density, with their units. State, Property, Process and Cycle, Quasi Static Process, Thermodynamic Equilibrium.

UNIT – II

Pure Substances: P-V, P-T, T-S diagrams of Pure Substances, Mollier Diagram, Dryness Fraction, Enthalpy and Entropy of Steam.**Boilers:** Classifications of Boiler, Water Tube and Fire Tube boilers, **Boiler mountings** -pressure gauge, water level indicator, fusible plug, blow down cock, stop valve, safety valve - **Boiler accessories** - feed pump, economiser, super heater and air pre-heater.

UNIT – III

Fluid Properties: Definition of a fluid – Physical properties of fluids- Density, Specific weight, Specific volume, Specific gravity, viscosity, Compressibility, Vapour pressure, Surface tension andcapillarity.
Fluid Statics: Pressure variation in a static fluid – Atmospheric, gauge and absolute pressures, Measurement of pressure – Piezometer – U – tube and inverted U tube manometers

UNIT – IV

Fluid Dynamics: Types of flow – Continuity equation in one dimensional form- Euler's equation of motion – Bernoulli's energy equation – Discharge measurement by Venturi meter and orifice meter – Impulse momentum equation – Energy gradient line – Hydraulic gradientline
Pipe Flow: Loss of head through pipes - Darcy Weisbach equation - Minor losses in pipe flow - Pipes in Series - Pipes in Parallel

UNIT – V

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat inclined and curved vanes - Jet striking centrally and at tip - Velocity triangles at inlet and outlet - Expressions for work done and efficiency.
Hydraulic Turbines: Classification of turbines – Heads and efficiencies of turbines -Pelton Wheel turbine - Modern Francis turbine – Kaplan turbine - Main components and working principle- Expressions for work done and efficiency – Working proportions and design of each – Draft tube

TEXT BOOKS

1. *Rajput, Thermal Engineering, R. K., Laxmi Publications, 6th Edition, New Delhi, 2010.*
2. *Dr.R.K.Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P) Ltd., 10th Edition, New Delhi.*

REFERENCES

1. *Domkundwar,A&Kothandaraman, Thermal Engineering, DhanpatRai& Co,, New Delhi, 2003.*
2. *Modi& Seth, Fluid Mechanics, Hydraulic and Hydraulic Machines, Standard book house, 22nd Edition, 2019.*
3. *Prasanna Kumar, Thermodynamics, Pearson Publishers, Delhi, 2018.*

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L	T	P	C
-	-	3	1.5

I B. Tech. – I Sem. **(20ME0301) ENGINEERING GRAPHICS**

(Common to all branches)

L	T	P	C
1	-	4	3

COURSE OBJECTIVES

The students are able to

1. *Draw simple curves like ellipse, cycloid and Involutes.*
2. *Describe the Orthographic projections of points, lines and planes.*
3. *Construct the projection of solids like cylinders, cones, prisms and pyramids.*
4. *Sketch the development of the surfaces for practical cut sections of cylinders, cones, prisms and pyramids.*
5. *Depict the isometric and Orthographic Projections of simple objects.*

COURSE OUTCOMES

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

1. *Interpret the engineering drawing fundamentals to draw the curves like ellipse, cycloid and Involutes.*
2. *Know the projection of points and implement the same in the construction of projection of lines and planes.*
3. *Recognize the basic solids like cylinders, cones, prisms and pyramids and sketch the projections of them.*
4. *Explain the sectional views of Right regular Solids and Apply visualization skills in developing new products.*
5. *Understand the basic principles of isometric and Orthographic Projections.*
6. *Construct the isometric and orthographic projections of simple objects.*

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections Eccentricity method, Rectangle Method, Parallelogram Method, Cycloids- Epi& Hypo-Cycloids and Involutes.

UNIT – II

Projections of Points: Principles of Orthographic Projections-Conventions - Projections of Points.

Projections of straight lines: Inclined to both the planes (Trapezoidal Method & Rotating line method) - simple problems only, Traces

UNIT – III

Introduction to plane surfaces: SurfaceInclined to one plane- Surface inclined to both reference planes

Projections of Solids: Introduction –Projections of right regular solids-Prisms, Pyramids in different positions (Inclined to one plane only).

UNIT – IV

Section of solids - Sectional Views of Right regular Solids - Prisms, Pyramids

Development of surfaces - Development of surfaces of Right Regular Solids - Prisms, Pyramids.

UNIT – V

Orthographic Projections - Principles of Orthographic projection, Conversion of objects from 3D to 2D

Isometric Projections - Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids, Conversion of 2D to 3D.

TEXTBOOKS

1. *K. L. Narayana, P.Kannaiah, A text Book of Engineering Drawing, Scitech Publishers, 23rd Reprint Edition, 2010.*
2. *N. D. Bhatt, Engineering Drawing, Charotar Publishers, 49th Edition, 2008.*

REFERENCES

1. *K. Venugopal, A text Book of Engineering Drawing and Graphic, New Age Publishing, 5thEdition, 2008.*
2. *Warren J. Luzadder& Jon M, Fundamentals of Engineering Drawing, Peach Pit Press, 11th Edition, 1992.*
3. *Dhananjay A Jolhe, Engineering Drawing with An introduction to AutoCAD, McGraw Hill Education; 1st Edition, 2017.*

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I B.Tech – I Sem.

L	T	P	C
-	-	3	1.5

(20HS0803)APPLIED CHEMISTRY LAB

COURSE OBJECTIVES

1. *Learn to estimate the chemical impurities present in water such as hardness, alkalinity, chlorine, etc.*
2. *Understand and experience the formation of inorganic complex and analytical technique for trace metal determination.*
3. *Be trained to use the instruments to practically understand the concepts of electrochemistry.*
4. *Bridge theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in engineering.*
5. *Learn and understand the practical implementation of fundamental concepts*

COURSE OUTCOMES

On successful completion of this course, student will be able to

1. *Develop and perform analytical chemistry techniques to address the water related problems (for e.g., hardness, alkalinity present in water) technically.*
2. *Prepare advanced polymer materials*
3. *Estimate the Iron in cement*
4. *Handle electro-analytical instruments like digital conductivity meter and potentiometer to perform neutralization, precipitation and redox titrations respectively.*
5. *Think innovatively and improve the creative skills that are essential for solving engineering problems*

List of Experiments

1. Conductometric Titration of Strong acid vs Strong base
2. Conductometric Titration of Weak acid vs. Strong base
3. Determination of Hardness of a Groundwater sample.
4. pH metric titration of Strong acid vs. Strong base,
5. Potentiometry - Determination of Redox potentials and emfs
6. Determination of Strength of an Acid in Pb-Acid battery
7. Preparation of a Polymer
8. Determination of viscosity of an oil by Redwood viscometer .
9. Determination of percentage of Iron in Cement sample by Colorimetry

10. Determination of acidity of water sample.
11. Determination of Alkalinity of water sample.
12. Determination of Percentage Moisture content in a Coal sample

TEXT BOOKS:

1. *J. Mendham et al, Vogel"s Text book of Quantitative Chemical Analysis, Pearson Education, Sixth Edition, 2002.*
2. *Chandra Sekhar, G.V.Subba Reddy and Jayaveera, Chemistry Practical – Lab Manual, McGraw Hill Higher Education, 2015.*

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I B.Tech – I Sem.

L	T	P	C
-	-	3	1.5

(20HS0811) COMMUNICATIVEENGLISHLAB

COURSE OBJECTIVES

The objectives of this course

1. *Students will be exposed to a variety of self-instructional, learner friendly modes of language learning.*
2. *Students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.*
3. *Students will learn better pronunciation through stress, intonation and rhythm.*
4. *Students will be trained to use language effectively to face interviews, group discussions, and public speaking*
5. *Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.*

COURSE OUTCOMES

On successful completion of this course, the student will be able to

1. *Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills.*
2. *Apply communication skills through various language learning activities.*
3. *Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.*
4. *Evaluate and exhibit acceptable etiquette essential in social and professional Settings.*
5. *Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.*
6. *Use effective communicative approaches by preparing job application, report and other kinds of writing correspondences.*

LIST OF EXPERIMENTS

1. 1**. PHONETICS**

Definition - Articulation - Phonetic Chart - Pure Vowels and Diphthongs.

1. 2. **MINIMAL PAIRS**

Definition - Minimal Pairs 1 -Minimal Pairs 2

2. 1.**CLUSTERS AND MARKERS**

Consonant Clusters - Initial Consonant Cluster -Final Consonant Clusters - Past Tense Markers - Plural Markers.

2. 2. **ICE BREAKING ACTIVITY**

Ice Breakers Overview - Ice Breakers Activity - Why Ice Breaker.

3. 1.**SYLLABLE**

Syllable Overview -Syllable Types.

3.2. **STRESS**

Syllable Stress - Stress Pattern -Stress and Rhythm - Word Stress - Sentence Stress.

4. Accent& Intonation

Intonation overview- Intonation making lists – Intonation questions – Intonation – yes or no questions – notes.

5. JAM

Jam tips - Sample topics.

6. Listening skills

Listening skills - Effective listening - Listening importance - Barriers to listening.

7.1. ROLE PLAY 1

Greetings - Giving compliments - Making requests – Hobbies - Asking permission – Thanking.

7.2. ROLE PLAY 2

Comparing and contrasting - Agreeing and dis agreeing - Expressing opinions - Likes and dis likes - Formal and informal – Suggestions - Polite requests - Meeting people.

7.3. ROLE PLAY 3

Phone calls – Directions.

8. Description

Describing a person- Adjectives to describe – Giving direction – Asking giving direction – describing a product – Describing products – Personal narrative – narrative writing Notes.

9. Book review

Introduction – Book review over view- Book review tips – Book review notes.

10. Information Transfer

Information writings–Text to Diagram- Diagram to Text.

Minimum requirements forCommunicativeEnglishLab

1. Computer Assisted Language Learning (CALL) Lab: The Computer Assisted Language Lab for 60 Students with 60 systems one Master Console, LAN facility and English Language Software for self-study by learners.
2. Communicative English Labwith movable chairs and audio visual aids with a P. A. system, Projector, a Digital stereo audio & video system and Camcorder etc.

System Requirement (Hardware component)

Computer network, LAN with minimum 60 multimedia systems with the following:

Specifications

i) a) Intel(R) core (TM) i3
   b) Speed 3.10 GHZ
   c) RAM – 4 GB
   d) Hard Disk – 320 GB

ii) Headphones with High quality

Software

Walden Info Tech Software

References

1. *A Textbook of English Phonetics for Indian Students*, second edition T. Balasubramanian. (Mcmillian) 2012.
2. *A Course in Phonetics and spoken English*, DhamijaSethi, Prentice-hall of India Pvt. Ltd, 2000.
3. *Speaking English Effectively*, second Edition Krishna Mohan & NP Singh 2011 (Mcmillian).
4. *A Hand Book of English Laboratories*, E.Sureshkumar ,P.Sreehari, Foundation books, 2011.
5. *Effective Technical Communication*, M Ashraf Rizvi, Director, Jaipuria Institute of Management, Lucknow. McGraw Hill Education; Second edition (27 July 2017).

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(20ME0354) THERMAL AND FLUID ENGINEERING LAB

COURSE OBJECTIVES

The Objective of this course is to

1. *Impart brief knowledge on Boilers.*
2. *Familiarize student with Water tube and Fire tube boilers.*
3. *Make the student learn about verifying Bernoulli"s theorem*
4. *Enable the student to conduct an experiment on Venturimeter, Orificemeter and Turbine flow meter.*
5. *Make the student to determine friction factor for a given pipe line.*

COURSE OUTCOMES

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

1. *Explain the need of Boilers and also list various classifications of boiler.*
2. *Describe the working of Water tube and Fire tube boilers.*
3. *State and verify Bernoulli"s theorem.*
4. *Compute discharge of fluid flowing through Venturimeter and Orifice meter.*
5. *Carryout an experiment on Turbine flow meter.*
6. *Finds the friction factor for a given pipe line.*

List of Experiments:

1. Study of Water Tube Boilers.
2. Study of Fire Tube Boilers.
3. Verification of Bernoulli's Equation
4. Calibration of Coefficient of discharge for Venturimeter.
5. Calibration of Coefficient of discharge for Orifice meter.
6. Turbine Flow Meter
7. Estimation of friction factor for a given pipeline
8. Impact of jet on vanes.
9. Performance test on Pelton wheel turbine.
10. Performance test on Francis turbine.
11. Performance test on Kaplan turbine.

Additional Experiments:

12. Efficiency test on centrifugalpump.
13. Study on Hydraulicjump.

Note: Any 10 Experiments are to be done

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(20HS0831) DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS

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

COURSE OBJECTIVES

The objectives of this course:

1. *To enlighten the learners in the concept of differential equations and multivariable calculus.*
2. *To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.*
3. *Provide a setting that prepares students to read and learn mathematics on their own.*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Classify the differential equations with respect to their order and linearity. Solve the differential equations related to various engineering fields.*
2. *Identify solution methods for partial differential equations that model physical processes.*
3. *Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions.*
4. *Understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations.*
5. *Recognize and apply the Cauchy"s integral formula and the generalized*
6. *Cauchy"s integral formula (relationship between the derivative and the contour integral of a function).*

UNIT I

First and Higher Order Ordinary Differential Equations: Exact, linear and Bernoulli's equations - Second and higher order linear differential equations with constant coefficients with R.H.S term of the types e^{ax} , *sinax, cosax,* polynomials in*x* ,e^{ax} *V(x).*

UNIT II

Equations Reducible to LinearDifferentialEquations: Method of variation of parameters - Cauchy's and Legendre's linear equations- simultaneous linear equations with constant coefficients - Applications to L-C-R Circuit problems.

UNIT-III

Partial Differential Equations:

Formation of P.D.E by elimination of arbitrary constants and arbitrary functions-Method of Separation of variables-Solutions of one dimensional Wave equation, Heat equation and two dimensional Laplace's equation under initial and boundary conditions.

UNIT-IV

Complex Variable – Differentiation:

Differentiation, analytic functions,Cauchy-Riemann equations in Cartesian and polar co-ordinates (without proof), harmonic functions, conjugateharmonic functions, Milne Thompson's method-Conformal mappings, Transformation by e^z, ln z, z^2, sin z and cos z-Mobius transformations and their properties.

UNIT-V

Complex Variable – Integration :

Line integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof)-Taylor's series, zeros of analytic functions, singularities, Laurent's series- Residues, Cauchy Residue theorem (without proofs), Evaluation of definite integral involving sine and cosine.

TEXT BOOKS

1. GrewalB. S, *Higher Engineering Mathematics*, 44th edition, Khanna Publishers,2017.
2. RamanaB. V, *Higher Engineering Mathematics*, McGraw Hill Education, 2010.

REFERENCES

1. Rukmangadachari.E&Keshava Reddy E, *Engineering Mathematics,* Volume-I,II&III, Pearson Publishers, 2010.
2. Iyengar T.K.V, Krishna Gandhi B, Ranganatham S & Prasad M.V.S.S.N,*Engineering Mathematics*,Volume-I,II&III, 12th Edition,S.Chand publication, 2014.
3. GargNishu Gupta R.L, *Engineering Mathematics,*Volumes-I &II, Pearson Education, 2014.

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(20HS0849) APPLIED PHYSICS

COURSE OBJECTIVES

1. *To identify the importance of optical phenomenon i.e. interference and diffraction related to its engineering applications.*
2. *To impart knowledge in basic concepts of free electron theory, energy bands in solids and propagation of Electromagnetic waves.*
3. *To recognize the basic concepts related to the properties of Lasers and Optical Fibers.*
4. *To understand key points, formation and importance of semiconductors in the functioning of electronic devices.*
5. *To understand the fundamental concepts of Superconductivity and Nano Science & Technology.*

COURSE OUTCOMES (COs)

On successful completion of this course, student will be able to

1. *Analyze the differences between interference and diffraction with applications.*
2. *Explain concepts of free electron theory and energy bands in solids and asses the EM wave propagation in non-conducting medium by using Maxwell Equations.*
3. *Explain the basic principles and properties of Lasers and Optical Fibers.*
4. *Identify the applications of semiconductors in electronic devices*
5. Explain the basic properties and applications of superconductors in various fields.
6. Illustrate methods for synthesis and characterization of nanomaterial's and apply basic principles of nanomaterial's in various engineering applications.

UNIT I: WAVE OPTICS INTERFERENCE - Principle of Superposition-Interference of light-Conditions for sustained Interference - Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength of light- Engineering Applications of interference.
Diffraction –Introduction- Fraunhofer Diffraction-Single Slit- Double Slit -Diffraction Grating Grating Spectrum -Determination of Wavelength of Light - Engineering Applications of diffraction.

UNIT II: ELECTRON THEORY OF METALS &ELECTROMAGNETIC THEORY
Electron Theory of Metals: Classical free electron theory: postulates- drawbacks- Quantum free electron theory.—Fermi Dirac distribution Effective mass of electron- sources of electrical resistance- Energy bands in solids - Types of electronic materials: metals, semiconductors and insulators.

Electromagnetic Theory :Divergence and Curl of Electric and Magnetic Fields- Gauss' theorem for divergence and Stokes' theorem for curl - Maxwell's Equations (Quantitative)- Electromagnetic wave propagation (Non-conducting medium).

UNIT III: LASERS AND FIBER OPTICS

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

Fiber Optics: Introduction to Optical Fibers-Total Internal Reflection-Construction of optical fibers, Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile & modes –Propagation of electromagnetic wave through optical fiber- Block Diagram of Fiber optic Communication system –Applications.

UNIT IV:SEMICONDUCTORS

Intrinsic semiconductors- Carrier concentration (qualitative) - Fermi level – Energy Band Structure - Electrical conductivity- Energy band gap - Extrinsic semiconductors- P-type & N-type – Carrier concentration (qualitative) - Fermi level – Energy Band Structure- Life time of charge carriers- Carrier generation and recombination – Drift and Diffusion processes –Einstein's Relation - Hall Effect and it's applications –Theory of p -n junction – Construction and working of LED and Photo Diode

UNIT V: SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS

Superconductivity: Introduction – Meissner effect - Properties of superconductors Type I and type II superconductors- ac and dc Josephson effects -BCS theory (qualitative) –Applications of superconductors.

Physics of Nanomaterials: Introduction, Nanoscience and Nanotechnology – Surface area to volume ratio and Quantum confinement- Classifications of Nanomaterials– Properties of nanomaterials: Mechanical, Magnetic, Optical - Synthesis of nanomaterials- Top Down Process- Ball Milling; Bottom Up Process: Sol-Gel method–Applications of nanomaterials.

TEXT BOOKS

1. B.E.A. Saleh and M.C. Tech. "*Fundamentals of Photonics*", John Wiley & Sons, 2nd ed.2012.
2. K.Thyagarajan ,"*Engineering Physics*" , McGraw Hill Education Private Ltd, New Delhi.2nd ed,2019.

REFERENCES

1. M.N.Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy" *A Text book of Engineering Physics*",S.Chand Publications, 11th Edition,2019.
2. J. Singh, "*Semiconductor optoelectronics* :*Physics and Technology*", McGraw-Hill Inc.2nd 1995.
3. S.M. Sze, "*Semiconductor Devices: Physics and Technology*", Wiley, 2rd ed. 2015.
4. P. Bhattacharya, "*Semiconductor Optoelectronic devices*", Prentice Hall of India , 2nd ed.1997.

5. R. Fitzpdricle , "*Maxwell"s equations and the principles of Electromagnetism*", Infinity Science Press, 1st ed.2010.
6. John David Jackson , "*Classical Electrodynamics*",Wiley,3rd ed. 2007.

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(20CS0501) C PROGRAMMING AND DATA STRUCTURES

COURSE OBJECTIVES

The objectives of this course:

1. *Teach the syntax and semantics of a C Programming language*
2. *Demonstrate the use of Control structures of C Programming language*
3. *Illustrate the methodology for solving Computational problems*
4. *Explain the approach to algorithm analysis*
5. *Introduce different data structures for solving the problems*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Recognize the programming elements of C language*
2. *Select the control structure for solving the problem*
3. *Apply modular approach for solving the problem*
4. *Solve mathematical problems using C Programming language*
5. *Develop the applications using stacks and queues*
6. *Construct the linked lists for various applications and perform sorting techniques*

UNIT- I

Introduction to C Language - C Language Elements, Variable Declarations and Data Types, General Form of a C Program, Input and Output Statements, Operators, Expressions, Precedence and Associativity, Type Conversions.

Statements :Decision Statements ,Loop Control Statements, break, continue, goto statement.

UNIT- II

Arrays - Declaring and Referencing Arrays, Array Subscripts, Multidimensional Arrays.

Functions - Library Functions, Communications among Functions, Using Array Elements as Function Arguments, Scope, Storage Classes ,Type Qualifiers, Recursion , Preprocessor Commands.

Strings - String Basics, String Library Functions

UNIT- III

Pointers - Pointer Declaration, Pointers and Arrays, Array of Pointers, Pointers to Pointers, Void Pointers, Memory Allocation Functions, Pointer to Functions, Pointers and Strings.

Structure and Union –Declaration and Initialization of Structures, Structure within Structure, Array of Structures, Pointer to Structure, Structure and Functions, typedef, Bit Fields, Enumerated Data Type, Union, Union of Structures.

UNIT- IV

Data Structures - Overview of Data Structure, Types of data structures, Stacks: Introduction-Definition-Representation of Stack-Operations on Stacks- Applicationsof Stacks. Queues: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues.

Linked List -Single linked list, Circular linked list, Double linked list, Circular Double linked list, Applications of linked lists.

UNIT- V

Searching & Sorting:

Linear Search, Binary Search, Exchange Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort.

TEXT BOOKS:

1. *J.R.Hanly, Ashok N. Kamthane and A.AnandaRao, Programming in C and Data Structures,Pearson Education.*
2. *B.A.Forouzan and R.F. Gilberg, C Programming & Data Structures,Third Edition, Cengage Learning.*

REFERENCES:

1. *Stephen G. Kochan,Programming in C , III Edition, Pearson Education.*
2. *J.A. Jones & K. Harrow ,C Programming with problem solving,Dreamtech Press.*
3. *Dr.N.B.Venkateswarlu, Dr. E.V.Prasad, S. Chand, C and Data Structures, a snapshot oriented treatise with live engineering examples.*
4. *E.Balaguruswamy, C and Data Structures, Tata McGraw Hill.*
5. *A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein ,Data Structures using C , Pearson Education / PHI, Eighth Edition.*

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(20EE0201) FUNDAMENTALS OF ELECTRICAL CIRCUITS

COURSE OBJECTIVES

The objectives of this course:

1. *To learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks.*
2. *To understand the concept of graphical solution to electrical network*
3. *To understand frequency response in electrical circuits*
4. *To develop a clear understanding of the important parameters of a magnetic circuit.*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Analyze DC circuits using different methods.*
2. *Analyze AC circuits and apply appropriate Network theorem for solving electric Circuits*
3. *Understand series and parallel resonance concepts and analyze coupled circuits.*
4. *Understand magnetically coupled circuits*
5. *Formulate network matrices using network topology and understand the concept of duality.*
6. *Understand the concepts of KVL and KCL*

UNIT- I

DC Circuits: Electrical circuit elements (R,LandC), voltage and current sources, Ohm's law. Kirchoff's laws, analysis of circuits with dc excitation (series, parallel and series-parallel).

AC Circuits: Representation of sinusoidal waveforms, peak,average and rms values, form factor phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits.

UNIT- II

Network Theorems: Superposition Theorem, Theven in's Theorem, Norton's Theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Telligen'stheorem and Compensation Theorem for DC excitation.

UNIT- III

Series and Parallel Resonance: Series Resonance, Impedance and Phase angle of a Series Resonant circuit, Voltages and Currents in a Series Resonant circuit, Bandwidth of an RLC circuit, The Quality factor (Q) and its effect on Bandwidth, Parallel Resonance, Resonant frequency for a tank circuit, Variation of Impedance with frequency, Q factor of Parallel Resonance.

UNIT- IV

Coupled Circuits: Introduction, Conductively coupled circuits and mutual Impedance, Mutual Inductance, Dot convention, Coefficient of Coupling, Ideal Transformer, Series connection of coupled Inductors, Parallel connection of coupled coils.

UNIT- V

Network Topology: Graph of a Network, Definitions associated with graph, formation of incidence matrix, loop matrix and cut - set matrices. Relationship between Branch VoltageMatrix, Twig Voltage matrix and Node voltage matrix. Relationship between branch current Matrix and Loop current matrix, Duality.

TEXT BOOK

1. *Ravish R Singh," Network Analysis and Synthesis", Tata McGraw Hill,1st edition,2011.*
2. *A.Sudhakar and ShyammohanS.Palli , "Circuits &Networks Analysis and Synthesis", 3rd ed., Tata McGraw-Hill, New Delhi, 2007*

REFERENCES

1. *W.H.Hayt, J.E.kemmerly and S.M.Durbin, Engineering Circuit Analysis, 8th Edition, Tata McGraw-Hill, New Delhi, 2012*
2. *Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Elec- tric Circuits, 5th Edition, McGraw-Hill, 2012.*

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(20EC0402) ELECTRONIC DEVICES AND CIRCUITS

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the characteristics and applications of P-N junction diode, special purpose devices in electronic circuits.*
2. *To familiarize working principle of BJT, JFET and MOSFET and to design single stage amplifier circuits using low frequencymodel.*
3. *To analyze and design various electronic devices and circuits using PN Junction diode,BJT, JFET and MOSFET.*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Demonstrate the characteristics of PN Junction Diode, Rectifiers, Filters, BJT, JFET, MOSFET and special purpose electronic devices.*
2. *Analyze numerical and analytical problems in Rectifiers, Filters, Transistor biasing circuits and Transistor amplifiers.*
3. *Design and develop electronic circuits such as Rectifiers with and without filters, Transistor biasing circuits and Transistor amplifiers.*
4. *Solve engineering problems and arrive at solutions relating to electronic devices and circuits.*
5. *Identify a suitable semiconductor device and transistor for any given specification.*
6. *Select suitable technique for transistor modelling.*

UNIT- I

P-N Junction Diode: Open circuited PN Junction, Forward and Reverse Bias of PN Junction, Current Components in a PN diode, Volt - Ampere Characteristic, Temperature dependence of the V-I characteristic, Diode Resistances, Diode Capacitances, Breakdown Mechanisms, Zener Diode - Zener Diode as Voltage Regulator, Diode Clippers and Clampers.

UNIT- II

Rectifiers: Definition and Types, Half wave Rectifier, Full wave Rectifier and Bridge Rectifier, Comparison of Rectifiers, Filter - Definition and Types, Inductor Filter, Capacitor Filter, L-section Filter, CLC or π - section Filter, Comparison of various types of filters.

Special Purpose Devices: Varactor Diode, Tunnel Diode, Uni Junction Transistor, SCR, Solar Cell, LCD, LED.

UNIT- III

Transistor Characteristics: BJT: BJT - Construction, Operation, Transistor Current Components, Transistor as an Amplifier, Transistor Characteristics - CB, CE and CC.

FET: Types, JFET - Construction, Working, Characteristics, MOSFET - types, Construction, Working, Characteristics, Comparison between JFET and MOSFET.

UNIT- IV

Transistor Biasing and Thermal Stabilization: Need for Transistor biasing, Operating point, Load line analysis, Biasing methods - Fixed bias, Collector to Base bias, Self-bias,stability factors, Bias compensation, Thermal Runaway, Thermal stability.

UNIT- V

Small Signal Low Frequency Transistor Amplifier Analysis: Frequency Response of Amplifier, Transistor hybrid model, Generalized analysis of Transistor amplifier using h-parameter model, Simplified Hybrid Model - Analysis of CE, CB and CC amplifiers using Approximate Model, Analysis of CE amplifier with emitter resistance using simplified hybrid model.

FET Amplifier Analysis: Small Signal Model, Analysis of CS and CD Amplifiers at Low frequencies.

TEXT BOOKS

1. *J.Millman, C.Halkias, Electronic Devices and Circuits, Tata Mc-Graw Hill, 4th Edition,2010.*
2. *S.Salivahanan, N.Suresh Kumar, Electronic Devices and Circuits, McGraw Hill Education (India) Private Limited, 3rd Edition, 2012.*

REFERENCES

1. *Jacob Millman, C.Halkies, C.D.Parikh, Integrated Electronics, Tata Mc-Graw Hill, 2nd Edition, 2009.*
2. *Sedra and Smith, Micro Electronic Circuits, Oxford University Press, 4th Edition, 2002.*
3. *Robert Boylested and Louis Nashelsky, Electron Devices and Circuit Theory, Pearson Prentice Hall, 10th Edition, July 2008.*

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(20HS0851) APPLIED PHYSICS LAB

COURSE OBJECTIVES

1. *To explore the application of Interference and Diffraction by doing concerned experiments.*
2. *Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.*
3. *To understand the concept of Rigidity modulus, energy gap and B-H curve.*
4. *Develop an ability to apply the knowledge of physics experiments in the later studies.*
5. *Recognize the significance of Laser by studying its characteristics and its application in finding the particle size.*

COURSE OUTCOMES (COs)

On successful completion of this course, student will be able to

1. *Operate various optical instruments.*
2. *Estimate wavelength of laser and particles size using laser.*
3. *Plot the intensity of the magnetic field of induction along the axis of circular coil carrying current with distance.*
4. *Evaluate the acceptance angle of an optical fiber and numerical aperture.*
5. *Determine energy loss by B-H curve.*
6. *Evaluate rigidity modulus of a given wire.*

Suggested list of experiments from the following: (Perform any TEN experiments from the following)

1. Determination of wavelengths of various colors of Mercury vapor lamp using Diffraction Grating – Normal Incidence method.
2. Determination of Dispersive power of prism.
3. Rigidity Modulus – Torsional Pendulum
4. Determination of thickness of thin object by wedge method.

5. Determination of radius of curvature of Plano convex lens – Newton's Rings.
6. Determination of wavelength of a given laser source by using diffraction grating.
7. Determination of particle size (Lycopodium particles deposited on glass plates) using Laser source.
8. Determination of energy gap of a semiconductor using p – n junction diode.
9. B- H curve.
10. Magnetic field along the axis of current carrying coil – Stewart & Gee's Method.
11. Determination of frequency of tuning fork - Melde's Apparatus.
12. Determination of spring constant – Coupled Oscillator.
13. Determination of di electric constant of dielectric material using charging and discharging of capacitor.
14. Determination of Numerical Aperture of an Optical fiber.
15. Measurement of resistance with varying temperature – Thermistor.

Reference Books:

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

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(20CS0502) C PROGRAMMING AND DATA STRUCTURES LAB

COURSE OBJECTIVES

The objectives of this course:

1. *Explain basic constructs of C language*
2. *Explain problem solving techniques*
3. *Develop applications in C using strings, pointers, functions, structures*
4. *Explain the different operations that can be performed on data structures*
5. *Introduce the different search and sorting algorithms*

COURSE OUTCOMES (COs):

On Successful completion of this course, the student will be able to

1. *Read, understand and trace the execution of programs written in C language*
2. *Develop C programs for simple applications making use of basic constructs, arrays and strings*
3. *Develop C programs involving functions, recursion, pointers, and structures*
4. *Select the data structure appropriate for solving the problem*
5. *Illustrate the working of stack and queue*
6. *Implement searching and sorting algorithms*

LIST OF EXPERIMENTS:

1. Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*,/,% and use Switch Statement)
2. a) Write a C program to find the sum of individual digits of a positive integer.
   b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. a) Write a C program to calculate the following Sum:
   Sum=1-x2/2! +x4/4!-x6/6!+x8/8!-x10/10!
   b) Write a C program to find the roots of a quadratic equation.
4. a) Write a C program to determine if the given string is a palindrome or not
   b) Write a C program to determine whether the given number is Armstrong number or not.
5. a) Write a C program to generate Pascal's triangle.
   b) Write a C program to construct a pyramid of numbers.
6. a) Write a C program to find both the larges and smallest number in a list of integers.
   b) Write a C program that uses functions to perform the following:
      i) Addition of Two Matrices
      ii) Multiplication of Two Matrices

7. Write C programs that use both recursive and non-recursive functions
   i) To find the factorial of a given integer.
   ii) To find the GCD (greatest common divisor) of two given integers.
   iii) To solve Towers of Hanoi problem.
8. Write a C program to swap(exchange) values of two integer variables using pointers
9. Write a C program that uses functions to perform the following operations:
   a) To insert a sub-string in to given main string from a given position.
   b) To delete n Characters from a given position in a given string.
10. a) Write a C program to check whether the entered string is palindrome or not.
    b) Write a C program to read student roll no, name and marks in six subjects for n number of students and give class of each student.
11. Write a C programs that implement stack (its operations) using Arrays
12. Write a C programs that implement queue (its operations) using Arrays
13. Write a C program that uses functions to perform the following operations on singly linked list.
    i) Creation ii) Insertion iii) Deletion iv) Traversal
14. Write a C program that uses functions to perform the following operations on doubly linked list:
    i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
15. a) Write a C program to perform Linear Search on the elements of a given array.
    b) Write a C program to perform Binary Search on the elements of a given array.
16. a) Write a C program to sort the elements using Bubble sort.
    b) Write a C program to sort the elements using Insertion sort.

TEXT BOOKS:

1. *J.R.Hanly, Ashok N. Kamthane and A.AnandaRao, Programming in C and Data Structures,Pearson Education.*
2. *B.A.Forouzan and R.F. Gilberg, C Programming & Data Structures,Third Edition, Cengage Learning.*

REFERENCS:

1. *P. Padmanabham ,C programming and Data Structures, Third Edition, BS Publications*
2. *E Balaguruswamy ,C and Data Structures,TMH publications.*

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I B.Tech. IISem.

(20ME0302)WORKSHOP PRACTICE LAB

COURSE OBJECTIVES

To make the student

1. *Familiarize with thedifferent types of wood and carpentry joints.*
2. *Develop Tapered Tray and Conical funnel using sheet metal.*
3. *Acquire practical knowledgeon Fitting and Electrical Wiring.*
4. *Learn about various peripherals of a computer.*
5. *Know about installation of MS Windows &Linux.*
6. *Gain knowledge on Productivity tools &Networking.*

COURSE OUTCOMES

Upon Completion of the course the students will be able to

1. *Describe the different types of wood and carpentry joints.*
2. *Produce Tapered Tray and Conical funnel using sheet metal.*
3. *Understands about Fitting and Electrical Wiring.*
4. *Identify various peripherals of a computer.*
5. *Explain the procedure to install MS Windows &Linux.*
6. *Understand about Productivity tools &Networking.*

PART A

LISTOFEXPERIMENTS

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

1. T-Bridle joint
2. Corner Dovetailjoint

SHEETMETAL WORKING: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal jobs using GI sheets.

1. Tapered tray
2. Conical funnel

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

1. Step Fitting
2. V-Fit

ELECTRICALWIRING: Familiarity with different types of basic electrical circuits and makes the following connections

1. Paralleland series
2. Twowayswitch
3. Go down lighting
4. Tube light
5. Three phase motor
6. Solderingof wires

PART B

Task 1:

Identification of the 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

Task 2:

A practice on disassembling the components of a PC and assembling them.

Task 3:

1. Basic DOS commands, Installation of MS windows.
2. Basic Linux Commands, Installation of Linux.

Task 4:

Hardware Troubleshooting (Demonstration): Identification of a problem and fixing the solution (improper assembly or defective peripherals). Software Troubleshooting (Demonstration): Identification of a problem and fixing the PC for any software issues

Productivity tools

Task 5:

1. **MS Word Orientation:** Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving

2. **Presentations:** Creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper linking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

3. **Spread sheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

Task 6:

Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc should be done by the student. The entire process has to be documented.

TEXT BOOKS

1. *V Ramesh Babu, EngineeringWorkshoppracticefor JNTU, VRBPublishersPvt. Ltd.,2009.*
2. *Peter Norton, "Introduction to Computers", McGraw Hill, 7th Edition, 2017.*
3. *Joan Lambert, Joyce Cox, MOS study guide for word, Excel, Power point & amp; Outlook Exams, PHI. 1st Edition, 2011.*

REFERENCES

1. *P. Kannaiah& K.L. Narayana,WorkshopManual,SciTechPublishers,2010.*
2. *Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.2009.*
3. *Rusen, Networking your computers and devices, PHI, 2009.*
4. *Bigelows, Trouble shooting, Maintaining & amp; Repairing PCs, TMH, 2010.*

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(20HS0816)INDIAN CONSTITUTION

COURSE OBJECTIVES

The objectives of this course:

1. *To know the premises informing the twin themes of liberty and freedom from a civil rightsperspective.*
2. *To address the growth of Indian opinion regarding modern Indian intellectuals „constitutional role.*
3. *To address entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indiannationalism.*
4. *To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the IndianConstitution.*
5. *To acquire knowledge for various competitive examinations.*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Explain the key concepts of political economy.*
2. *Analyse the significant developments in the political ideologies.*
3. *Describe the salient features of the constitution of India interpret, integrate and critically.*
4. *Analyse the political economy of Indian international relations and gain knowledge in Judiciary system.*
5. *Apply their knowledge and skills acquired to write various competitive examinations.*
6. *Analyse the constitutional rights in relating to Practical life.*

UNIT-I

Constitution: Definition, Introduction, Meaning of the term,- Indian Constitution: Sources and Features

UNIT-II

Historical Perspective of Indian Constitution; The Government Act of 1919and1935 - A Dual Form of Government–The Constitutional Reforms of Simon commission–Formation of Drafting Committee–The Role of Constitution Assembly. Salient features and characteristics of the Constitution of India: Structure of the Indian Union: Federalism, Centre- State relationship.

UNIT-III

Scheme of the Fundamental Rights: Concept of Fundamental Rights in India, Justifiability of Fundamental Rights - Reach of Fundamental Rights -The scheme of the Fundamental Duties and its Legal Status: Fundamental Duties in India – Article 51A - Introduction to Fundamental Duties in India—Importance of Fundamental Duties.The Directive Principles of State Policy - Its importance and implementation - The Potential of Directive Principles of State Policy for the Judicial Enforcement of Socio-Economic Rights.

UNIT-IV

Parliamentary Form of Government in India: Origin, growth and development of the parliamentary system in India – Chief Characteristics of Indian Parliament Constitutional Powers and Functions of Indian Parliamentary system. The President of India: Qualifications of President - Election of President, Tuner of President - Status, Powers and Functions of President. The Historical Perspectives of the Constitutional Amendments inIndia: Types of Amendments & Constitutional Amendment Process in India - Indian Polity-Judiciary System Introduction to Indian Judiciary System - Independent Indian Judiciary - Indian Judiciary Structure - Powers and Functions of Indian Judiciary

UNIT-V

Local Self Government – Constitutional Scheme in India - District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO ZillaPachayat: Position and role, Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy.
Election Commission: Role and Functions of Chief Election Commissioner and Election Commissioners,State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

TEXT BOOKS

1. *Government of India Ministry of Law and Justice (Legislative Department) The Constitution of India, 1950 (Bare Act)Government Publication, 2015*
2. *Dr.Busi S.N, Dr.B.R.Ambedkar framing of Indian Constitution, 1st Edition, Government Publication 2015*

REFERENCES

1. *Jain M. PIndian Constitution Law LexisNexis Publishers 7th Edition.2014.*
2. *Basu D.D Introduction to the Constitution of India Lexis Nexis,8th Edition 2015*
3. *...BakshiP.M Constitution of India Universal Law Publishing.15th Edition,2018*

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II B.Tech. – I Sem.

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(20HS0832) PROBABILITY. NUMERICAL METHODS AND TRANSFORMS

COURSE OBJECTIVES

The objectives of this course is to

1. *To introduce the tools of differentiation and integration of functions of numerical methods that is used in various techniques dealing engineering problems.*
2. *To develop the essential tool of Probability & Statistics in a comprehensive manner.*
3. *To acquaint the student with mathematical tools needed in evaluating Transform Calculus and their usage.*

COURSE OUTCOMES

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

1. *A good understanding of the laws of probability and the use of Baye's theorem.*
2. *To develop the mathematical skills of the students in the areas of numerical methods.*
3. *Apply numerical methods to find our solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations.*
4. *Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.*
5. *Calculate the Laplace transform of standard functions both from the definition and by using tables.*
6. *Ability to compute z- transform and inverse z- transform.*

UNIT-I

Probability:

Introduction to Probability-Additional theorem, Conditional probability, dependent and independent events, Multiplication theorem, Baye's theorem.

UNIT II

Numerical solution of Algebraic and Transcendental equations: The Bisection method, Newton-Raphson method and Regula-Falsi method.

Interpolation: Finite differences-Newton's forward and backward difference formulae.

UNIT III

Numerical solution of Ordinary differential equations:

Taylor's series(first and second order), Euler's method, Modified Euler's method and Runge-Kutta method of fourth order for solving first order differential equations.

Numerical integration:

Trapezoidal rule and Simpson's 1/3rd and 3/8rules.

UNIT IV

Laplace Transforms: Laplace transforms of standard functions-Properties of Laplace Transform-Inverse transforms-First shifting theorem, Unit step function,Second shifting theorem,Change of scale property,Transforms of derivatives and integrals-Evaluation of integrals by Laplace transforms. Use of partial fractions to find Inverse Laplace transforms-Convolution theorem.

UNIT-V

Applications of Laplace transforms:

Application of Laplace transforms to ordinary differential equations of first and second order.

Z- Transforms:

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

TEXT BOOKS

1. Grewal B. S, *Higher Engineering Mathematics,* 44th edition, Khanna Publishers, 2017.

2. Ramana B. V, *Higher Engineering Mathematics*, Mc Graw Hill Education, 2010.

REFERENCES

1. Iyengar T.K.V, Krishna Gandhi B, Ranganatham S & Prasad M.V.S.S.N, *Engineering Mathematics,* Volume-I,II&III, 12thEdition, S.Chand publication, 2014.
2. Rukmangadachari. E & Keshava Reddy E, *Engineering Mathematics,* Volume-I,II&III, Pearson Publishers, 2010.
3. Garg Nishu Gupta R.L, *Engineering Mathematics,* Volumes-I &II, Pearson Education, 2014.
4. Bali N, Goyal M & Watkins C, *Advanced Engineering Mathematics*, Infinity Science Press, 2007.

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(20EC0446) ANALOG ELECTRONIC CIRCUITS

COURSE OBJECTIVES
The objectives of this course:

1. *Familiarize the student with the analysis of Feedback amplifiers, Oscillators and OperationalAmplifiers.*
2. *Study the applications of operational amplifiers.*
3. *Design circuits for various applications of operational amplifiers.*

COURSE OUTCOMES
On successful completion of the course, the student will be able to

1. *Understand the background of Feedback amplifiers, Oscillators and Operational Amplifiers.*
2. *Analyze the analog electronic circuits for meeting defined specifications.*
3. *Design and develop analog electronic circuits such as Feedback Amplifiers, Oscillators and various applications of operational amplifier with given specifications.*
4. *Compute the parameters related to analog electronic circuit design.*
5. *Choose the required Amplifier circuit suitable for a specific electronic subsystem.*
6. *Solve the requirements for electronic circuits and understand the consequent responsibilities relevant to the professional engineering practice using analog electronic circuits.*

UNIT –I
FEEDBACK AMPLIFIERS: Feedback concept, Classification of basic amplifiers - Voltage amplifier, Current Amplifier, Transresistance Amplifier and Transconductance Amplifier, Feedback amplifier topologies, Characteristics of negative feedback amplifiers, Analysis of feedback amplifiers, Performance comparison of feedback amplifiers.

UNIT –II
OSCILLATORS: Principle of operation of oscillator, Barkhausen Criterion, Types of oscillators, Analysis of RC-phase shift and Wien bridge oscillators using BJT, Generalized analysis of LC Oscillators, Hartley and Colpitts"s oscillators with BJT, Crystal oscillators, Frequency stability of oscillators.

UNIT –III
OPERATIONAL AMPLIFIER: Basic Information of Op-Amp, Ideal Op-Amp, Inverting Amplifier, Non-Inverting Amplifier, Voltage Follower, Differential Amplifier, Difference and Common Mode gains, CMRR, DC Characteristics ~~In~~put

Bias Current, Input Offset Current, Input and Output Offset Voltage, Thermal Drift, AC Characteristics – Frequency Response, Frequency Compensation, Slew rate.

UNIT –IV

APPLICATIONS OF OP-AMP: Summing Amplifier, Subtractor, Differentiator, Integrator, Sample and Hold Circuit, Astable Multivibrator, Monostable Multivibrator, Triangular wave generator.

UNIT –V

ACTIVE FILTERS AND CONVERTERS USING OP-AMP: Active Filters - Low pass active filter, High pass active filter, DAC–Weighted Resistor DAC, R-2R ladder DAC, Inverted R-2R Ladder DAC, ADC–Flash Type ADC, Dual Slope ADC, DAC/ADC Specifications.

TEXT BOOKS

1. S.Salivahanan, N.Suresh Kumar, *Electronic Devices and Circuits*, McGraw Hill Education(India) Private Limited, Third Edition, 2012.
2. D.Roy Choudhury, Shail B.Jain, *Linear Integrated Circuits*, New Age International Publishers, Fourth Edition, 2010.

REFERENCES

1. *J*.Millman, C.Halkias, *Electronic Devices and Circuits*, Tata Mc-Graw Hill, 4th Edition,2010.
2. Sedra and Smith, *Micro Electronic Circuits*, Oxford University Press, Fourth Edition, 2002.
3. Ramakanth A. Gayakwad, *Op-Amps &Linear ICs*, PHI, 3rd & 4th edition, 1987.

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(20EE0202) ELECTRICAL MACHINES-I

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COURSE OBJECTIVES:

The objectives of this course:

1. *To understand the operation of dc machines.*
2. *Analyse the differences in operation of different dc machine configurations.*
3. *To understand the testing of dc machine.*
4. *Analyse special type motors.*

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

1. *Calculate the EMF generated on open circuit and find terminal voltage on load.*
2. *Diagnose the failure of DC generator to build up voltage.*
3. *Compute the load shared by each generator when several generators operate in parallel.*
4. *Identify suitable method and conditions for obtaining the required speed of DC motor.*
5. *Determine* the gross torque and useful torque developed by DC motor
6. *Able to understand the different special type motors*

UNIT- I

DC GENERATORS - I

Electromechanical Energy Conversion Principle - Construction & Principle of operation of DC generator - Armature Windings — Emf equation – Types of DC Generators - armature reaction - demagnetizing and cross magnetizing - compensating windings – commutation - Reactance Voltage – methods of improving commutation.

UNIT- II

D.C GENERATORS –II

E.M.F Build-Up of in Different types of Generators –Characteristics of DC Generators- Causes for Failure to Self-Excitation and Remedial Measures- – Parallel Operation of D.C Generators Use of Equalizer Bar and Cross Connection of Field Windings –Applications of DC Generator.

UNIT- III

DC MOTORS:

Motors – Principle of Operation – Back E.M.F. – Torque Equation – Characteristics of DC Motors – Armature Reaction and Commutation.

Speed Control of D.C. Motors: Armature Voltage and Field Control Methods. Ward- Leonard System. Applications of DC motors.

UNIT- IV

STARTING & TESTING METHODS OF DC MACHINES:

Starting of dc motors: constructional details of 3-point and 4-point starters, Losses of DC machines – Calculation of Efficiency – Condition for Maximum Efficiency. Methods of Testing – Direct, Indirect – Brake Test – Swinburne's Test – Hopkinson's Test – Field's Test and Retardation Test

UNIT- V

SPECIAL MOTORS:

Construction – Working Principle and Applications of PMBLDC motor – AC series motor – Universal motor – Stepper motor – switched Reluctance motor.

TEXT BOOK

1. I.J.Nagrath ,D.P.Kothari, *Electric Machines*, New Age International Ltd, 5th Edition 2017.
2. P.S.Bimbhra, *"Electrical machinery"*, Khannna Publishers, 2019.

REFERENCES

1. B.R.Gupta, Vandana Singhal, *"Fundamentals of Electrical Machines"*, New Age International Ltd.2005
2. E.G. Janardhanan. "Special Electrical machines ", PHI Learning private Ltd.2014
3. S.K. Battacharya *Electrical Machines*, , TMH Edn Pvt. Ltd., 3rd Edition, 2009.
4. S. Kamakshaiah *Electromechanics, II (transformers and induction motors),* Hitech Publishers, 2005.

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II B.Tech. – I Sem.

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(20EE0203) GENERATION OF ELECTRICAL POWER

COURSE OBJECTIVES:

The objectives of this course:

1. *To understand Structure, essential components and their layout in thermal power station*
2. *To understand Selection of site for hydro power generation*
3. *To learn about Various aspects and issues involved in Nuclear power generation*
4. *To understand Electric power generation from renewable energy sources as sun, wind and ocean*
5. *To understand Cost of generation and tariff methods*

COURSE OUTCOMES:

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

1. *Estimate the coal requirement, cost per kWh generation and number of units generated for thermal power station*
2. *Estimate the required flow of river water, cost of generation and number of units generated in hydel power generation*
3. *Compute various factors like load factor, plant factor*
4. *Evaluate the tariffs to be charged for the consumers*
5. *Plot the load curve, load duration curve*
6. *Evaluate determine the load capacity of the plant.*

UNIT-I
THERMAL & HYDRO POWER GENERATING SYSTEMS

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

Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.

UNIT-II
NUCLEAR POWER GENERATING SYSTEMS

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

UNIT-III
SOLAR & WIND POWER GENERATING SYSTEMS

Solar Power Generation: Role and Potential of Solar Energy, Flat Plate and Concentrating Solar Energy Collectors, Different Methods of Solar Energy Storage Photovoltaic Cell construction and operation, V-I Characteristics of PV.

Wind Power Generation: Role and potential of Wind Energy, Horizontal and Vertical Axis Wind Mills- Performance Characteristics- Power- Speed & Torque- Speed Characteristics-Pitch & Yaw Controls.

UNIT-IV

BIOGAS, GEOTHERMAL AND OCEAN POWER GENERATING SYSTEMS

Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters – Characteristics of Bio-Gas- Utilization- Economic and Environmental Aspects.

Geothermal and Ocean Power Generation: Principle of Geothermal Energy Methods of Harnessing-Principle of Ocean Energy-Tidal and Wave Energy and Ocean Thermal Energy Conversion systems.

UNIT-V

ECONOMIC ASPECTS OF POWER GENERATION

Load Curve, Load Duration and Integrated Load Duration Curves-Load Demand, Diversity, Capacity, Utilization and Plant Use Factors-. Costs of Generation and their Division into Fixed, Semi-Fixed & Running Costs.

Tariff Methods: Desirable Characteristics of a Tariff Method- Flat Rate, Block-Rate, Two-Part, Three–Part, and Power Factor Tariff Methods and.

TEXT BOOKS:

1. M.L.Soni, P.V.Gupta A Text Book on *Power System Engineering*,2 nd Edition U.S.Bhatnagar and Dhanpat Rai & Co. Pvt. Ltd., 1999.2013.
2. C.L Wadhwa A Text Book on Electric Power Generation Distribution and Utilization by,4th edition New Age International (P) Ltd., 2017.
3. G.D. Rai *Non Conventional Energy Sources*,3rd Edition, Khanna Publishers, 2017.

REFERENCES:

1. John Twidell and Tony Weir *Renewable Energy Resources*, Third Edition, Taylor and Francis Group,2015.
2. S.N.Singh *Electrical Power Generation, Transmission and Distribution*, PHI, 2004
3. N. Bhadra, D. Kastha & S. Banerjee *Wind Electrical Systems* Oxford University Press, 2013.

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(20EE0204) ELECTROMAGNETIC FIELDS

COURSE OBJECTIVES:

The objectives of this course:

1. *To learn the laws concerning static electric fields: Coulomb's law, Gauss law; the laws concerning static magnetic fields: Biot, savart law, Ampere circuital law*
2. *To learn the equations concerned with static electric fields*
3. *To learn the equations concerned with static magnetic fields*
4. *To find the difference between the behaviors of conductors and dielectrics in electric fields*
5. *To determine the energy stored and energy density in static electric field and magnetic field*

COURSE OUTCOMES:

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

1. *Acquires mathematical foundation on vector calculus*
2. *Analyse and estimate Electric field quantities with charge distribution*
3. *Study the behavior of electric fields in conductor and dielectric materials*
4. *Estimate the magnetic field strengths due to different current carrying elements*
5. *Evaluate the magnetic forces generated due to interaction of electric and magnetic fields*
6. *Understand the Time varying fields.*

UNIT-I
INTRODUCTION TO VECTOR CALCULUS

Three orthogonal coordinate systems (rectangular, cylindrical and spherical)- Representation of a point and a vector in three coordinates, Conversion of point and vector from one coordinate system to another. Vector algebra- Vector addition, subtraction and multiplications; vector operators gradient, divergence and curl; integral theorems of vectors. Representation of differential length, surface and volume.

UNIT-II
STATIC ELECTRIC FIELD

Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Divergence theorem and Maxwell's First equation, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT-III

CONDUCTORS, DIELECTRICS AND CAPACITANCE

Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.

UNIT-IV

MAGNETOSTATICS

Biot-Savart Law, Amperes Law, Stokes's theorem and Maxwell's second equation. Magnetic flux and magnetic flux density, Maxwell's third equation. Scalar and Vector Magnetic potentials. Force on a moving charge in a magnetic field, Force on a differential current element and straight current carrying conductor in a magnetic field, Force between differential current elements, Force between two parallel current carrying conductors. Self-inductance of solenoid, toroid and coaxial cable. Energy stored in a magnetic field.

UNIT-V

TIME VARYING FIELDS AND MAXWELL'S EQUATIONS

Faraday's law of Electromagnetic induction, Maxwell's fourth equation Displacement current, Modification of Maxwell's third equation for time varying fields. Point and integral form of Maxwell's equations for time varying fields.

TEXT BOOKS:

1. William.H.Hayt, *"Engineering Electromagnetics"* Mc.Graw,Hill, Seventh edition,2010.
2. Gangadhar, *Field Theory*, Khanna Publications, 2003.

REFERENCES:

1. Griffith, "*Electrodynamics* "PHI, 4th Edition, 2014..
2. Sadiku, "*Electromagnetic Fields* "Oxford University Press, 5th Edition, 2010.
3. Joseph Edminister, "*Electromagnetics*" Tata Mc Graw Hill, 2006.
4. J.D.Kraus, "*Electromagnetics*" Mc.Graw,Hill Inc,5th edition,1999.

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(20EC0447) ANALOG ELECTRONIC CIRCUITS LAB

COURSE OBJECTIVES
The objectives of this course:

1. *Understand the student about feedback amplifiers, oscillators and applications of operational amplifiers.*
2. *Obtain the characteristics and design of feedback amplifiers, oscillators and applications of operational amplifiers.*

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

1. *Understand the background of different electronic devices and analog circuits.*
2. *Analyze the characteristics of different electronic devices and circuits like Diodes-PN Junction Diode, Zener Diode and Transistors-BJT, FET.*
3. *Apply the knowledge of different feedback amplifiers, sinusoidal oscillators and operational amplifiers in different electronic circuits.*
4. *Design different analog electronic circuits for various applications with given specifications.*
5. *Decide the required Amplifier circuit suitable for a specific electronic subsystem.*
6. *Provide the requirements for electronic circuits and understand the consequent responsibilities relevant to the professional engineering practice using analog electronic circuits.*

List of Experiments (Minimum of TEN experiments to be completed)

1. Voltage series feedback amplifier
2. Current series feedback amplifier
3. RC phase shift oscillator using BJT
4. Colpitts oscillator using BJT
5. Inverting Amplifier using OpAmp
6. Non Inverting Amplifier using OpAmp
7. Differentiator using OpAmp
8. Integrator using OpAmp
9. Active Low pass filter using OpAmp
10. Active High pass filter using OpAmp.
11. Weighted Resistor DAC using OpAmp
12. R-2R Ladder DAC using OpAmp

Additional Experiment:

1. PCB Design of a simple electronic device application

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(20EE0205) ELECTRICAL MACHINES-I LAB

COURSE OBJECTIVES:

The student has to learn about:

1. *No load and load characteristics of DC generators.*
2. *Various tests on DC motors.*
3. *The speed control techniques of DC motors.*

COURSE OUTCOMES:

The student should be able to do the following:

1. *Conduct experiments to obtain the no load and load characteristics of D.C. Generators.*
2. *Conduct tests on D.C. motors for predetermination of efficiency.*
3. *Conduct tests on D.C. motors for determination of efficiency.*
4. *Control the speed of D.C. motor in a given range using appropriate method .*
5. *Identify the reason as to why D.C. Generator is not building up voltage.*
6. *Identify the Separation of Losses in DC Shunt Motor*

List of Experiments

Any TEN of the following experiments are to be conducted:

1. Magnetization Characteristics of DC Shunt Generator. Determination of Critical Field Resistance and Critical Speed.
2. Speed Control of DC Shunt Motor.
3. Load Test on DC Shunt Generator. Determination of Characteristics.
4. Load Test on DC Series Generator. Determination of Characteristics.
5. Load Test on DC Compound Generator. Determination of Characteristics.
6. Brake Test on DC Shunt Motor. Determination of Performance Curves.
7. Brake Test on DC Compound Motor. Determination of Performance Curves.
8. Fields Test on DC Series Machines. Determination of Efficiency.
9. Swinburne's Test on DC Machine.
10. Retardation Test on DC Shunt Motor. Determination of Losses at Rated Speed.
11. Separation of Losses in DC Shunt Motor.
12. Hopkinson's Test on DC Shunt Machines. Predetermination of Efficiency.

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(20EE0206) ELECTRICAL CIRCUITS AND SIMULATION LAB

COURSE OBJECTIVES

The student has to learn about:

1. *To study fundamentals of Kirchhoff's current and voltage laws and its practical Implementation.*
2. *Measurement of voltage, current, power and impedance of any circuit.*
3. *Analysis of a given circuit depending on types of elements.*
4. *To identify the basic electrical circuits and observe the characteristics.*

COURSE OUTCOMES:

The student should be able to do the following:

1. *Experimentally verify the basic circuit theorems.*
2. *Understand 3 phase balanced, star and delta connected supply and load and to measure power in 3 phase circuits*
3. *Determine the resonant Frequency, quality factor & bandwidth of the RLC circuits*
4. *Draw the locus diagrams of RLC circuits.*
5. *Find the various parameters of two port network.*
6. *Determine the Z and Y parameters*

Any EIGHT of the following experiments are to be conducted:

1. Verification of Thevenin's, and Norton's theorems
2. Verification of Superposition theorem and maximum power transfer theorem.
3. Verification of Compensation theorem
4. Verification of Reciprocity and Millman's theorem
5. Locus diagram of RL and RC series circuits
6. Series parallel resonance
7. Determination of self and mutual inductance and coefficient Coupling.
8. Determination of Z and Y parameters of two port network
9. Determination of Hybrid and Transmission Parameters of Two port network
10. Measurement of active and reactive power for star and delta connection in balanced loads
11. Measurement of 3 phase power by two wattmeter in unbalanced loads

Any TWO simulation experiments are to be conducted:

1. Simulation of DC circuits
2. Simulation of DC transient response of inductor and capacitance
3. Mesh analysis
4. Nodal analysis

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(20EC0455) PCB DESIGNING LAB

COURSE OBJECTIVES

The objectives of this course:

1. *Understand the need for PCB Design and steps involved in PCB Design and Fabrication process.*
2. *Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools.*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design.*
2. *Understand basic concepts of transmission line, crosstalk and thermal issues.*
3. *Create schematics from lue prints and perform simple simulations.*
4. *Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits.*
5. *Design (schematic and layout) and fabricate PCB for simple circuits.*
6. *Apply techniques, skills and modern engineering tools necessary for engineering practice.*

Tools and materials required for PCB fabrication:

1. Open source EDA Tool Kit Cad.
2. Single-sided copper clad sheet.
3. Diluted Acidic solution for copper etching purpose with plastic tray.
4. Tapes and pads for layout design of different dimensions.
5. Hand drilling/Power drilling machine.
6. Tool kit (tong, hand gloves etc.)

CONTENTS

1. Introduction to PCB

- Definition and Need/Relevance of PCB
- Background and History of PCB
- Types of PCB
- Classes of PCB Design
- Terminology in PCB Design
- Different Electronic design automation (EDA) tools and comparison.

2. PCB Design Process

- PCB Design Flow, Placement and routing
- Steps involved in layout design
- Artwork generation Methods - manual and CAD
- General design factor for digital and analog circuits
- Layout and Artwork making for Single-side, double-side and Multilayer Boards.
- Design for manufacturability
- Design-specification standard

3. Introduction to PCB Fabrication & Assembly

- Steps involved in fabrication of PCB.
- PCB Fabrication techniques-single, double sided and multilayer
- Etching: chemical principles and mechanisms
- Post operations- stripping, black oxide coating and solder masking
- PCB component assembly processes

4. Transmission lines and crosstalk

- Transmission Line: Transmission lines and its effects Significance of Transmission line in Board design Types of Transmission lines.
- Crosstalk: The crosstalk in transmission lines Crosstalk control in PCB design parts, planes, tracks, connectors, terminations Minimization of crosstalk.
- Thermal issues: Thermal mapping of design

5. Design PCB (schematic and Layout) for following exercises.

Example circuit: -Inverting Amplifier or Summing Amplifier using op-amp

- Using any Electronic design automation (EDA) software, Practice following PCB Design steps
- (Open source EDA Tool Ki Cad Preferable)
- Schematic Design: Familiarization of the Schematic Editor, Schematic creation, Annotation, Net list generation
- Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB layout Schematic
- Create new schematic components
- Create new component footprints

6. Example circuit: **Full-wave Rectifier**

7. Example circuit: **Full-Adder using half-adders.**

8. Design a 8051 Development board

- Power section consisting of IC7805, capacitor, resistor, headers, LED

9. Serial communication

- Serial Communication section consisting of MAX 232, Capacitors, DB9 connector, Jumper, LEDs

10. Reset & Input/ output sections

- It consisting of 89C51 Microcontroller, Electrolytic Capacitor, Resistor, Jumper, Crystal Oscillator, Capacitors

Note: Fabricate single-sided PCB, mount the components and assemble in a cabinet for any one of the circuits mentioned

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(20HS0801) ENVIRONMENTAL SCIENCE

COURSE OBJECTIVES

The objectives of this course:

1. *Identify environmental problems arising due to engineering and technological activities and the science behind those problems.*
2. *To identify the importance of interlinking of food chains.*
3. *Learn about various attributes of pollution management and waste management practices.*

COURSE OUTCOMES

On successful completion of this course, the student will be able to

1. *Recognize the physical, chemical and biological components of the earth's systems and show how they function.*
2. *Characterize and analyze human impacts on the environment.*
3. *Integrate facts, concepts and methods from multiple disciplines and apply to environmental Problems.*
4. *Create 1informed opinions about how to interact with the environment on both a personal and a social level.*
5. *Perform independent research on human interactions with the environment.*
6. *Recognize the ecological basis for regional and global environmental issues.*

UNIT – I

INTRODUCTION: Definition, Scope and Importance of environmental science, Need for Public Awareness

NATURAL RESOURCES: Forest resources: Use and over-exploitation, deforestation, Mining, dams and their effects on forests 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

Energy resources: Renewable and Non- Renewable sources of energy. Solar energy, Hydro electrical energy, Wind energy, Nuclear energy.

UNIT-II

ECOSYSTEMS:

Concept of an ecosystem, structure and function of an ecosystem. Producers, Consumers and Decomposers. Biogeochemical cycles, Ecological succession, energy flow in an ecosystem, Food chains, food webs and ecological pyramids. Types of ecosystems (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem.

UNIT-III

BIODIVERSITY AND ITS CONSERVATION:

Introduction, Definition, genetic, species and ecosystem diversity, Bio-geographical classification of India, India as a Mega diversity Nation, Hot spots of biodiversity, Value of biodiversity, Threats to biodiversity, Endemic, Endangered and Extinct species of India, In-Situ and Ex-situ conservation of biodiversity.

UNIT-IV

ENVIRONMENTAL POLLUTION AND GLOBAL ENVIRONMENTAL ISSUES:

Natural Disasters: Droughts, Floods, Cyclone, Landslides, Earthquake.

Pollution episodes: Air pollution, Water pollution, Land pollution, Noise pollution, Automobile, Nuclear pollution. Global warming, Acid rain, Ozone layer depletion and controlling measures.

Global Environmental Issues: Population Growth, Urbanizations, Land Management, Water and Waste Water Management. Climate change and impacts on human environment.

Solid Waste Management: causes, effects and control measures of Municipal solid wastes.

E-waste and management, Role of an individual in prevention of pollution.

UNIT-V

ENVIRONMENTAL LEGISLATIONS, LAWS, POLICIES FOR SUSTAINABLE DEVELOPMENT:

Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water Act.

Wildlife protection Act, Forest conservation Act. Municipal Solid Waste management.

International conventions/Protocols Earth summit, Kyoto protocol and Montreal Protocol.

Unsustainable to sustainable development, Role of NGOs for Sustainable development. Role of IT in Environment, GIS methods for Sustainable development.

Field work- visit to a local area to document environmental assets, river, forest, grassland/hill, mountain and polluted sites (urban/rural/industrial/Agriculture). study simple ecosystems.

TEXT BOOKS:

1. A.Kaushik and C.P.Kaushik, *Environmental Sciences, 5th edition,* New age international publishers, 2015.
2. M.Anji Reddy, *Text Book of Environmental Science and Technology,* BS Publications, 2016.

REFERENCES:

1. Anil Kumar and Arnab Kumar De, *Environmental Studies*, New Age International Publishers, New Delhi, 3rd Edition 2015.
2. R.K. Trivedi, *"Handbook of Environmental Laws, Rules, Guidelines, Compliances andStandards"*, Vol.I and II, Enviro Media, 2016.
3. Rajagopalan.R, *"Environmental Studies-From Crisis to Cure"*, Oxford University Press, 2005.

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II B.Tech. – II Sem. (20EC0448) DIGITAL ELECTRONICS

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COURSE OBJECTIVES

The Objective of this course:

1. *Familiarize the student with fundamental principles of digital design.*
2. *Acquire the skills to manipulate and examine Boolean algebraic expressions, logical operations, Boolean functions and their simplifications.*
3. *Acquaint with classical hardware design and software implementation for both combinational and sequential logic circuits.*

COURSE OUTCOMES

On successful completion of this course, the student will be able to

1. *Apply the concepts of binary systems, Boolean algebra and logic gates in digital systems.*
2. *Analyze and compare the different minimization techniques in the designing of digital systems.*
3. *Understand the difference between combinational and sequential circuit in digital systems.*
4. *Design and implement Sequential and Combinational circuits.*
5. *Apply the state reduction methods in design of FSMs.*
6. *Understand and design memory systems like RAM, ROM, PLA, PAL.*

UNIT –I

BINARY SYSTEMS: Digital Systems– Binary Numbers –Octal and Hexadecimal Numbers, Number Base Conversions Complements–Signed Binary Numbers–Binary Codes. **BOOLEAN ALGEBRA AND LOGIC GATES:** Basic Definitions, Axiomatic Definition of Boolean Algebra –Basic Properties of Boolean Algebra –Boolean Functions, Canonical and Standard Forms–Other Logic Operations Digital Logic Gates Integrated circuits.

UNIT –II

GATE–LEVEL MINIMIZATION: The Map Method, Four Variable K-Map, Five VariableK-Map– Product of Sums Simplification – Don't–Care Conditions– NAND and NOR implementation, Other Two Level Implementations, EX-OR Function Tabular Minimization method.

UNIT –III

COMBINATIONAL LOGIC: Combinational Circuits Analysis Procedure– Design Procedure –Binary Adder – Subtractor – Decimal Adder – Binary Multiplier– Magnitude Comparator–Decoders Encoders Multiplexers De-Multiplexers.

UNIT – IV

SYNCHRONOUS SEQUENTIAL LOGIC: Sequential Circuits – Latches, Flip Flops – Analysis of Clocked Sequential Circuits – Registers, Shift Registers, Ripple counters, Synchonous counters, Ring Counter and Johnson Counter.

UNIT – V

FINITE STATE MACHINES AND PROGRAMMABLE MEMORIES: Introduction to FSM – Mealy and Moore models – State Reduction and State Assignment – Design procedure – Random access memory, memory decoding – Error Detection and Correction – Read–only Memory – Programmable Logic Array – Programmable Array Logic.

TEXT BOOKS

1. Morris Mano, *Digital Design*, PHI, 3rd Edition, 2006.
2. Zvi Kohavi, *Switching & Finite Automata theory*, TMH, 2ndEdition.
3. A.Anandkumar, *Switching Theory and Logic Design*, PHI,2008.

REFERENCES

1. Fletcher, *An Engineering Approach to Digital Design*, PHI.
2. Charles H. Roth, *Fundamentals of Logic Design*, Thomson Publications, 5th Edition, 2004.
3. John M. Yarbrough, *Digital Logic Applications and Design*, Thomson Publications, 2006

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II B.Tech. – II Sem.

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(20HS0815) ENTREPRENEURSHIP DEVELOPMENT

COURSE OBJECTIVES:
The objectives of this course:

1. *To acquire necessary skills and knowledge required for organizing and carrying out entrepreneurial activities,*
2. *To develop the ability of analyzing and understanding business situations in which entrepreneurs act*
3. *To develop the ability of analyzing various aspects of entrepreneurship especially of taking over the risk, and the specificities as well as the pattern of entrepreneurship development*

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

1. *The ability to discern distinct entrepreneurial traits and identify the successful elements of successful entrepreneurial ventures*
2. *Consider the legal and financial conditions for starting a venture and to assess the opportunities and constraints for new ventures*
3. *Design strategies for the successful implementation of ideas*
4. *To comprehend the evaluation of business opportunity from the prospective of an investor*
5. *Identify the most suitable sources of finance for start-ups*
6. *To write and execute their own business plan*

UNIT-I

Introduction to Entrepreneurship - Concept of Entrepreneur's, Enterprise and Entrepreneurship; Characteristics, Qualities, Functions of entrepreneur and Advantages of Entrepreneurship; Role of entrepreneurship in Economic development, Challenges faced by entrepreneurs, Entrepreneurial scenario in India and Abroad; Elements of Social Entrepreneurship, Types of Entrepreneurs, Entrepreneurship vs. Intrapreneurship.

UNIT-II

Small Business and its Importance - Introduction, Need, Classification of Micro, Small and Medium Enterprises (MSMEs), Role of MSMEs, Problems of MSMEs, Steps for Starting MSMEs, The role of government in supporting MSMEs in India.

Forms of Business Organization: Evaluation of Form of Business organization: Sole Proprietorship, Partnership, Joint Hindu Family, Joint Stock Company and Co-operative Society. Special forms of business ownership: Licensing, Franchising and Leasing.

UNIT-III

Innovation and Idea Generation in Entrepreneurship - Concept of Invention and Innovation, types of innovation, Sources of Innovation, Importance of Innovation in Entrepreneurship. Sources of new ideas, Methods of generating ideas and Opportunity recognition and idea generation in entrepreneurship. Intellectual Property Rights (IPRs): Patents, trademarks, copyrights, and trade secrets. E-commerce and Business Start-ups, Sources of information for Start-up Entrepreneurs in India. Problems of Start-ups without IPRs.

UNIT-IV

Entrepreneurial Motivation - Concept of Motivation and Factors influencing the entrepreneurs; Motivational Theories-Maslow's Need Hierarchy Theory, McClelland's Acquired Need Theory. Entrepreneurship Development Programs (EDPs) - Need and Role of EDPs. Opportunities for entrepreneurship in present scenario. Successful entrepreneurs

Financing of Enterprises - Source of financing - Debt capital, seed capital, venture capital, Loans available for starting ventures in India, Role of government agencies in small business financing. Role of consultancy organizations.

UNIT-V

Project Planning and Feasibility Study - Meaning of Project, Project Life Cycle, and Stages of Planning Process. Project Planning and Feasibility, Project proposal and report preparation.

TEXT BOOKS:

1. Robert D Hisrich, Mathew J.Manimala, Michael PPeters, Dean A.Shepherd *Entrepreneurship*, McGraw HillEducation.
2. VasanthDesai *The Dynamics of Entrepreneurial Development and Management*, , Himalaya Publishing House, Mumbai.

REFERENCES:

1. S.S. Khanka *Entrepreneurial Development*, S. Chand and Company Limited.,
2. H. Nandan *Fundamentals of Entrepreneurship*, PHI.
3. Bholanath Dutta *Entrepreneurship Management* – text and cases, , Excel Books.
4. *Entrepreneurship* – New venture Creation, Holt, and PHI.
5. Ramachandran *Entrepreneurial Development*, Tata McGraw Hill, New Delhi.

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II B.Tech. – II Sem.

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(20EE0208) ELECTRICAL POWER TRANSMISSION SYSTEMS

COURSE OBJECTIVES:

The objectives of this course:

1. *To understand Transmission line parameters Resistance, Inductance and Capacitance.*
2. *To develop Nominal-T, Nominal-Pie models for short, medium and long transmission lines.*
3. *To understand concept of insulators and effect of corona on overhead transmission system.*
4. *To understand concept of sag and tension calculations of overhead transmission system.*
5. *To understand concepts of insulating materials and underground cables.*

COURSE OUTCOMES:

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

1. *Compute the transmission line parameters*
2. *Estimate the performance of a given transmission line*
3. *Understand the types of insulators and Grading of insulators for overhead transmission system.*
4. *Analysis of Corona and Estimate the corona power loss*
5. *Computation of Sag and Tension Calculations*
6. *Understand the construction, types and grading of underground cables and analyze cable performance.*

UNIT-I
TRANSMISSION LINE PARAMETERS

Types of Conductors: ACSR, Bundled and Strandard Conductors, Resistance for Solid Conductors, Skin effect, 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, Capacitance Calculations for Symmetrical and Asymmetrical Single and Three Phase, Single and Double Circuit Lines.

UNIT-II
PERFORMANCE OF SHORT, MEDIUM AND LONG TRANSMISSION LINES

Classification of Transmission Lines-Short, medium and long line and their model - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants. Mathematical Solutions

to estimate regulation and efficiency of all types of lines, Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants- Ferranti Effect-Proximity effect.

UNIT-III

OVERHEAD INSULATORS AND CORONA

Overhead Line Insulators: Types of Insulators, String Efficiency and its improvement methods, Capacitance Grading and Static Shielding.

Corona: Corona Phenomenon, Electric stress, Corona Discharge, Factors Affecting Corona, Critical Voltages and Power Loss, Radio Interference, Advantages and disadvantages of corona.

UNIT-IV

MECHANICAL DESIGN OF TRANSMISSION LINES

Introduction to Sag and Tension, Definitions of Sag and Tension, Calculations with equal and unequal heights of Towers, Effect of Wind and Ice on weight of conductor, Stringing Chart and Sag Template-Applications.

UNIT-V

UNDERGROUND CABLES

Types of Cables, Construction, Types of Insulating Materials, Calculations of Insulation Resistance and Stress in Insulation, Capacitance of Single and 3-Core Belted Cables. Grading of Cables - Capacitance Grading, Description of Inter-sheath Grading.

TEXT BOOKS:

1. C.L.Wadhwa *Electrical power systems*, New Age International (P) Limited, Publishers,
   4th Edition, 2005.
2. V.k.Mehta & Rohit Mehta *Principles of power systems* by S.Chand seal of trust, 4th revised Edn.

REFERENCES:

1. I.J.Nagrath and D.P.Kothari *Modern Power System Analysis*, Tata McGraw Hill, 3rd Edn, 2008.
2. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarti *Power System Engineering*, Dhanpat Rai & Co Pvt. Ltd., 2003.

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II B.Tech. – II Sem.

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(20EE0209) POWER ELECTRONICS

COURSE OBJECTIVES:
The objectives of this course:

1. *To provide the students a deep insight in to the working of different switching devices with respect to their characteristics.*
2. *To analyze different converters and control with their applications.*
3. *To study advanced converters and switching techniques implemented in recent Technology*
4. *To study the applications of Power electronic conversion to domestic, industrial, aerospace, commercial and utility systems etc.*
5. *To study the various power conversion methods, controlling and designing of power converters.*

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

1. *Design of power electronic converters in power control applications.*
2. *Basic operating principles of power semiconductor switching devices*
3. *Ability to express characteristics of SCR, BJT, MOSFET and IGBT.*
4. *Ability design AC voltage controller and Cyclo Converter.*
5. *Ability to design Chopper circuits.*
6. *Ability to know the operation of power electronic converters, choppers, inverters, AC voltage controllers, and cycloconverters, and their control.*

UNIT-I
SWITCHING DEVICES
Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor.

UNIT-II
RECTIFIERS
Single-phase half-wave and full-wave rectifiers with R-load, and inductive load; Single-phase and three phase fully controlled-bridge rectifier with R-load and inductive load;

UNIT-III
CHOPPERS
DC-DC Buck converter
Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.

DC-DC Boost converter

Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

UNIT-IV

CYCLO CONVERTERS

Cyclo Converters – Single Phase Mid-Point Cycloconverters with Resistive and Inductive Load (Principle of Operation only) –Bridge Configuration of Single Phase Cycloconverter (Principle of Operation only) ~~W~~aveforms

UNIT V

AC VOLTAGE CONTROLLERS

AC Voltage Controllers – Single Phase Two SCR's in Anti Parallel – With R and RL Loads – Modes of Operation of TRIAC – TRIAC with R and RL Loads ~~–F~~iring Circuit.

TEXT BOOKS:

1. M.H. Rashid *Power electronics: circuits devices, and applications, Fourth edition* Pearson Education India, 2017.
2. N. Mohan and T. M. Undeland, *Power Electronics: Converters, Applications and Design,* Third edition, John Wiley & Sons, 2007.

REFERENCES:

1. R. W. Erickson and D.Maksimovic, *Fundamentals of Power Electronics* , springer
   Science & Business Media, 2020.
2. L. Umanand, *Power Electronics: Essentials and Applications*, Wiley India,2009

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(20EE0210) ELECTRICAL MACHINES –II

COURSE OBJECTIVES:

The objectives of this course:

1. *To understand Constructional details of transformer and its operation*
2. *To understand Predetermination of regulation and efficiency of transformer from OC and SC test results*
3. *To understand Constructional details, principle of operation and the importance of slip in Induction motor*
4. *To understand speed control methods of induction motors*
5. *To understand behavior of single-phase induction motors.*

COURSE OUTCOMES:

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

1. *Draw the equivalent circuit of transformer*
2. *Conduct OC and SC tests and predetermined efficiency and regulation of transformer*
3. *Analyze the performance of 3 phase induction motors*
4. *Draw the circle diagram of a three phase Induction motor and predetermine the performance characteristics*
5. *Determine the starting torque, maximum torque, slip at maximum torque using given data*
6. *Draw the equivalent circuit of single-phase induction motor*

UNIT-I

SINGLE PHASE TRANSFORMERS

Single Phase Transformers- Constructional Details-Working Principle -EMF Equation-Operation on No Load and on Load Phasor Diagrams. Equivalent Circuit- Losses, Efficiency, Condition for maximum Efficiency and Voltage Regulation- All Day Efficiency.

UNIT-II -

TESTING OF TRANSFORMERS,

OC and SC Tests - Sumpner's Test - Predetermination of Efficiency and Regulation-Separation of Losses Test-Parallel Operation with Equal and Unequal Voltage Ratios - Auto Transformers-Equivalent Circuit - Comparison with Two Winding Transformers.

Three Phase Transformers - Connections - Y/Y, Δ/Δ, Y/Δ, Δ/Y and Open Δ-Three Winding Transformers-Tertiary Windings- Scott Connection.

UNIT-III

THREE-PHASE INDUCTION MOTORS

Poly-phase Induction Motors-Constructional Details of Cage and Wound Rotor Machines-Production of Rotating Magnetic Field - Principle of Operation–Slip - Rotor EMF and Rotor Frequency - Rotor Reactance, Rotor Current and Power factor at Standstill and under running conditions - Rotor Power Input, Rotor Copper Loss and Mechanical Power Developed and Their Inter Relationship.

UNIT-IV

THREE PHASE INDUCTION MOTOR CHARACTERISTICS

Torque Equation - Expressions for starting torque, Running Torque & Maximum Torque and their ratios- Torque-Slip & Torque speed Characteristics–Load characteristics - Equivalent Circuit - Phasor Diagram - Crawling and Cogging -Circle Diagram-No Load and Blocked Rotor Tests-Speed Control of Induction Motors. Applications of 3-Phase Induction motors.

UNIT-V

SINGLE PHASE INDUCTION MOTORS

Introduction to Single phase Induction motor. Principle of Operation, Double Field revolving Theory-Cross field Theory-Equivalent Circuit of Single-phase Induction Motor-Starting and Types of single-Phase Induction Motors: Split Phase, Resistance Start, Capacitor Start Motor-Capacitor Start and Capacitor Run Induction Motor-Shaded Pole Induction Motor. Applications of single-phase induction motors.

TEXT BOOKS:

1. P.S. Bimbhra, *Electrical Machinery,* Khanna Publishers, 7th Edition, 2011
2. D.P.Kothari and I.J. Nagrath,*Electric Machines fifth edition h edition,* Mc Graw Hill Education (India) Pvt. New Age International (P) Ltd., *2017*

REFERENCES:

1. M. G. Say, *The Performance and Design of Alternating Current Machines,* CBS Publishers, 3rd Edition, 2002.
2. Alexander S. Langsdorf, *Theory of Alternating Current Machinery,* Tata McGraw-Hill, 2nd edition, 1999, 35th Reprint.
3. K R Siddhapura and D B Raval, *A Textbook of Electrical Machines,* , Vikas Publishing House Pvt. Ltd., 2014.

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(20EC0449) DIGITAL ELECTRONICS LAB

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the Basics of logic Gates.*
2. *To know the concepts of Combinational circuits.*
3. *To understand the concepts of flip flops, registers and counters.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Verify the operation of Logic gates, combinational and Sequential circuits.*
2. *Construct basic combinational circuits and verify their functionalities.*
3. *Apply the design procedures in the implementation of basic sequential circuits.*
4. *Understand the functionality of counters.*
5. *Understand the sequencing of Shift registers.*
6. *Construct various digital circuits and verify their operation.*

LIST OF EXPERIMENTS:

1. Verify the truth tables of Basic Logic gates.
2. Verify the truth tables of Universal Logic Gates
3. Design & Verify the truth tables of Half /Full Adder/Subtractor using logic gates.
4. Design & Verify the truth tables of 4- bit binary adder / subtractor using logic gates.
5. Design & Verify the truth tables of Multiplexer and De-Multiplexer.
6. Design & Verify the truth tables of Encoder and Decoder using logic gates.
7. Verify the truth table of Magnitude comparator.
8. Verify the functionality of RS & JK FF using NAND gates.
9. Design & Realize Synchronous counters.
10. Design & Realize Asynchronous counters.

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(20EE0211) POWER ELECTRONICS & SIMULATION LAB

COURSE OBJECTIVES

The student has to learn about:

1. *To analyze various characteristics of power electronic devices with gate firing circuits*
2. *To learn the operation of single-phase half & fully-controlled converters, and inverters with different types of loads*
3. *To learn various characteristics of power electronic converters*
4. *To control power electronic components by using dSPACE 1104 kit*

COURSE OUTCOMES

The student should be able to do the following:

1. *Analyze various power electronic devices and their commutation circuits*
2. *Understand voltage and current characteristics of various converters and inverters at different firing angles*
3. *Analyze different types converters and inverters with different types of loads*
4. *Design current and speed controllers to control dc motor*
5. *Design DC-DC converter and regulated power supply*
6. *Understand the Characteristics of SCR, MOSFET & IGBT*

LIST OF EXPERIMENTS

Any EIGHT experiments from following

1. Characteristics of SCR, MOSFET & IGBT
2. Gate Firing Circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase Fully Controlled Bridge Converter with R and RL Loads
5. Single Phase half Controlled Bridge Converter with R and RL Loads
6. Single Phase Inverter with R and RL Loads
7. Single Phase Cycloconverter with R and RL Loads
8. Three Phase Half Controlled Bridge Converter with R-Load
9. Single Phase Dual Converter with RL Loads
10. Design step down DC-DC converter (30V to 5V) using MC34063A IC.

Any TWO simulation experiments from following

11. Single-phase full converter using RLE load using PSPICE
12. single-phase AC voltage controller using RLE loads using PSPICE
13. Resonant pulse commutation circuit and Buck chopper using PSPICE.
14. Single phase Inverter with PWM control using PSPICE
15. Single Phase dual converter with RL loads using PSPICE

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(20EE0212) ELECTRICAL MACHINES-II LAB

COURSEOBJECTIVES:
The student has to learn about:

1. *To deal with the detailed analysis of polyphone induction motors & Synchronous generators and motors*
2. *To understand operation, construction and types of single-phase motors and their applications in house hold appliances and control systems.*
3. *To introduce the concept of parallel operation of synchronous generators.*
4. *To introduce the concept of regulation and its calculations*

COURSE OUTCOMES:
The student should be able to do the following:

1. *Identify different parts of transformers and induction motors and specify their functions.*
2. *Compute the Regulation and efficiency of transformer.*
3. *Carry out different tests on induction motor to assess the performance*
4. *Analysis of V and Inverted V Curves of 3Phase Synchronous Motor*
5. *Determine the regulation of synchronous machine*
6. *Carry out the performance of Single-Phase Induction Motor*

LIST OF EXPERIMENTS

1. O.C. &S.C Tests on Single phase Transformer.
2. Sumpner's Test on a Pair of identical Single-Phase Transformers
3. Scott Connection of Transformers
4. No-Load & Blocked Rotor Tests on Three Phase Induction Motor
5. Regulation of Three-Phase Alternator by Synchronous Impedance & M.M.F Methods
6. V and Inverted V Curves of 3Phase Synchronous Motor.
7. Equivalent Circuit of Single-Phase Induction Motor
8. Determination of X_d and X_q of Salient Pole Synchronous Machine
9. Separation of Core Losses of Single-Phase Transformer
10. Brake Test on Three Phase Induction Motor
11. Regulation of Three-Phase Alternator by Z.P.F. and A.S.A Methods
12. Load Test on Single Phase Transformer.

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(20EE0213) SENSORS MODELLING AND SIMULATION LAB (VIRTUAL LAB)

COURSEOBJECTIVES:
The student has to learn about:

1. *To deal with Different types of sensors*
2. *To understand operation of sensors used in Industry.*
3. *To understand the feasibility of sensors for applications.*

COURSE OUTCOMES:
The student should be able to do the following:

1. *Identify different types of temperature sensors*
2. *Compute the performance of Bio sensors.*
3. *Carry out different tests to identify the characteristics of LVDT*
4. *Analysis of orifice plate for a typical application*
5. *Determine the strain gauge sensor applications*
6. *Identify the Realtime sensor modelling and its feasibility*

List of Experiments

1. Characterize the temperature sensor (RTD)
2. Simulate the performance of a bio-sensor
3. Measurement of level in a tank using capacitive type level probe
4. Characterize the LVDT
5. Design an orifice plate for a typical application
6. Simulate the performance of a chemical sensor
7. Characterize the strain gauge sensor
8. Characterize the temperature sensor (Thermocouple)

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(20EE0214) CONTROL SYSTEMS

COURSE OBJECTIVES:

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

1. *To make the students familiarize various representations of systems.*
2. *To make the students analyze the stability of linear systems in time domain and frequency domain.*
3. *To make the students analyze the stability of linear systems in frequency domain.*
4. *To make the students design compensator based on the time and frequency domain Specifications.*
5. *To develop linear models mainly state variable model and Transfer function model*

COURSE OUTCOMES:

After completing the course, the student should be able to

1. *Identify open and closed loop control system*
2. *Represent simple systems in transfer function and state variable forms.*
3. *Analyse simple systems in time domain.*
4. *Analyse simple systems in frequency domain.*
5. *Infer the stability of systems in time and frequency domain.*
6. *Interpret characteristics of the system and find out solution for simple control problems*

UNIT I

SYSTEMS AND REPRESENTATION

Control systems: – Open and closed loop systems –First principle modeling: Mechanical, Electrical and Electromechanical systems - Transfer function representations: Block diagram– Signal flow graph

UNIT II

TIME DOMAIN ANALYSIS

Time Response Analysis - Standard test input signals – Time response - Time domain specifications, Transient and steady state response of first and second order systems- Error constants, Steady state error and generalized error constants–- Proportional, integral and derivative Controllers.

UNIT III

STABILITY ANALYSIS

Stability analysis: Concept of stability – Routh Hurwitz stability criterion – Root locus: Construction and Interpretation. Effect of adding poles and zeros

UNIT IV

FREQUENCY DOMAIN ANALYSIS

Frequency Response Analysis: Frequency domain specifications, Frequency response plots - Bode Plots, Polar plots, Nyquist Plots, Gain margin and Phase margin – Stability Analysis. Lead, Lag and Lag-lead compensators.

UNIT V

STATE SPACE ANALYSIS

State, state variables and state model, diagonalization, solution of state equations- State transition matrix and its properties. Concept of controllability and observability.

TEXT BOOKS:

1. Benjamin C. Kuo, *"Automatic Control Systems",* 9th edition JOHN WILEY & SONS, INC..

2. Nagarath, I.J. and Gopal, M., *"Control Systems Engineering*", New Age International Publishers 2010.

REFERENCES:

1. Richard C.Dorf and Bishop, R.H., *"Modern Control Systems",* Education Pearson, 3 Impression 2009.

2. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon*, "Linear Control System Analysis and Design with MATLAB",* CRC Taylor& Francis Reprint 2009.

3. Katsuhiko Ogata, *"Modern Control Engineering",* PHI Learning Private Ltd, 5thEdition, 2010

4. NPTEL Video Lecture Notes on *"Control Engineering" by Prof.S.D.Agashe*, IIT Bombay

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(20EE0215) ELECTRICAL MACHINES-III

COURSE OBJECTIVES

The objectives of this course are to make the student learn about:

1. *The construction and principle of working of synchronous machines*
2. *Different methods of predetermining the regulation of alternators*
3. *The concepts and computation of load sharing among alternators in parallel*
4. *The performance characteristics of synchronous motor*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Understand Regulation of synchronous generators using different methods*
2. *Understand construction of synchronous generator and parallel operation*
3. *Analyze the performance characteristics of synchronous motors*
4. *Make necessary calculations for power factor improvement using synchronous condenser*
5. *Understand methods of starting of synchronous motors and equivalent circuit*
6. *Understand variation of current and power factor with excitation*

UNIT- I

Synchronous Generators: Principle and constructional features of salient and non-salient machines-Armature windings-concentrated and distributed winding-integral slot and fractional slot winding-full pitch and short pitch windings-pitch factor-distribution factor and winding factors-EMF equation and numerical problems-harmonics in generated EMF and elimination of harmonics.

UNIT- II

Regulation of Synchronous Generators: Basic definitions of effective armature resistance-leakage reactance-armature reactance-synchronous reactance and synchronous impedance-Regulation of non salient-pole and salient pole machines-voltage regulation methods-EMF method-MMF method-ZPF method-ASA method-short circuit ratio-Two reactance theory-determination of X_d and Xq by slip test- phasor diagram-numerical problems

UNIT- III

Parallel Operation of Synchronous Generators: Power flow equation in alternators-Synchronizing torque and power-Parallel operation and load sharing-effect of change of excitation and mechanical power input-synchronizing alternators with infinite bus bar-Determination of subtransient, transient and steady state reactances.

UNIT- IV

Synchronous Motors-I: Theory of operation ,phasor diagram and back EMF equation at different power factors –power flow equation in synchronous motors-verification of current and power factor with excitation-V and inverted V curves-synchronous condensers-numerical problems.

UNIT- V

Synchronous Motors-II: Hunting and methods to eliminate hunting-starting methods of synchronous motors-excitation circle and power circle –Different torques in synchronous motor-Applications of synchronous motors-construction and principle of operation of synchronous induction motors-procedure for estimation of load current and power factor at over excitation.

TEXT BOOKS

1. Electrical machinery fundamentals,Stephen J Chapman,Mc Graw series 4th edition,2010, 10th Reprint 2015
2. Electrical Machinery – P.S.Bimbhra, Khanna Publishers,2011

REFERENCES

1. Fundamentals of Electrical Machines – B. R. Gupta, Vandana Singhal, New Age International Ltd.
2. Electric machines, D.P Kothari and I.J Nagrath,Mc Graw Hill education 4th edition,2010, 16th Reprint 2015
3. Electrical Machines-S.K. Battacharya, TMH Publications, 3rd Edition Reprint,2015

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(20EE0216) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

COURSE OBJECTIVES:

The objectives of the course are to make the student learn about

1. *The basic principles of different types of electrical instruments for the Measurement of voltage, current, power factor, power and energy.*
2. *The measurement of R, L, and C parameters using bridge circuits.*
3. *The use of Current Transformers, Potential Transformers, and Potentiometers.*
4. *The principle of magnetic measurements and working of CRO and its applications*.

COURSE OUTCOMES:

After successful completion of the course, student will be

1. *Able to develop an understanding of construction and working of different measuring instruments*
2. *Able to develop an understanding of construction and working of different AC and DC bridges and its applications*
3. *Familiar with various measuring instruments used to detect electrical quantities such as power and energy.*
4. *Familiar with C.T and P.T and its applications*
5. *Able to choose suitable transducers for measurements of non-electrical quantity.*
6. *Able to measure magnetic measurements, Phase, Frequency, Current and Voltage by using CRO.*

UNIT I

Measuring instruments:
Classification – Ammeters and Voltmeters – PMMC, Dynamometer type, Moving Iron Type Instruments –Expression for the Deflecting Torque and Control Torque – Errors and Compensations, Range Extension of Ammeters and Voltmeters, Aryton Shunt. Electrostatic instruments- Principle of operation, Quadrant type electrostatic voltmeter, attracted disc type Kelvin absolute Electrometer.

UNIT – II

D.C & A.C Bridges
Methods of Measuring Low, Medium and High Resistances – Sensitivity of Wheatstone‟s Bridge – Kelvin‟s Double Bridge for Measuring Low Resistance, Measurement of High Resistance – Loss of Charge Method. Measurement of Inductance - Maxwell‟s Bridge, Anderson‟s Bridge. Measurement of Capacitance and Loss Angle - Desauty Bridge. Wien‟s Bridge – Schering Bridge.

UNIT – III

Measurement of Power and Energy

Single Phase Dynamometer Wattmeter, LPF and UPF, Double Element and Three Element Dynamometer Wattmeter, Expression for Deflecting and Control Torques. Single Phase Induction Type Energy Meter – Driving and Braking Torques – Errors and Compensations. Three Phase Energy Meter.

UNIT –IV

Instrument Transformers & Transducers:

Current Transformers & Potential Transformers: Construction, Principle of operation and characteristics.

TRANSDUCERS: Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle of Operation of Resistive, Inductive, Capacitive Transducers, LVDT, Strain Gauge and its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Piezo electric Transducers, Photovoltaic, Photo Conductive Cells, Photo Diodes.

UNIT V

MAGNETIC MEASUREMENTS:

Ballistic Galvanometer – Equation of Motion – Flux Meter – Constructional Details, Comparison with Ballistic Galvanometer. Determination of B-H Loop - Methods of Reversals - Six Point Method.

Cathode Ray Oscilloscope - Cathode Ray tube-–Application of CRO -Measurement of Phase, Frequency, Current & Voltage- Lissajous Patterns.

TEXT BOOKS:

1. A.K. Sawhney, puneet Sawhney *"*A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai & Co. Publications, 2016.
2. E.W. Golding and F.C. Widdis *Electrical Measurements and measuring Instruments*, 5th Edition, Reem Publications, 2011.

REFERENCES:

1. U.A. Bakshi, LateA.V. Bakshi *"Electrical measurements and Instrumentation"*, Technical publications, Pune, Nov-2020.
2. R. K. Rajput *Electrical & Electronic Measurement & Instrumentation*, 2nd Edition, S. Chand & Co., 2nd Edition, 2013.
3. Reissland, M.U *Electrical Measurements: Fundamentals, Concepts, Applications*, New Age International (P) Limited, 2010.
4. Buckingham and Price *Electrical Measurements*, Prentice – Hall, 3rd Edition, 1970.

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(20EE0217) POWER QUALITY
(Professional Elective courses-I)

COURSE OBJECTIVES:
Students undergoing this course are expected to:
1. *To know about introduction on power quality issues.*
2. *To learn about voltage disturbances and power transients that is occurring in power systems.*
3. *To know the concept of harmonics in the system and their effect on different power system equipment.*
4. *To know about different power quality measuring and monitoring concepts.*

COURSE OUTCOMES:
On successful completion of this course, the student will be able to
1. *Identify the terminology used in power quality issues and evaluate the power quality issues.*
2. *Identify the different power quality disturbances existing power system.*
3. *Understand power quality monitoring and classification techniques*
4. *To Study the interruptions types and its influence in various components.*
5. *To study various methods of power quality monitoring.*
6. *To understand the different types of custom power devices.*

UNIT I

INTRODUCTION
Definition of Power Quality- Power Quality Terminology –evaluation procedure, Classification of Power Quality Issues Magnitude Versus Duration Plot-Power Quality Standards - Responsibilities of The Suppliers and Users of Electric Power-CBEMA and ITIC Curves.

UNIT II

POWER QUALITY DISTURBANCES
General classes of power quality problems - Impulsive and oscillatory Transients - Sag-Swell-Sustained Interruption - Under Voltage – Over Voltage– Outage. Sources of Different Power Quality Disturbances-Principles of Regulating the Voltage Conventional Devices for Voltage Regulation Estimation of the sag severity Overview of mitigation methods.

UNIT III

FUNDAMENTALS OF HARMONICS & APPLIED HARMONICS
Harmonic Distortion, Voltage Versus Current Distortion, Harmonics Versus Transients, Effect of harmonics – harmonic distortion – voltage and current distortion - harmonic indices - inter harmonics – resonance Power System Qualities Under Non Sinusoidal Conditions, Harmonic Indices, Harmonic Sources From Commercial Loads, Harmonic Sources From Industrial Loads. Applied Harmonics: Effects Of Harmonics, Harmonic Distortion Evaluations, devices for controlling harmonic distortion - passive and active filters.

UNIT IV

POWER QUALITY MONITORING

Power Quality Benchmarking-Monitoring Considerations- Choosing Monitoring Locations- Permanent Power Quality Monitoring Equipment-Historical Perspective of Power Quality Measuring Instruments Power Quality Measurement Equipment-Types of Instruments- Assessment of Power Quality Measurement Data- Power Quality Monitoring Standards.

UNIT V

POWER QUALITY ENHANCEMENT USING CUSTOM POWER DEVICES

Custom Power Devices—introduction Network Reconfiguring Type: Solid State Current Limiter (SSCL) -Solid State Breaker (SSB) -Solid State Transfer Switch (SSTS) - Compensating Type: distribution static compensator (DSTATCOM),Dynamic Voltage Restorer (DVR)-Unified Power Quality Conditioner(UPQC)-Principle of Operation Only.

TEXT BOOKS:

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, *"Electrical Power Systems Quality,"* 3rd edition McGraw Hill,2017.
2. Eswald.F.Fudis and M.A.S. Masoum, *"Power Quality in Power System and Electrica Machines,"* Elseviar Academic Press, 2013.

REFERENCE BOOKS:

1. Math H. J. Bollen, *"Understanding Power quality problems",* IEEE Press, 2007.
2. Arindam Ghosh, Gerard Ledwich, *"Power quality enhancement using custom power devices",* Kluwer academic publishers, 2002

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(20EE0218) FLEXIBLE AC TRANSMISSION SYSTEMS
(Professional Elective courses-I)

COURSE OBJECTIVES:

Students undergoing this course are expected to:

1. *To know the importance of compensation in transmission lines and the concepts of FACTS devices.*
2. *To know the Concept of Voltage Sourced Converters and current source converters.*
3. *To learn the operation, modes, modelling and applications of SVC and TCSC.*
4. *To study the principle, characteristics, modelling and applications of STATCOM and SSSC.*
5. *To summarize about the importance in coordination of FACTS controllers.*

COURSE OUTCOMES:

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

1. *Understand the power flow aspects in AC transmission system and realize the need of compensation and FACTS controllers.*
2. *Understand the Bridge converter transformer connections.*
3. *Realize the principle of static shunt compensation techniques and apply an appropriate shunt controller for sustainable operation of AC transmission system.*
4. *Realize the principle of static series compensation techniques and apply an appropriate series controller for sustainable operation of AC transmission system.*
5. *Realize the various power flow controllers operating in various modes to control the active and reactive power in AC transmission system.*
6. *Conceptualize the reactive power compensation in Power system*

UNIT-I

CONCEPTS OF FLEXIBLE AC TRANSMISSION SYSTEMS

Transmission line Interconnections, Power flow in parallel lines, Mesh systems, Stability considerations, Relative importance of controllable parameters, Basic types of FACTS controllers, Shunt controllers, Series controllers, Combined shunt and series controllers, Benefits of FACTS.

UNIT-II

VOLTAGE AND CURRENT SOURCED CONVERTERS

Concept of Voltage Sourced Converters, Single Phase Full Wave Bridge Converter, Transformer Connections for 12-Pulse Operation, Three Level Voltage Sourced Converter, Pulse Width Modulation (PWM) Converter, Concept of Current Sourced Converters, Current Sourced –vs- Voltage Sourced Converters.

UNIT-III

STATIC SHUNT COMPENSATORS

Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, Improvement of Transient Stability,

Methods of Controllable VAR Generation, Variable Impedance Type Static VAR Generators, Switching Converter Type VAR Generators, SVC and STATCOM, Comparison Between STATCOM and SVC, V-I, V-Q Characteristics.

UNIT-IV

STATIC SERIES COMPENSATORS

Objectives of Series Compensation, Voltage Stability, Improvement of Transient Stability, Variable Impedance Type Series Compensators, GTO Thyristor Controlled Type Series Capacitor (GCSC), Thyristor Switched Series Capacitor (TSSC), Thyristor-Controlled Series Capacitor (TCSC), Basic Operating Control Schemes for GCSC, TSSC, and TCSC, Switching Converter Type Series Compensators, The Static Synchronous Series Capacitor (SSSC), Capability to Provide Real Power Compensation.

UNIT-V

POWER FLOW CONTROLLERS

The Unified Power Flow Controller-Basic Operating Principles, Conventional Transmission Control Capabilities, Independent Real and Reactive Power Flow Control. Control Structure, Basic Control System for P and Q Control.

TEXT BOOKS:

1. Understanding FACTS – Concepts and technology of Flexible AC Transmission systems, Narain G. Hingorani, Laszlo Gyugyi, IEEE Press, WILEY, 1st Edition, 2000, Reprint 2015.
2. FACTS Controllers in Power Transmission and Distribution, Padiyar K.R., New Age International Publishers, 1st Edition, 2007.

REFERENCE BOOKS:

1. Flexible AC Transmission Systems: Modelling and Control, Xiao – Ping Zhang, Christian Rehtanz, Bikash Pal, Springer, 2012, First Indian Reprint, 2015.
2. FACTS – Modelling and Simulation in Power Networks, Enrigue Acha, Claudio R. Fuerte – Esquival, Huge Ambriz – perez, Cesar Angeles –Camacho, WILEY India Private Ltd., 2004, Reprint 2012.

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(20EE0219) ELECTRICAL DISTRIBUTION AND AUTOMATION
(Professional Elective courses-I)

COURSE OBJECTIVES

The student has to acquire knowledge about:
1. *The classification of distribution systems*
2. *The technical aspects and design considerations in DC and AC distribution systems and their comparison.*
3. *Technical issues of substations such as location, ratings and bus bar arrangements*
4. *The causes of low power factor and methods to improve power factor*
5. *The principles in Distribution automation*

COURSE OUTCOMES

On successful completion of this course, the student should be able to
1. *Compute the various factors associated with power distribution*
2. *Analyse AC and DC distribution systems in ring main and radial configurations*
3. *Make voltage drop calculations in given distribution networks*
4. *Understand the concepts of various types of substation design.*
5. *Calculation of power factor and placement of capacitor for p.f. correction*
6. *Understand implementation of SCADA for distribution automation and understand the concepts of CIS, GIS and AMR.*

UNIT- I:
GENERAL CONCEPTS
Introduction to distribution systems, load modelling and characteristics - coincidence factor, contribution factor, loss factor, relationship between the load and loss factors. Classification of loads (residential, commercial, agricultural and industrial) and their characteristics.

UNIT-II:
CLASSIFICATION OF DISTRIBUTION SYSTEMS
Classification of distribution systems - comparison of DC Vs AC and Under-ground Vs Over-head distribution systems - Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, Voltage drop calculations and problems in DC distributors. In AC distributors for The Following Cases: power factors referred to receiving end voltage and With Respect to Respective Load Voltages.

UNIT - III:
SUBSTATIONS AND GROUNDING SYSTEMS
Location of substations - rating of distribution substations, Service Area with in Primary Feeders. Classification of Substations: Air Insulated Substations - Indoor & Outdoor Substations, different bus bar schemes, Neutral Grounding - Grounded and ungrounded systems,

UNIT- IV:

COMPENSATION FOR POWER FACTOR IMPROVEMENT

Causes of low power factor, methods of improving power factor - Most Economical power factor for constant KW load and constant KVA type loads(numerical problems). Capacitive Compensation for Power-Factor Control - Effect of Shunt Capacitors (Fixed and Switched), Power Factor Correction- Economic Justification - Procedure to Determine the Best Capacitor Location.

UNIT - V:

DISTRIBUTION AUTOMATION

Introduction to Distribution automation-Definitions-Communication sensors - Supervisory Control and Data Acquisition (SCADA) - Consumer Information Service (CIS) - Geographical Information system (GIS) - Automatic Meter Reading(AMR)-Automation Systems.

TEXT BOOKS:

1. Turan Gonen, Electric Power Distribution Engineering, CRC Press, 3rd Edition, 2014.
2. V.K.Mehta, Rohit Mehta, *Principles of Power System*, Principles of Power System, S.Chand & Company Ltd, revised edition, 2013.

REFERENCES:

1. Dr. M. K. Khedkar and Dr. G. M. Dhole, Electric Power Distribution Automation, University Science Press, 2010.
2. C.L.Wadhwa, *Generation, Distribution and Utilization of Electrical Energy, New Age International, 1993.*
3. A.S.Pabla, *Electric Power Distribution*, Tata Mc Graw-Hill Publishing Company, 4thedition, 1997

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(20CE0170) FUNDAMENTALS OF CIVIL ENGINEERING
[Open Elective (OE)-I]

COURSE OBJECTIVES
The objectives of this course to

1. *Impart basic knowledge on Civil-Engineering.*
2. *Familiarize the materials and measurements used in Civil Engineering.*
3. *Provide the exposure on the fundamental elements of civil engineering structures.*
4. *Have knowledge on surveying and the instruments used in it*
5. *Explain the importance of water treatment and its applications*

COURSE OUTCOMES
On successful completion of this course, the student will be able to

1. *Explain the usage of construction material and proper selection of construction materials*
2. *Attain the knowledge of building planning and construction of buildings.*
3. *Understand various basic methods and techniques of surveying and its applications*
4. *An ability describe to the various functional units in water treatment and distribution system*
5. *Describe water quality criteria and standards, and their relation to public health*
6. *Understand the rigid pavements as per IRC & Describe different components of permanent way in Railway Track*

UNIT – I

Introduction to Civil engineering: Introduction - History of Civil Engineering- Sub-Disciplines of Civil Engineering

Building materials : Classification - Properties of Building Materials- Most Common Building Materials- Uses of Building Materials- Bricks- Classification- Size and weight of bricks- Qualities of good brick- Stones- Sources of stones- Common Building Stones in India- Timber- Qualities of good timber- Common timbers used for building work- Steel-Uses of steel in building work.

UNIT – II

Building Construction: Building Components-Basic Requirements of Building Components, Planning Regulations-Foundation-Purpose of Providing a Foundation, Types of Foundations-Mortar- Functions, Types of Mortars and their Preparation-Masonry Works-Stone Masonry, Classification of Stone Masonry, Brick Masonry, Types of Brick Masonry-Concrete-Ingredients of Concrete and their Functions, Mixing of Concrete, Curing of Concrete.

UNIT – III

Surveying : Objectives of Surveying- Principles of Surveying-Equipment's used in surveying-Types of Surveying- Classification of Surveying- Basic methods used in surveying- Linear and angular measurements- chain Surveying, -Levelling - Purpose of Levelling, Major parts in levelling instrument, Technical terms used in levelling -Introduction to Theodolite.

UNIT – IV

Introduction to Water Supply: Importance and Necessity of protected water supply system - Objectives of protected water supply system- Flow chart of public water supply system,
Wastewater Characteristics: Characteristics of sewage – Physical, Chemical and Biological.
Wastewater Treatment: Layout and general outline of various units in a wastewater treatment plant– Primary treatment-Screens–Grit Chamber– Skimming tanks – Sedimentation tanks.

UNIT – V

Transportation Engineering: Introduction- Planning and design aspects of transportation Engineering- different modes of transport- Pavement Design- Types of pavement ,Components and their functions - Railway Engineering - Permanent way components , Cross section of permanent way , Functions and requirements of Rails, Sleepers and Ballast , Types of gauges, Rail fastenings.

TEXT BOOKS :

1. 1.Sateesh Gopi, *Basic Civil Engineering, Pearson publications*, Published by Dorling Kindersley (India) Pvt. Ltd.
2. Madan Mohan Das, Bharga b Mohan Das, Mimi Das Saikia, Et Al. Saikia, *Elements Of Civil Engineering (1st Edition)*, Published by Ashoke K PHI Learning Pvt. Ltd.
3. Modi, P.N., *Water Supply & Waste Water Engineering, Vol. I & II*, Standard Book House, New Delhi, 2010.

REFERENCES :

1. S.C.Saxena and S.P.Arora, *A Text Book of Railway Engineering*, Dhanpat Rai Publications, New Delhi, 2011
2. L.R.Kadiyali and Lal, *Principles and Practice of Highway Engineering Design*, Khanna Publications, 7th edition, 2013
3. Punmia, B.C., Jain, A.K., and Jain.A.K, *Water Supply & Waste Water Engineering, Vol. I & II*, Laxmi Publications, 2010
4. Dr. B.C. Punmia, *Ashok Kumar Jain, Arun Kumar Jain*, Surveying-Vol I, Lakshmi Publications(P) Ltd., New Delhi, Seventeen Edition,2016.

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(20ME0322) NON- CONVENTIONAL ENERGY RESOURCES

COURSE OBJECTIVES

The objective of the course is to

1. *Know the importance of energy, resources of renewable energy, their usage and impact on environment.*
2. *Recognize the significance of solar energy, its harnessing technologies & its applications.*
3. *Identify the method of exploiting energy from wind and parameters to be considered for the selection of site for wind turbine installation.*
4. *Explain the concept of bio energy and its conversion devices.*
5. *Differentiate various renewable energies such as tidal energy, fuel cells.*

COURSE OUTCOMES

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

1. *State various sources of energies, its availability and explain the importance of them by observing the global energy scenario.*
2. *Distinguish the types of solar energy tapping devices and describe the method of harnessing the solar energy.*
3. *Summarize the wind energy systems and elucidate the impact of it in environmental aspects.*
4. *Describe the biomass conversion process and list out various bioenergy applications.*
5. *Interpret the knowledge of renewable energies such as tidal energy, OTEC.*
6. *Identify numerous applications renewable energy resources and illustrate its harnessing technologies.*

UNIT-I

Fundamentals of Energy system: Energy source, various forms of renewable energy, Conservation of energy and Energy scenario, need for non-conventional energy sources, alternative energy sources, Environmental consequences of oil fuel use, Role of new and renewable sources.
Solar Radiation: Environmental Impact of solar power, Direct & Diffuse Radiation, Terrestrial and extraterrestrial solar radiation, Solar radiation on tilted surface- Measurement of Solar Radiation using Pyranometer, Pyrheliometer, and Sunshine recorder.

UNIT-II

Solar thermal conversion: Flat Plate and Concentrating Collectors – Solar direct Thermal Applications– Solar thermal Power Generation
Photo voltaic Conversion: Fundamentals of Solar Photo Voltaic Conversion – Solar Cells –Solar PV Power Generation – Solar PV Applications

UNIT-III

Wind Energy: Wind Formation - Site Selection for Wind Turbine – wind speed and power relations, power extracted from the wind.

Wind Energy System: Types of Wind Energy Systems – Components of Wind Turbine – Horizontal Vs Vertical axis turbine -Performance –Safety and Environmental Aspects.

UNIT-IV

Bio – Energy: Origin of biomass, Bioenergy conversion technology – Biomass gasifiers: classification of biomass gasifiers, Biogas plants: classification of biogas plant
Bio Fuel: Ethanol production – Biodiesel – Cogeneration - Applications of Biofuel

UNIT-V

Hydrogen Energy: production of Hydrogen-Storage and Transportation of Hydrogen, Safety aspects and Applications of hydrogen.
Other Sources of Energy: Tidal energy – Wave Energy –OTEC Cycles - Open and Closed OTEC cycles, Geothermal Energy- Types of cycles

TEXT BOOKS

1. R. K.Rajput, *Non-conventional Energy Sources and Utilization,* S. Chand Publishers, 2nd Edition, 2014.
2. G. D Rai, *Non-Conventional Energy Sources*, Khanna Publishers, 1st Edition, 2010.
3. Nicholas Jenkins & Janaka Ekanayake, *Renewable Energy Engineering*, Cambridge University Press; 1st Edition, 2017.

REFERENCES

1. Dr. R K Singal, *Non-Conventional Energy Resources*, S.K Kataria & Sons, 4th Edition, 2014.
2. John Twidell & Tony Weir, *Renewable Energy Sources*, Routledge publisher, 3rd Edition, 2015.
3. Sukhatme. S.P, *Solar Energy, Principles of Thermal Collection and Storage*, Tata McGraw Hill Publishing Company Limited, 6th Edition, 1990.

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III B.Tech – I Sem.

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(20EC0451) INTRODUCTION TO COMMUNICATION SYSTEMS
[Open Elective (OE)-I]

COURSE OBJECTIVES
The objectives of this course to
1. *Study the fundamental concepts of the analog communication system.*
2. *Analyze various analog modulation and demodulation techniques.*
3. *Understand, analyze, and design fundamental digital communication systems.*
4. *Focus on developing digital communication systems.*
5. *Understand basics of various Communication.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to
1. *Demonstrate knowledge in elements of Analog Digital and Wireless Communication Systems.*
2. *Analyze the analog modulated and demodulated systems.*
3. *Understand the principle involved in different modulation techniques.*
4. *Understand the basic principles of baseband and pass band digital modulation schemes.*
5. *Analyze probability of error performance of digital systems and are able to design digital communications.*
6. *Implement various Keying and accessing techniques in real time wireless communication systems.*

UNIT- I

Communication: Introduction, Elements of communication systems, wired Communications systems, Wireless Communications systems, Modulation, Need of modulation, modulation Methods, difference between Analog and Digital communication
Amplitude Modulation & Demodulation: DSB-FC(AM) modulation& its demodulation, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Single sideband (SSB) transmission, Comparison of various amplitude modulation techniques.

UNIT- II

Angle Modulation & Demodulation: Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM) and Wide band FM (WBFM), Phase modulation(PM).

UNIT- III

Noise in Communication Systems: Types of noise, Noise figure.
Analog Pulse Modulation Schemes: Pulse amplitude modulation (PAM), Pulse Width modulation (PWM) and Pulse Position modulations (PPM)

UNIT IV
Digital Communication: Introduction-Elements of digital communication systems, sampling process, quantization, quantization noise.

Source Coding Systems: Pulse-Code Modulation (PCM), Differential PCM (DPCM), Delta modulation (DM), Comparison of PCM, DPCM, DM.
Pass Band Data Transmission: Introduction, Amplitude shift keying (ASK), binary phase shift keying (BPSK), Binary Frequency shift keying (BFSK) Comparison of ASK, PSK, FSK.

UNIT V

Introduction to Wireless Communication Systems: Evolution of Mobile Radio Communication Systems, Examples of wireless communication Systems – Paging Systems, Cordless Telephone, Cellular Telephone Systems, Overview of generation of cellular systems.
Multiple Access Techniques for Wireless Communications: Introduction to Multiple Access, FDMA, TDMA, CDMA, SDMA.

TEXT BOOKS

1. Simon Haykin, *Communication Systems,* Wiley India Edition, 4th Edition, 2011.
2. B.P. Lathi, &Zhi Ding, *Modern Digital & Analog Communication Systems*, Oxford University Press, International 4th edition, 2010.

REFERENCES

1. Sam Shanmugam, *Digital and Analog Communication Systems,* John Wiley, 2005.
2. Bruce Carlson, & Paul B. Crilly, *Communication Systems – An Introduction to Signals & Noise in Electrical Communication*, McGraw-Hill, 5th Edition, 2010
3. Bernard Sklar, *Digital Communications,* Prentice-Hall PTR, 2nd edition, 2001.
4. Herbert Taub & Donald L Schilling, *Principles of Communication Systems,* Tata McGraw-Hill, 3rd Edition, 2009.
5. *MATLAB,* J.G.Proakis, M Salehi, Gerhard Bauch, *Modern Communication Systems Using* CENGAGE, 3rd Edition, 2013.

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(20CS0550) RELATIONAL DATABASE MANAGEMENT SYSTEM
[Open Elective (OE)-I]

COURSE OBJECTIVES
The objectives of this course to

1. *Explain different issues involved in the design and implementation of a database system.*
2. *Explain physical and logical database designs, database modelling, relational, hierarchical, and network models*
3. *Introduce data manipulation language to, update, query and manage a database*
4. *Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling and designing a DBMS.*

COURSE OUTCOMES
On successful completion of this course, the student will be able to

1. *Develop relational algebra expressions for queries and optimize them.*
2. *Design the databases using E_R method for a given specification of requirements.*
3. *Apply Normalization techniques on given database.*
4. *Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.*
5. *Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.*
6. *Understand Physical Storage Media and RAID concepts.*

UNIT- I
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Data Abstraction, Data Independence, Data Models, Database Languages, Database Architecture, Database Users and Administrators.

UNIT-II
Introduction to Data base design: ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets.
Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins.

UNIT-III
Form of Basic SQL Query- Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values.

UNIT-IV

Introduction to Schema Refinement- Problems Caused by redundancy, Normal Forms - FIRST, SECOND, THIRD Normal forms.

Properties of Decompositions: Lossless join Decomposition, Dependency preserving Decomposition - FOURTH Normal Form, FIFTH Normal form.

UNIT- V

Recoverability: System Recovery – Media Recovery –Two Phase locking – Deadlock- Detection, Recovery and Prevention.

Physical Storage and Database Concepts: Overview of Physical Storage Media and RAID.

TEXT BOOK

1. Henry F. Korth and S. Sudharshan, *Database System Concepts*, Sixth Edition, Abraham Silberschatz, Tata McGraw Hill, 2011.
2. Raghurama Krishnan, Johannes Gehrke, *Database Management Systems*, 3rd Edition, McGrawHill Education,2003.

REFERENCES

1. J. D. Ullman, *Principles of Database and Knowledge – Base Systems*, Vol 1 Computer Science Press.
2. Peter Rob & Carlos Coronel , *Database Systems Concepts*, Cengage Learning, 2008.
3. C.J. Date, *Introduction to Database Systems*, Pearson Education.
4. G.K. Gupta, *Database Management Systems*, McGraw Hill Education.

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(20HS0813) MANAGEMENT SCIENCE
[Open Elective (OE)-I]

COURSE OBJECTIVES

The objectives of this course to

1. *Understand the basic concepts, principles and processes of management*
2. *Help the students gain an understanding of the functions, responsibilities of managers*
3. *Get an awareness about the latest developments and contemporary issues in the field of management*

COURSE OUTCOMES

On successful completion of this course, the student will be able to

1. *Utilize appropriate theoretical frameworks to real life business and managerial problems*
2. *Identify appropriate operational risks and develop appropriate responses to them*
3. *Apply human resource principles to recruit, select and manage employees to achieve organizational goals*
4. *Enact strategy, including contingent plans for the effective management of the organization*
5. *Identify, plan, and implement the projects and evaluate the performance of the projects*
6. *Analyze effective application of latest developments to diagnose and solve organizational problems*

UNIT I

INTRODUCTION TO MANAGEMENT:

Management-Concept and meaning-Nature-Functions-Management as a science and art and both. Schools of management thought-Taylor‘s scientific theory-Henry Fayol‘s principles- Weber‘s Ideal Bureaucracy - Elton Mayo‘s Human relations-Systems theory- Situational or Contingency theory-Social responsibilities of management.

Organizational structure and design: Features of organizational structure-work specialization-Departmentation -Span of control-Centralization and Decentralization. **Organizational designs**-Line organization-Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of organization.

UNIT II

OPERATIONS MANAGEMENT:

Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study- Statistical Quality Control**:** *C* chart, *P* chart, (simple Problems) Deming’s contribution to quality. **Material Management:** Objectives-Inventory-

Functions, types, inventory classification techniques-EOQ-ABC Analysis-Purchase Procedure and Stores Management. **Marketing Management:** Concept- Meaning - Nature-Functions of Marketing-Marketing Mix- Channels of distribution -Advertisement and sales promotion- Marketing Strategies based on Product Life Cycle.

UNIT III

HUMAN RESOURCES MANAGEMENT (HRM):

HRM- Definition and meaning – nature-Managerial and Operative functions-Evolution of HRM-Human Resource Planning(HRP)-Employee Recruitment-sources of recruitment- employee selection-process and tests in employee selection- Employee training and development-On- the- job and Off-the- job training methods-Performance Appraisal systems- Concept-MethodsofPerformanceAppraisal-Placement-EmployeeInduction-WageandSalary Administration-Objectives-Essentials of Wage and Salary Administration-Job Analysis- Process -Job Evaluation-Employee Grievances-techniques of handling Grievances.

UNIT IV

STRATEGIC MANAGEMENT:

Definition& meaning-Setting of Vision- Mission- Goals- Corporate Planning Process- Environmental Scanning-Steps in Strategy Formulation and Implementation-SWOT Analysis. **Project Management (PERT/CPM):**Network Analysis- Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying Critical Path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

UNIT V

CONTEMPORARY ISSUES IN MANAGEMENT:

TheconceptofMIS-MaterialsRequirementPlanning(MRP)-Just-In-Time(JIT)System-Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management-Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO), Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

TEXT BOOKS:

1. A.R Aryasri: *Management Science*, TMH,2013
2. Stoner, Freeman, Gilbert, *Management*, Pearson Education, New Delhi, 2012.

REFERENCES:

1. Kotler Philip & Keller Kevin Lane, *Marketing Management*, PHI, 2013.
2. Koontz & Weihrich, *Essentials of Management*, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich, *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2004.
5. Memoria & S.V.Gauker, *Personnel Management*, Himalaya, 25/e,2005

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(20EE0220) ELECTRICAL MEASUREMENTS LAB

COURSE OBJECTIVES:

The objectives of this course are to make the student learn:

1.*Calibration of various electrical measuring/recording instruments.*
2.*To determine the values of inductance and capacitance using a.c bridges.*
3.*To determine accurately the values of very low resistances.*
4.*Measurement of reactive power in 3-phase circuit using single wattmeter.*
5.*How to determine ratio error and phase angle error of CT.*

COURSE OUTCOMES:

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

1.*Calibrate various electrical measuring/recording instruments.*
2.*Accurately determine the values of inductance and capacitance using a.c bridges.*
3.*Accurately determine the values of very low resistances.*
4.*Measure reactive power in 3-phase circuit using single wattmeter.*
5.*Determine ratio error and phase angle error of CT.*
6.*Understand the process of standardization*

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of Single Phase Energy Meter
2. Calibration of Dynamometer Power Factor Meter
3. Crompton D.C. Potentiometer – Calibration of PMMC Ammeter and PMMC Voltmeter
4. Kelvins Double Bridge – Measurement of Resistance – Determination of Tolerance.
5. Measurement of % Ratio Error and Phase Angle of Given C.T. by Comparison.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 Phase Reactive Power with Single-Phase Wattmeter.
8. Measurement of Parameters of a Choke Coil Using 3 Voltmeter and 3 Ammeter Methods.

In addition to the above EIGHT experiments, at least any TWO of the experiments from the following list are required to be conducted:

9. Optical Bench – Determination of Polar Curve Measurement of MHCP of Filament Lamps
10. Calibration LPF Wattmeter – by Phantom Testing
11. Measurement of 3 Phase Power with Two Wattmeter Method (Balanced & Unbalanced).
12. Dielectric Oil Testing Using H.T. Testing Kit
13. LVDT and Capacitance Pickup – Characteristics and Calibration
14. 14. Resistance Strain Gauge – Strain Measurements and Calibration
15. Transformer Turns Ratio Measurement Using A.C. Bridge.
16. A.C. Potentiometer – Calibration of AC Voltmeter, Parameters of Choke.

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(20EE0221) CONTROL SYSTEMS AND SIMULATION LAB

COURSE OBJECTIVES

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

1. *The effects of feedback on system performance*
2. *Determination of transfer functions of DC Machine.*
3. *The design of controllers/compensators to achieve desired specifications.*
4. *The characteristics of servo mechanisms used in automatic control applications.*

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

1. *Design the controllers/compensators to achieve desired specifications.*
2. *Understand the effect of location of poles and zeros on transient and steady state behavior of systems.*
3. *Assess the performance, in terms of time domain specifications, of first and second order systems.*
4. *Understand the effect of P,PD,PI,PID controllers on second order systems.*
5. *Use MATLAB/SIMULINK software for control system analysis and design.*
6. *Use MATLAB/SIMULINK software for state space model*

LIST OF EXPERIMENTS

Any EIGHT of the following experiments are to be conducted:

1. Time Response of Second Order System
2. Characteristics of Synchros
3. Programmable Logic Controller – Study and Verification of Truth Tables of Logic Gates, Simple Boolean Expressions and Application of Speed Control of Motor.
4. Effect of Feedback on DC Servo Motor
5. Transfer Function of DC Machine
6. Effect of P, PD, PI, PID Controller on Second Order Systems
7. Lag and Lead Compensation – Magnitude and Phase Plot
8. Temperature Controller Using PID
9. Characteristics of Magnetic Amplifiers
10. Characteristics of AC Servo Motor

Any TWO simulation experiments are to be conducted:

1. PSPICE Simulation of Op-Amp Based Integrator and Differentiator Circuits.
2. Linear System Analysis (Time Domain Analysis, Error Analysis) Using MATLAB.
3. Stability Analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant System Using MATLAB
4. State Space Model for Classical Transfer Function Using MATLAB –Verification.

TEXT BOOKS:

1. J. Nagrath and M. Gopal *Control Systems Engineering,* New Age International Limited, Publishers, 2nd edition. 2008
2. Nagoor Kani *Control Systems*, RBA Publications, Second Edition, 2009.

REFERENCES:

1. A. Anand Kumar *Control System,* Eastern Economy Edition -PHI learning Private Ltd. 2011
2. Benjamin C. Kuo, *Automatic Control Systems*, Wiley, 2014.

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(20HS0859) ENGLISH FOR CORPORATE COMMUNICATION SKILLS LAB

COURSE OBJECTIVES

The objective of this course is to

1. Improve the students' fluency in English, through a well-developed vocabulary

2. Enable them listening spoken English at normal conversational speed by English speakers

3. Respond appropriately in different social-cultural and professional contexts

4. Develop drafting skills among the students.

5. Develop Inter-personal and Intra-personal Skills

COURSE OUTCOMES

On successful completion of this course the student will be able to

1. Use fluency in English for all kinds of professional communication

2. Enhancing job required skills for getting success in their professions

3.Improving Effective Speaking Abilities for their business or professional correspondence

4. prepare effective Interview techniques to get job in the present scenario

5.Using the appropriate skills in all kinds of professional activities

6. Use effective communicative approaches by preparing job application, report and other kinds of spoken and written correspondences.

UNIT I
COMMUNICATIVE COMPETENCY

1. Functional English
2. Reading Comprehension
3. Vocabulary for competitive purpose
4. Spotting Errors

UNIT II
TECHNICAL WRITING

5. Cover Letter
6. Curriculum vitae
7. Report writing

UNIT III
PRESENTATIONAL SKILLS

8. Impromptu Speech
9. Oral presentation
10. Power point presentation
11. Poster presentation

UNIT IV
CORPORATE SKILLS
12. Problem Solving
13. Team Work
14. Leadership Skills

UNIT V
GETTING READY FOR JOB
15.Group Discussion
16.Interview skills

Minimum requirements for English for Corporate Communication Skills Lab

1. Computer Assisted Language Learning (CALL) Lab: The Computer Assisted Language Lab for 60 Students with 60 systems one Master Console, LAN facility and English Language Software for self-study by learners.

2. English for Corporate Communication Skills Lab with movable chairs and audio visual aids with a P. A. system, Projector, a Digital stereo audio & video system and Camcorder etc.

System Requirement (Hardware component):
Computer network, LAN with minimum 60 multimedia systems with the following

Specifications

i) a) Intel(R) core (TM) i3
   b) Speed 3.10 GHZ
   c) RAM – 4 GB
   d) Hard Disk – 320 GB

ii) Headphones with High quality

SOFTWARE
Walden Info Tech Software

REFERENCES

1. Effective Tech Communication, Rizvi, Tata McGraw – Hill Education, 2007.
2. Communication skills, Sanjay Kumar &Pushpalatha, Oxford University Press, 2012.
3. Writing Tutor. Advanced English Learners' Dictionary, 9th Edition, Oxford University Press, 2015.
4. Powerful Vocabulary Builder, AnjanaAgarwal, New Age International Publishers, 2011.
5. Listening Extra, Miles Craven, Cambridge University Press, 2008.

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(20HS0817) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

COURSE OBJECTIVES

The objective of the course is to

1. *Impart basic principles of thought process, reasoning and inference.*
2. *Connect society and nature through sustainability.*
3. *Know Holistic life style of yogic science and wisdom capsules in Sanskrit literature.*
4. *Introduce Indian knowledge system and Indian perspective of modern scientific world-wide.*
5. *Learn the basic principles of Yoga and holistic health care system.*

COURSE OUTCOMES

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

1. *Connect up the basic principles of thought process.*
2. *Understand Holistic life style of yogic science and wisdom capsules in Sanskrit literature.*
3. *Analyze the society and nature through sustainability.*
4. *Explain Indian knowledge system and Indian perspective of modern science.*
5. *Use the basic principles of Yoga and holistic health care system.*

UNIT-I

- Basic structure of Indian Knowledge System: 4 ved
- 4 Upaved (Ayurved, Dhanurved, GandharvaVed&SthapthyaAdi.,)

UNIT-II

- 6 Vedanga (Shisha, Kalppa, Nirukha, VYkaran, Jyothish&Chand)
- 4 Upanga (Dharma Shastra, Meemamsa, Purana&TharkaShastra)

UNIT-III

- Modern Science and Indian KnowledgeSystem
- Yoga and Holistic Healthcare

UNIT-IV

- Philosophical Tradition (Nyaya, ,Sankhya, Yog, Jain &Boudha
- Indian Linguistic Tradition –(Phonology, morphology, syntax andsemantics)

UNIT-V

- Indian Artistic Tradition - Chitrakala,Vasthukala, Sangeetha, Nruthy Sahithya
- Casestudies

TEXT BOOKS

1. Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, Bharatiya VidyaBhavan, Mumbai. 5th Edition,2014.
2. Swami Jitatmanand, *Modern Physics and Vedant*, Bharatiya VidyaBhavan.
3. Swami Jitatmanand, *Holistic Science and Vedant*, Bharatiya VidyaBhavan.
4. Fritzof Capra, *Tao ofPhysics.*
5. Fritzof Capra, *The Wave oflife.*

REFERENCES

1. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International ChinmayFoundation, Velliarnad, Arnakulam.
2. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with VyasaBhashya, VidyanidhiPrakashan, Delhi 2016.
3. RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, VidyanidhPrakashan, Delhi 2016.
4. P B Sharma (English translation), Shodashang Hridayan
5. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya VidyaBhavan, Mumbai. 5th Edition, 2014.
6. S.C. Chaterjee& D.M. Datta, An Introduction to Indian Philosophy, University of Calcutta, 1984.
7. K.S. Subrahmanialyer, Vakyapadiya of Bhartrihari, (Brahma Kanda), DeccanCollege Pune 1965.
8. Panini Shiksha, MotilalBanarasidas
9. V.N. Jha, Language, Thought and Reality, Vasudevasharan AGRAWAL Kala yevamSamskruthi, ShithyaBhavanElahabad, 1952.
10. Pramod Chandra, India Arts, Howard Univ. Press, 1983.
11. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.
12. R. Nagaswamy, Foundations of Indian Art, Tamil Arts Academy, 2002.

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(20EC0416) MICROPROCESSORS AND MICROCONTROLLERS

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the basic architecture of computer, evolution, and its applications*
2. *To learn the architectures of Microprocessor and Microcontroller*
3. *To learn the programming of Microprocessors and Microcontrollers using their programming model*
4. *To learn the interfacing of memory, I/O, sensors and actuators to microprocessors and microcontrollers*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Understand the evolution of computers, processors, and its applications*
2. *Explain the various software and hardware parts of a microprocessors and computer*
3. *Understand the architectures of 8085,8086 microprocessors and 8051 microcontroller system*
4. *Analyze the programming model of 8085,8086 Microprocessors & 8051 microcontroller development environment.*
5. *Implement the techniques of interfacing memories, various I/O devices, sensors and actuators with microprocessor and microcontrollers*
6. *Design and develop various microprocessor/microcontroller-based systems for the real-life problems*

UNIT – I

Microprocessors, Microcomputers and Assembly Language: Microprocessors – Microprocessor instruction set and computer languages – From large computers to single chip microcontrollers – Application: Microprocessor controlled temperature system (MCTS)

Microprocessor Architecture and Microcomputer Systems: Microprocessor Architecture and its operation – Memory – Input and output devices – Example of a microcomputer system

UNIT – II

8085 Microprocessor Architecture: The 8085 MPU - The 8085 Microprocessor, Microprocessor communication and bus timings, Demultiplexing the bus AD7-AD0,

Generating control signals and A detailed look at the 8085 MPU and its architecture– Instruction, Data format and Data Storage – Overview of the 8085 Instruction set .

UNIT – III

The 8051 Architecture: Introduction – 8051 microcontroller hardware – Input/output pins, ports and circuits – External memory – Counters and timers – Serial data input/output - Interrupts

UNIT – IV

Programming the 8051: Addressing modes - Moving data – Logical operations – Arithmetic operations – Jump and call instructions

UNIT – V

Applications: Introduction – Keyboards – Displays – D/A and A/D Conversion - Multiple interrupts

TEXT BOOKS

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, *Computer Organization,* McGraw Hill Eductaion Pvt. Ltd, 5th Edition, 2017.
2. Ramesh Gaonkar, *Microprocessor Architecture, programming and applications with the 8085,* Penram International Publications Pvt Ltd. 6th Edition, 2015.
3. Kenneth J Ayala, *The 8051 microcontroller,* Penram International Publications Pvt Ltd, 2nd Edition, 1997

REFERENCES

1. Ray Bhurchandi, *Advanced Microprocessors & Peripheral interfacing,* MC graw hill Publications, 3rd edition, 2012.
2. N.Senthil Kumar, M.Saravanan, S.Jeevanathan, *Microprocessor and Microcontrollers,* Oxford Publishers. 1st Edition, 2015.

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(20EE0223) Power System Analysis

COURSE OBJECTIVES

The objectives of this course:

1. *To learn concepts of Y bus and Z bus formation of power system network*
2. *To understand power flow studies of power system network*
3. *To learn short circuit analysis of power systems*
4. *To study swing equation and its solution*
5. *To learn equal area criterion and its applications*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Determine of Y bus and Z bus oof a given power systems network*
2. *Make fault calculations for various types of faults*
3. *Conduct load flow studies of a power system network.*
4. *Compare various power system load flow solution methods*
5. *Understand concepts of transient, dynamic and steady state stabilities*
6. *Understand equal area criterion and its applications*

UNIT- I
POWER SYSTEM NETWORK MATRICES

Representation of power system elements-Graph Theory-Bus Incidence matrix-Y bus formation by direct and singular transformation methods-numerical problems. Formation of Z bus. Algorithm for modification of Z bus matrix for addition of element for the following cases: Addition of element from a new bus to reference-addition of element from a new bus to old bus-addition of element between an old bus to reference and addition of element between two old buses.

UNIT- II
SHORT CIRCUIT ANALYSIS

Per Unit system representation – Per Unit equivalent reactance network of a three-phase power system. Symmetrical Fault Analysis: short circuit current and MVA calculations-fault levels - application of series reactors. Symmetrical component theory: Symmetrical component transformation–positive -negative and zero sequence components-voltages-currents and impedances. Sequence networks-positive, negative and zero sequence networks-Unsymmetrical Fault Analysis: LG-LL-LLG faults with and without fault impedance.

UNIT- III
POWER FLOW STUDIES-I

Necessity of power flow studies- Data for power flow studies – Derivation of static load flow equations- Load Flow Solutions using Gauss Siedel Method – acceleration factor – load flow solution with and without PV buses- Algorithm and flow chart. Numerical load flow solution for a power system network (maximum 3 buses). Determination of bus voltages – injected active and reactive powers and losses for the given bus voltages.

UNIT- IV

POWER FLOW STUDIES-II

Newton Raphson method in rectangular and polar co-ordinates form – load flow solution with or without PV buses- Determination of Jacobian elements – Algorithm and Flow Chart-numerical problems-Decoupled and Fast Decoupled methods-Comparison of load flow methods.

UNIT- V

POWER SYSTEM STABILITY ANALYSIS

Concepts of steady state-dynamic and transient stabilities – steady state stability power limit transfer reactance – synchronizing power coefficient -power angle curve-methods to improve steady state stability-Swing Equation – Determination of transient stability by Equal Area criterion- Application of Equal Area Criterion. Solution of swing equation- methods to improve stability.

TEXT BOOKS

1. Grainer and Stevenson *Power System Analysis — Tata Mc Graw Hill,2010.*
2. I.J.Nagarath & D.P.Kothari *Modern Power System Analysis– TMH,2003,2nd edition.*

REFERENCES

1. M.A.Pai,TMH *Computer Techniques in Power System Analysis -2005,2nd Edition.*
2. K.Uma Rao *Computer Techniques and Models in Power Systems, -I.K.International*
3. S A Nasar, Schaum's Outline Series *Electrical Power Systems*- TMH,1997,1st Edn.
4. E.I.Staff and EI *Computer Methods in Power System Analysis* –-Abiad, TMH,1969.

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(20EE0224) Power System Operation and Control

COURSE OBJECTIVES:

The objectives of this course are to make the student learn:

1. *This subject deals with Economic operation of power systems.*
2. *To learn about Hydrothermal scheduling and Modeling of turbines.*
3. *To understand the operation of Automatic controllers.*
4. *It Emphasizes on Single area load frequency control, Two area load frequency control and Reactive power control.*

COURSE OUTCOMES:

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

1. *Apply the Lagrange's method to the economic dispatch of thermal units.*
2. *Develop the mathematical models of turbines and governors.*
3. *Address the load frequency control problem.*
4. *Explain the automatic generation control of a single area and two area system.*
5. *Explain how shunt and series compensation helps in reactive power control.*
6. *Explain the issues concerned with power system operation in competitive environment.*

UNIT I

ECONOMIC OPERATION

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 and problems.

UNIT II

HYDRO - THERMAL SCHEDULING

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems-Short term hydrothermal scheduling problem.

UNIT III

MODELING OF TURBINE AND GOVERNOR

Modeling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models. Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function – Block Diagram.

UNIT IV

LOAD FREQUENCY CONTROL

Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control. Proportional plus Integral control of single area and its block diagram representation, steady state response.

UNIT-V

REACTIVE POWER CONTROL & POWER SYSTEM RESTRUCTURING

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. Introduction – Need for Regulation – Motivation for Power System Restructuring – Key issues in Deregulation.

TEXT BOOKS

1. I.J.Nagrath & D.P.Kothari *Modern Power System Analysis* Tata M Graw – Hill Publishing Company Ltd, 2nd edition.
2. Sivanaga Raju & G.Sreenivasan *Power system operation and control* -Dorling Kindersley (India) pvt.ltd. Licensees of Pearson Education in south Asia.

REFERENCES

1. J.Duncan Glover and M.S.Sarma *Power System Analysis and Design* THOMPSON, 3rd Edition.
2. S. A. Nasar, Schaum‘s Outline Series *Electric Power Systems Revised 1st Edition, TMH*
3. O I Elgerd *Electric Energy Systems* Mc Graw-hill Edition.
4. S. N. Singh *Electric Power Generation, Transmission and Distribution* 2nd Edition, PHI.
5. Abhijit Chakrabarti, D. P. Kothari, A. K. Mukhopadhyay and Abhinanda *Reactive Power Control and Voltage Stability in Power Transmission Systems by De,* Eastern Economy Edition, 2010.

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(20EE0225) Power Semiconductor Drives
(Professional Elective courses-II)

COURSE OBJECTIVES:

1. *To understand the application of Power Electronics*
2. *To learn the operation of the chopper fed DC Drives and characteristics*
3. *To Understand the basic concept and advanced speed control techniques using Power electronics converters that are used in industry*
4. *Distinguishing features of Induction Motor drives and Synchronous Motor Drives*

COURSE OUTCOMES (COS):

After completion of the course, students would be able to

1. *Analyzation of single Phase and three phase rectifier fed DC motors as well as chopper fed DC Motors.*
2. *Study the four quadrant operation of DC Drives*
3. *Develop the concept of Speed control of induction motor by using AC Voltage control and Voltage Source Inverters.*
4. *Understand the Principle of static rotor resistance control and various slip power recovery schemes.*
5. *Formulate the concept of CSI inverter fed synchronous motor drive*
6. *Apply the concept of closed loop control motor drives.*

UNIT- I

CONVERTER FED DC MOTORS

Introduction to Thyristor Controlled Drives, Single Phase, Three Phase Semi and Fully Controlled Converters Connected to D.C Separately Excited and D.C Series Motors , Continuous Current Operation, Output Voltage and Current Waveforms , Speed and Torque Expressions , Speed , Torque Characteristic, Problems.

UNIT- II

FOUR QUADRANT OPERATION OF DC DRIVES

Introduction to Four Quadrant Operation, Motoring Operations, Electric Braking, Plugging, Dynamic and Regenerative Braking Operations. Four Quadrant Operation of D.C Motors by Dual Converters, Closed Loop Operation of DC Motor.

UNIT- III

CHOPPER FED DC MOTORS

Single Quadrant, Two Quadrant and Four Quadrant Chopper Fed DC Separately Excited and Series Excited Motors , Continuous Current Operation, Output Voltage and Current Wave Forms , Speed - Torque Expressions, Speed - Torque Characteristics , Problems on Chopper

Fed D.C Motors, Closed Loop Operation.

UNIT -IV

CONTROL OF INDUCTION MOTOR

Induction Motor Stator Voltage Control and Characteristics by AC Voltage Controllers, Waveforms, Speed - Torque Characteristics, Stator Frequency Control and Characteristics by voltage Source and Current Source Inverter and Cycloconverters, PWM Control,Comparison of VSI and CSI Operations ,Speed - Torque Characteristics, Closed Loop Operation of Induction Motor Drives ,Static Rotor Resistance Control ,Slip Power Recovery, Static Scherbius Drive, Static Kramer Drive –Their Performance and Speed - Torque Characteristics ,problems and Applications.

UNIT -V

CONTROL OF SYNCHRONOUS MOTORS

Self and separate Control of Synchronous Motors ,Operation of Self Controlled Synchronous Motors-VSI and CSI Fed Cycloconverters. Load Commutated CSI Fed Synchronous Motor, Operation, Waveforms – Speed - Torque Characteristics, Closed Loop Control Operation of Synchronous Motor Drives, Variable Frequency Control-PWM, VSI, CSI, Problems and applications.

TEXT BOOKS:

1. G K Dubey *Power semiconductor controlled drives* Prentice Hall, 1989.
2. M.H. Rashid *Power Electronic Circuits, Devices and applications* PHI, 2005.

REFERENCES*:*

1. MD Singh and K B Khanchandani *Power Electronics* Tata – McGraw-Hill Publishing company, 1998
2. B.K.Bose *Modern Power Electronics and AC Drives* PHI, 1986.
3. Vedam Subramanyam *Thyristor Control of Electric drives* Tata McGraw HillPublications, 1988.
4. S K Pillai *A First course on Electrical Drives* New Age International(P) Ltd. 2nd Edition, 1989.
5. N. K. De *Electric Drives* PHI Publications, 2006.

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(20EE0226) High Voltage Engineering
(Professional Elective courses-II)

COURSE OBJECTIVES:

Students undergoing this course are expected to:

1. *understand various types of over voltages in power system and protection methods*
2. *To know breakdown phenomenon in solid dielectrics.*
3. *To know generation of high voltages and currents*
4. *Understand measurement techniques for high voltages and currents.*
5. *Understand overvoltage phenomenon and insulation coordination in electric power systems.*

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

1. *Identify the HV technologies and industrial applications of High voltage.*
2. *Know the generation of high voltage AC and DC voltages and impulse voltages*
3. *Identify different high voltage circuits and calculate the regulation, ripple and optimum number of stages for minimum voltage drop*
4. *Measure high voltages by using different techniques like Chubb and Fortescue Method*
5. *Test high voltages by using different techniques and identify factors affecting high voltages.*
6. *Understand non-destructive testing of materials and electric apparatus and high-voltage testing of electric apparatus*

UNIT I

OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS

Causes of over voltages and its efects on power system – Lightning, switching surges and temporary over voltages, Corona and its efects – Bewley latice diagram- Protection against over voltages.

UNIT II

DIELECTRIC BREAKDOWN

Properties of Dielectric materials – Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and composite dielectrics- Aplications of insulating materials in electrical equipments.

UNIT III

GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS

Generation of High DC voltage: Rectifers, voltage multipliers, vandigraf generator: generation of high impulse voltage: single and multistage Marx circuits – generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges – generation of impulse curents – Trigering and control of impulse generators.

UNIT IV

MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers – Peak Voltmeter, Generating Voltmeters – Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps – High curent shunts- Digital techniques in high voltage measurement.

UNIT V

HIGH VOLTAGE TESTING & INSULATION COORDINATION

High voltage testing of electrical power aparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers.

TEXT BOOKS:

1. M.S.Naidu and V. Kamaraju,"*High Voltage Engineering,"* TMH Publications, 4th Edition, 2004.
2. C.L.Wadhwa*,"High Voltage Engineering*," New Age Internationals (P) Limited, 1997.

REFERENCE BOOKS:

1. E.Kuffel, W.S.Zaengl, J.Kuffel, "*High Voltage Engineering: Fundamentals*" Elsevier, 2ndEdition, 2000.
2. Ravindra Arora, Wolfgang Mosch," *High Voltage Insulation Engineering*," New Age International (P) Limited, 1995.
3. L. L. Alston ,"*High Voltage Technology*," OXFORD University Press, Second Edition, 2009.
4. R. D. Begamudre ,"*High Voltage Engineering Problems & Solutions*,"New Age International Publishers, First Edt., 2010.

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(20EE0227) Generation of Energy from Waste

(Professional Elective courses-II)

COURSE OBJECTIVES

The objectives of this course:

1. *To understand different types of waste as fuel*
2. *To introduce Pyrolysis methods and conversion processes*
3. *To understand gasification methods for biomass*
4. *To learn concepts of biomass resources, combustion types and biogas plant technology*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Analyse agro based, forest residue and industrial waste conversion processes.*
2. *Manufacture of Pyrolytic oils and gases*
3. *Manufacture of charcoal, yields and applications*
4. *Understand various types of gasifiers operation*
5. *Understand inclined and fluidized bed combustors operation*
6. *Understand types of biogas plants and biomass energy programme in India*

UNIT- I

Introduction to Energy from waste: Classification of waste as fuel – Agro based- Forest residue- Industrial waste- MSW- conversion devices- Incinerators- Gasifiers-Digestors.

UNIT- II

Bio-mass Pyrolysis: Pyrolysis- Types- Slow-Fast- Manufacture of Charcoal- methods- yields and application. Manufacture of Pyrolytic oils and gases – yields and applications.

UNIT- III

Biomass Gasification: Gasifiers- Fixed bed system- Downdraft and Updraft gasifiers- Fluidized bed gasifiers- construction and operation- Gasifier burner arrangement for thermal heating.

UNIT- IV

Biomass Combustion: Biomass stoves- Types- Inclined combustors- Fluidized bed combustors- construction and operation of above biomass combustors.

UNIT- V

Properties of Biogas: Biogas plant Technology and status – Biomass resources and their classification- Biomass conversion processes- thermo chemical conversion – Direct

Combustion- Biomass gasification- Pyrolysis and liquefaction – bio-chemical conversion- anaerobic digestion- Types of biogas plants- applications-Biomass Energy Programme in India.

TEXT BOOKS

1. Non-Conventional Energy- Desai Ashok V. Wiley Eastern Ltd 1990.
2. Biogas Technology – A Practical Hand Book – Khandelwal K.C. and Mahdi SS, Vol I & II. Tata Mc Graw Hill Publishing Co Ltd.,1983.

REFERENCES

1. Food, Feed and Fuel from Biomass – Challal D.S., IBH Publishing Co Pvt Ltd.,1991.
2. Non-conventional Energy Sourcrs- GD Roy, Khanna Publishers, 6th Edition
3. Biomass & Bioenergy – Khahid Rehman Hekeem, Mohammad Jawald., Umar Rashid- Springer International Publishing Ltd.

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(20CE0147) FUNDAMENTALS OF URBAN PLANNING
[Open Elective (OE)-II]

COURSE OBJECTIVES
The objectives of this course to

1. *Understand the concept of balanced town by ensuring that new and existing facilities are complimentary to each other*
2. *Provide sustainable buildings by considering the environmental, social and economic conditions*
3. *Create awareness about the traffic management within the town*

COURSE OUTCOMES
On successful completion of this course, the student will be able to

1. *Recognize issues related to town planning and discuss the objectives, necessity and stages of town planning*
2. *Summarize importance of zoning, can classify various town planning practices and can conduct surveys for town planning*
3. *Classify the residential building, list the agencies involved in improving house and review the problems associated with residential housing*
4. *Discuss the issues associated with slums and recognize the methods to improve condition of slums*
5. *Interpret norms laid down for public and industrial building and can summarize building bye-laws*
6. *List and discuss various urban roads and the concepts of traffic management in a town*

UNIT – I
Introduction to Town Planning: Objects of town planning - Necessity of town planning - Principles of town planning - Stages of Town Planning - Origin and growth of towns - Development of towns - Modern town planning in India - Socio - Economic aspects of town planning - Selection of site for an ideal town – Cost of town planning.

UNIT – II
Surveys & Planning: Various types of surveys to be conducted for town planning project - Data to be collected in different types of town planning survey - Types of planning - A brief note on urban, rural and regional planning.

Zoning: Definition - Objects and principles of zoning - Advantages of zoning - Special Economic Zone (SEZ) - Maps for zoning.

UNIT – III

Housing: Classification of residential building as per HUDCO norms - Low Cost Housing - Housing policy - Different types of housing agencies involved in housing - Investment in Housing - Housing Problems in India.

Slums: Causes - growth - Characteristics - Effects - Slum clearance and re-housing - Prevention of slum formation - Financial assistance for slum clearance.

UNIT – IV

Public Buildings & Industries: Classification - Location - Design Principles of public building - Grouping of public buildings - Effects of Industries on towns and cities - Classification of industries – Requirements of an industry - Regulation of their location.

Building Bye-Laws: Objectives of bye-laws - Importance of bye-laws - Function of local authority - Responsibility of owner - Applicability of bye-laws - Principles underlying building bye-laws.

UNIT – V

Urban Roads: Objectives – Requirements - Classification - Types of street systems - Through and bypass roads - Outer and inner ring roads - Expressways - Freeways.

Traffic Management: Objectives - Traffic surveys - Traffic congestion - Traffic control - Parking - Road accidents - Traffic capacity of roads - Road intersections - Traffic islands - Roundabouts - Traffic signals - Road signs - Road markings - Street lighting in a town.

TEXT BOOKS

1. Rangwala, *Town Planning*, Charotar Publishing,30th edition, 2018
2. G K Hiraskar, *Fundamentals of Town Planning*, Dhanpat Rai Publications, New Delhi, 17th edition, 2018

REFERENCES

1. Abirb and yopadhyay, *Text book of Town Planning*, Books & Allied (P) Ltd, 2000
2. Peter Hall and Mark Tewdwr-Jones, *Urban and Regional Planning*, Routledge Publications, 5th edition, 2010
3. Catanese A J, *Urban Planning*, McGraw Hill Publications, 2nd edition, 2014

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(20ME0354) GENERAL MECHANICAL ENGINEERING
(Common to all branches)

COURSE OBJECTIVES
Objective of this course is to

1. *Impart knowledge on Engineering materials and Manufacturing Process.*
2. *Understand about Automation, CAD, CAM and CIM.*
3. *Know the various Industrial Robot applications.*
4. *Learn about advanced manufacturing systems like NC, CNC and DNC system.*
5. *Study the construction details of the Automobile systems like engines.*
6. *Learn about Refrigeration and Air conditioning systems.*

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

1. *List the types of Engineering materials and Manufacturing Processes.*
2. *Apply Automation, CAD, CAM and CIM in the manufacturing.*
3. *Explicate the various Industrial Robot applications.*
4. *Classify various Machining processes like NC, CNS and DNC system and determine the best suitable process to machine a component.*
5. *Recognize the different parts of the automobile system and know the importance of IC Engines in automobiles.*
6. *Distinguish various types of Refrigeration and Air conditioning systems.*

UNIT-I
Material and selection, Mechanical Handling Equipment- belts, conveyors, hosty, power transmission

UNIT-II
CAD/CAM: Role of computers in manufacturing - CAD, Design process – CAM - CIM, Scope of CIM - Advantages - Benefits.
Introduction to Automation: Automation, Need - Types - Basic Elements - Strategies and Levels of Automation.

UNIT-III
Introduction to Industrial Robotics: Classification of Robot Configurations, functional line diagram - Principle components - Degrees of freedom – Joints - Advantages, Applications.
Machine Tools: Conventional Machine Tools, Types - Traditional Vs NC machining – Advanced Machine Tools, Classifications - NC, CNC and DNC systems – Advantages, Disadvantages.

UNIT-IV
I.C. Engines- Definition of Engine and Heat Engine, I.C Engine Classification –Parts of an IC Engine, Working of Two Stroke and Four Stroke Engines.
Automobile Engineering: Layout of Automobile, Types, Components - Vehicle chassis, frame and body construction

UNIT-V

Refrigeration: Introduction to Refrigeration- Classifications of Refrigeration systems-Vapour compression and Vapour absorption systems.

Air conditioning: Introduction to Air conditioning - Classifications of Air conditioning systems-window air conditioning system, split conditioning system, Central air conditioning system.

TEXT BOOKS

1. Mikel P.Groover *Automation, Production systems and Computer Integrated Manufacturing Systems, Pearson Higher Education, Inc., 3rd Edition, 2014.*
2. R. K. Rajput, *Engineering Materials and Metallurgy*, S. Chand Publishers, 3rd Edition, 2008.
3. C.P. Arora & Domkundwar, *Refrigeration and Air conditioning*, McGraw Hill, 3rd Edition, 2010.

REFERENCES

1. Kirpal Singh, *Automobile Engineering,* Vol.1 & Vol.2, Standard Publishers Distributors, 13th Edition, 2013
2. R.K.Rajput, *Thermal Engineering*, Laxmi Publications, 6th Edition, New Delhi, 2010.
3. R.K. Jain, *Production Technology*, Khanna Publishers, 17th edition, 2012

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(20EC0452) ELEMENTS OF EMBEDDED SYSTEMS
[Open Elective (OE)-II]

COURSE OBJECTIVES

The objectives of this course is to

1. *Understand the fundamental concepts of embedded systems.*
2. *Learn the core of embedded systems.*
3. *Learn to program the open source electronics.*
4. *Understand the principles of Internet of Things (IoT).*
5. *Understand the concepts of Internet of Things (IoT).*

COURSE OUTCOMES

On successful completion of this course, students will be able to

1. *Differentiate between general computing system and the embedded system, also recognize the classification of embedded systems.*
2. *Enumerate and describe the components of an embedded system.*
3. *Learn about open source electronics platform.*
4. *Program an embedded system by interfacing sensors & actuators.*
5. *Identify the basic building blocks of Internet of Things and characteristics.*
6. *Implement their own ideas in various application areas of Embedded systems and IoT.*

UNIT – I

Introduction to Embedded Systems: Definition –Embedded systems vs General computing systems – History – Classification – Purpose - Major application areas – Characteristics – Architecture of embedded system – CPU, RAM & ROM, timers, clocks, address bus & data bus – overview of design process of embedded systems – programming languages and tools for embedded design.

UNIT – II

Typical Embedded System: Core of the embedded system– RISC vs CISC design philosophy– Memory – Harvard and Von-Neuman architecture–sensors and actuators– Other system components – reset, brownout protection, oscillator, RTC, Watch dog timer. Embedded firmware.

UNIT – III

Communication: Communication Interfaces – Onboard (I2C, SPI, UART, 1-wire interface, parallel interface), External (RS-232 & RS-485, USB, IEEE 1394, IrDA, Bluetooth, Wi-Fi, ZigBee, GPRS.

UNIT – IV

Designing of Embedded Systems with Arduino Microcontrollers: Introduction to Arduino platform– Overview of Arduino UNO board–ATMega328/P Block diagram–Pin functions– Introduction to Arduino programming –Interfacing & programming sensors –Interfacing & programming actuators Interfacing & programming serial communication devices.

UNIT – V

Introduction to IOT: Introduction to Internet of Things– reference architecture of IoT– Internet principles – IP addresses, MAC addresses, TCP and UDP ports– Application layer protocols– Data protocols– MQTT, XMPP, CoAP– challenges of IoT, Case studies demonstrating IoT – Home automation, cities, Environment, Agriculture.

TEXT BOOKS

1. Shibu K V, *Introduction to Embedded systems,* Tata McGraw-Hill Education, 1st Edition, 2009.
2. Raj Kamal, *Embedded systems,* Tata McGraw-HillEducation, 2nd Edition, 2011.
3. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach,* Universities Press/Orient Black Swan Pvt. Ltd, 1st Edition, 2015.

REFERENCES

1. Adrian McEwen & Hakim Cassimally, *Designing of Internet of Things*, John Wiley and sons Ltd, 1st Edition, 2014.

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(20CS0551) JAVA PROGRAMMING
[Open Elective (OE)-II]

COURSE OBJECTIVES
The objectives of this course is to

1. *Introduce standard tools and techniques for software development.*
2. *Understand the object oriented approach for automated software build process.*
3. *Introduce the concepts of AWT framework.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Implement simple abstract data types and design abstraction functions.*
2. *Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.*
3. *Apply object-oriented design patterns for problem solving.*
4. *Implement Exception handling with synchronization.*
5. *Execute programs on Multithreading and String handling concepts.*
6. *Design applications with an event-driven graphical user interface.*

UNIT- I
The Java Language: Importance of Java -Programming Paradigms -The History and Evolution of Java -Java Byte Code.

Introduction of OOP: Abstraction, Encapsulation, Inheritance, Polymorphism-Understanding static -Varargs -Data Types -Type Casting -Java Tokens - Java Statements -Arrays.

UNIT- II
Introducing Classes –Class Fundamentals -Declaring Objects -Introducing Methods Introduction to Constructors -Garbage Collection-Introducing final -Inheritance - Method Overriding -abstract classes -Packages and Interfaces.

UNIT- III
Exception Handling - Exception Fundamentals - Exception Types -Uncaught Exceptions - Using try and catch - Nested try Statements -throw -throws –finally -Creating Your Own Exception Subclasses - Chained Exceptions.

UNIT-IV
Multithreaded Programming - The Java Thread Model -Thread Priorities -The Thread Class and the Runnable Interface - Creating Multiple Threads -Using isAlive( ) and join( ) – Synchronization- String Handling.

UNIT- V

Generics-A simple Generic Example-General form of Generic class -Generic Interfaces Collection Framework-Collections overview, Collection class, Collection interfaces.

Introducing the AWT - Using AWT Controls-Layout Managers -Introducing Swing - Exploring Swing.

TEXT BOOKS

1. Herbert Schildt, *The Complete Reference Java,* Eighth Edition , McGraw Hill.
2. Y Daniel Liang, *Introduction to Java programming* — Que E &T.

REFERENCES

1. P.J. Deitel and H.M. Deitel, *Java for Programmers,* Pearson education.
2. Bruce Eckel, *Thinking in Java*, Pearson Education.

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(20HS0814) INTELLECTUAL PROPERTY RIGHTS
[Open Elective (OE)-II]

COURSE OBJECTIVES
The objectives of this course is to

1. *Provide an understanding of the concept and significance of intellectual property rights*
2. *Understand the concept of trademarks, copy rights, patents and the need for their protection*
3. *Comprehend the concept of competition, unfair competition and the latest developments in the laws pertaining to intellectual property rights*

COURSE OUTCOMES
On successful completion of this course, the student will be able to

1. *Become aware of intellectual property rights, concepts, treaties, agencies and international organizations involved in sanctioning IP rights*
2. *Identify different types of intellectual properties, ownership rights and the scope of the protection*
3. *Get an adequate knowledge on patents, trademarks, copy rights and to get property rights for their intellectual work*
4. *Able to identify, apply, and assess ownership rights, registration processes for IP rights*
5. *Discern the approaches for intellectual property management and intellectual property audits*
6. *Demonstrate knowledge and understanding on unfair competition and latest developments in IP rights at international level*

UNIT-I
INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual propertyrights.

UNIT-II
TRADE MARKS: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT-III
LAW OF COPY RIGHTS: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

LAW OF PATENTS: Foundation of patent law, patent searching process, ownership

rights and transfer

UNIT-IV

TRADE SECRETS: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secret elitigation.

UNFAIR COMPETITION: Misappropriation right of publicity, False advertising.

UNIT-V

NEW DEVELOPMENT OF INTELLECTUAL PROPERTY: new developments in trade mark law; copy right law, patent law, intellectual property audits -International overview on intellectual property, international - trade mark law, copy right law, international patent law, international development in trade secrets law.

TEXT BOOKS

1. Deborah, E. Bouchoux, *Intellectual property right*, cengage learning
2. Nityananda KV, Intellectual *property rights: Protection and Management.* Cengage Learning India Private Limited.

REFERENCES

1. Prabuddha ganguli, *Intellectual property right - Unleashing the knowledge economy*, Tata McGraw Hill Publishing CompanyLtd.
2. Ahuja VK , *Law relating to Intellectual Property rights.* IN: Lexis Nexis
3. Neeraj P &Khushdeep D, *Intellectual Property Rights,* India. PHI learning pvt limited.

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(20EC0418) MICROPROCESSORS AND MICROCONTROLLERS LAB

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the structure of assembly language and embedded C programming.*
2. *Develop programs using various instructions and addressing modes of 8051 microcontroller*
3. *Design and simulate the interfacing of peripherals to microcontroller board.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand arithmetic, logical and string operations using assembly language programming.*
2. *Develop embedded C language programs for various applications using 8051 microcontroller*
3. *Explore the provided example code and online resources for extending knowledge about the capabilities of the 8/16-bit microcontrollers*
4. *Implement project intended solution for project based learning.*
5. *Know the procedure for test, debug, and deploy the 8051 microcontroller-based systems.*
6. *Design and develop own microprocessor/microcontroller-based solutions for the real-world problems.*

Note: Minimum **Ten** Experiments to be conducted (9 from Part A, B and one from Part C)

Part A: 8085 Microprocessor Programming

1. a) 8-bit addition operations
   b) 8-bit subtraction operations
2. a) 8-bit Multiplication operations
   b) 8-bit Division operations
3. Logical operations on an 8-bit number

Part B: 8051 Microcontroller Programming

1. Interfacing LED
2. Interfacing Push button
3. Interfacing 7 segment display
4. Interfacing ADC
5. Interfacing Sensors
6. Interfacing Actuators

Part C: Mini projects

1. 4-way Traffic light control system.
2. Three floor elevator system.
3. Automatic streetlight control system.
4. Intruder alert system.
5. Automatic Tollgate system.
6. Water level control system.
7. Digital alarm clock.
8. Electronic code lock.
9. Automatic gardening system.
10. Self-developed project

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L	T	P	C
-	-	3	1.5

(20EE0228)POWER SYSTEMS AND SIMULATION LAB

Course Objectives:

The objectives of this course include:

1. *Experimental determination (in machines lab) of sequence impedance and Subtrasient reactances of synchronous machine*
2. *Conducting experiments to analyze LG, LL, LLG, LLLG faults*
3. *The equivalent circuit of three winding transformer by conducting a suitable experiment.*
4. *Developing MATLAB program for formation of Y and Z buses.*
5. *Developing MATLAB programs for gauss-seidel and fast decoupled load flow studies.*
6. *Developing the SIMULINK model for single area load frequency control problem.*

Course Outcomes:

At the end of the lab course, the student should be able to do the following:

1. *Experimental determination (in machines lab) of sequence impedance and subtrasient reactance's of synchronous machine*
2. *Conducting experiments to analyze LG, LL, LLG, LLLG faults*
3. *The equivalent circuit of three winding transformer by conducting a suitable experiment.*
4. *Developing MATLAB program for formation of Y and Z buses.*
5. *Developing MATLAB programs for gauss-seidel and fast decoupled load flow studies.*
6. *Developing the SIMULINK model for single area load frequency control problem.*

List of Experiments:

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine.
2. Fault Analysis – I LG Fault LL Fault
3. Fault Analysis – II LLG Fault LLLG Fault
4. Determination of Subtransient reactances of salient pole synchronous machine.
5. Equivalent circuit of three winding transformer.
6. Y formation using MATLAB
7. Z formation using MATLAB
8. Gauss-Seidel load flow analysis using MATLAB
9. Fast decoupled load flow analysis using MATLAB
10. Develop a Simulink model for a single area load frequency control problem

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L	T	P	C
-	-	3	1.5

(20EE0229) SUBSTATION AND AUTOMATION LAB (VIRTUAL LAB)

COURSE OBJECTIVES:
To prepare the students

1. *To analyze the operation of switch gears.*
2. *To learn the operation of feeders in work station.*
3. *To understand the substation automation schemes*

COURSE OUTCOMES:
Students will be able to

1. *Test and analyze circuit breakers and switches performance.*
2. *Understand the control, monitoring and protection functions in work station.*
3. *To analyze scenario Fault simulation of feeders, transformers and buses.*
4. *To analyze development of substation automation scheme using PLC for normal load operation.*
5. *To analyze development of substation automation scheme using PLC for timer ON/OFF load control and cyclic ON/OFF load control.*
6. *Understand Auto recloser and Sectionalizers Operation*

LIST OF EXPERIMENTS
Any **TEN** Experiments from the following

1. Circuit Breaker Status Indication from field input.
2. Control of Group Operated Switches (GOS) from workstation.
3. Monitoring Feeder parameter from workstation.
4. Fault scenario simulation in a feeder.
5. Fault scenario simulation in a Transformer /Bus.
6. Load Transfer from one Feeder to other during Transformer Maintenance.
7. Control of Bus Voltages Through On load Tap Changes.
8. Development of 11KV/433 volts substation automation scheme using PLC for normal load operation.
9. Development of 11KV/433 volts substation automation scheme using PLC for timer ON/OFF load control.
10. Development of 11KV/433 volts substation automation scheme using PLC for cyclic ON/OFF load control.
11. Auto recloser and Sectionalizers Operation

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L	T	P	C
1	0	2	2

(20EE0229) Industrial Automation with PLC/SCADA

CONTENTS

- Location & percent fill.
- Visibility & orientation.
- Object size.
- Touch push button.
- Sliders
- User input & value display.
- Colour property.
- Trends.
- Window scripts.

9. Application tasks in SCADA

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L	T	P	C
3	-	-	3

(20HS0864) HUMAN VALUES AND PROFESSIONAL ETHICS

COURSE OBJECTIVES

The Objective of the course:

1. *Create awareness on Human Values.*
2. *Impart knowledge on an Engineering Ethics*
3. *Instill morality, accountability in an engineering experimentation*
4. *Create awareness on an assessment of safety, risk and rights*
5. *Develop knowledge on global issues*
6. *Create an awareness on Human Values and Engineering Ethics, Engineers social responsibility in an experimentation, appreciate the rights of others and ethics in global issues.*

COURSE OUTCOMES

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

1. *Identify and analyze human values in their relevant field*
2. *Assess their own engineering ethics and have the social consciousness*
3. *Get knowledge on codes of ethics and on an utilitarian thinking*
4. *Identify safety, risks and an ethical concern in research and intellectual contexts*
5. *know necessity of computer and an environmental ethics, give a picture on weapons development*
6. *Upon completion of the course, the student should be able to apply the ethics in society, discuss an ethical issues related to engineering and realize the responsibilities and rights in the society*

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UNIT I

Human Values - Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Necessity of Yoga and meditation for professional excellence and stress management.

UNIT II

Engineering Ethics - Senses of 'Engineering Ethics' – Variety of moral issues – 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

UNIT III

Engineering As Social Experimentation- Engineering as Experimentation--Engineering Projects VS. Standard Experiments, Engineers as responsible Experimenters– Conscientiousness- Comprehensive Perspective - Moral Autonomy - Accountability, Industrial Standards, Codes of Ethics – A Balanced Outlook on Law.

UNIT IV

Safety, Responsibilities And Rights- Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk, Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V

Global Issues-Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility

TEXTBOOKS

1.R S Nagarajan, *Professional Ethics and Human Values*, New Age International (P) Limited
Publishers,3rd Edition,2006
2.M.Govindarajan,S.Natarajananad,V.S.SenthilKumar,*EngineeringEthicsincludes Human Values* -PHI Learning Pvt. Ltd- 2nd Edition,2009

REFERENCES

1. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, *Engineering Ethics – Concepts and Cases*, Cengage Learning, 2nd Edition, 2009
2. John R Boatright, *Ethics and the Conduct of Business*, Pearson Education, New Delhi, 1st Edition,2003
3. Edmund G Seebauer and Robert L Barry, *Fundamentals of Ethics for Scientists and Engineers*, Oxford University Press, Oxford, 4th Edition,2001
4. PSR Murthy, *Indian Culture, Values and Professional Ethics*, BS Publication, 2nd Edition, 2013