SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Bachelor of Technology
Department of Electrical & Electronics Engineering

I B. Tech. – I Semester (E.E.E)

S.No.	Course Code	Subject	L	T	P/Drg	C
1.	16HS601	Functional English	3	-	-	3
2.	16HS602	Engineering Mathematics-I	3	1	-	3
3.	16HS603	Engineering Physics	3	1	-	3
4.	16CS501	Computer Programming	3	1	-	3
5.	16HS606	Human Values & Professional Ethics	3	-	-	3
6.	16HS608	Engineering Physics Lab	-	-	4	2
7.	16CS502	Computer Programming Lab	-	-	4	2
8.	16ME301	Engineering & IT Workshop Lab	-	-	4	2
Contact Periods / Week			15	3	12	21
			Total/Week 30			

I B. Tech. – II Semester (E.E.E)

S.No.	Course Code	Subject	L	T	P	C
1.	16HS610	Professional English	3	-	-	3
2.	16HS611	Engineering Mathematics-II	3	1	-	3
3.	16HS604	Engineering Chemistry	3	1	-	3
4.	16ME302	Engineering Graphics	-	-	6	3
5.	16EE201	Electrical Circuits	3	1	-	3
6.	16HS607	English Language and Communication Skills Lab	-	-	4	2
7.	16HS609	Engineering Chemistry Lab	-	-	4	2
8.	16EE202	Electrical Circuits Lab	-	-	4	2
Contact Periods / Week			12	3	18	21
			Total/Week 33			

II B. Tech. – I Semester (E.E.E)

S.No.	Course Code	Subject	L	T	P	C
1.	16HS612	Engineering Mathematics-III	3	1	-	3
2.	16HS605	Environmental Studies	3	-	-	3
3.	16EE203	Network Analysis & synthesis	3	1	-	3
4.	16EC401	Basic Electronic Devices	3	1	-	3
5.	16EE210	Generation of Electric Power	3	1	-	3
6.	16EE211	Electrical Machines –I	3	1	-	3
7.	16EE204	Network Analysis & synthesis Lab	-	-	4	2
8.	16EC405	Basic Electronic Devices Lab	-	-	4	2
Credit Course						
9.	COE-I	Comprehensive Online Examination-I				1
Audit Course						
10.	16CS503	Data Structures through C	**3**	-	-	-
Contact Periods / Week			**21**	**5**	**8**	**23**
			Total/Week **34**			

II B. Tech. – II Semester (E.E.E)

S.No.	Course Code	Subject	L	T	P	C
1.	16HS613	Probability & Statistics	3	1	-	3
2.	16CE112	Fluid Mechanics & Hydraulic Machinery	3	1	-	3
3.	16EE214	Electromagnetic Fields	3	1	-	3
4.	16EC411	Analog Electronic Circuits	3	1	-	3
5.	16EE215	Electrical Machines –II	3	1	-	3
6.	16EE217	Electrical Machines-I Lab	-	-	4	2
7.	16EC414	Analog Electronic Circuits Lab	-	-	4	2
8.	16CE116	Fluid Mechanics & Hydraulic Machinery Lab	-	-	4	2
Credit Course						
9.	COE-II	Comprehensive Online Examination-II				1
Audit Course						
10.	16HS614	Comprehensive Soft Skills	3	-	-	-
Contact Periods / Week			18	5	12	**22**
			Total/Week **35**			

III B. Tech. – I Semester (EEE)

S.No.	Course Code	Subject	L	T	P	C
11.	16EE216	Linear Control Systems	**3**	**1**	**-**	**3**
12.	16EE218	Electrical Power Transmission Systems	**3**	**1**	**-**	**3**
13.	16EE219	Power Electronics	**3**	**1**	**-**	**3**
14.	16EE220	Electrical Machines-III	**3**	**1**	**-**	**3**
15.	16EC402	Switching Theory and Logic Design	**3**	**1**	**-**	**3**
16.	16EC417	Linear IC Applications	**3**	**1**	**-**	**3**
17.	16EE221	Electrical Machines-II Lab	**-**	**-**	**4**	**2**
18.	16EE222	Control Systems and Simulation Lab	**-**	**-**	**4**	**2**
Credit Course						
19.	COE-III	Comprehensive Online Examination-III	**-**	**-**	**-**	**1**
Audit Course						
20.	16HS616	Aptitude Practice-I	**3**	**-**	**-**	**-**
Contact Periods / Week			**21**	**6**	**8**	**23**
			Total/Week 35			

III B. Tech. – II Semester (EEE)

S.No.	Course Code	Subject	L	T	P	C
1.	16EE223	Power Semiconductor Drives	**3**	**1**	**-**	**3**
2.	16EE224	Electrical and Electronic Measurements	**3**	**1**	**-**	**3**
3.	16EE225	Switch Gear and Protection	**3**	**1**	**-**	**3**
4.	16EE226	Power System Analysis	**3**	**1**	**-**	**3**
5.	16EC423	Microprocessors & Microcontrollers	**3**	**1**	**-**	**3**
6.	16HS615	Advanced English Language and Communication Skills Lab.	**-**	**-**	**4**	**2**
7.	16EE227	Power Electronics and Simulation Lab	**-**	**-**	**4**	**2**
8.	16EC428	Microprocessors and Microcontrollers lab	**-**	**-**	**4**	**2**
Credit Course						
9.	COE-IV	Comprehensive Online Examination-IV	**-**	**-**	**-**	**1**
Audit Course						
10.	16HS617	Aptitude Practice-II	**3**	**-**	**-**	**-**
Contact Periods / Week			**18**	**5**	**12**	**22**
			Total/Week **35**			

IV B. Tech. – I Semester (EEE)

S.No.	Course code	Subject	L	T	P	C
1	16EE228	Power System Operation and Control	**3**	**1**	**-**	**3**
2	16EE229	Electrical Distribution Systems	**3**	**1**	**-**	**3**
3	16EC422	Digital Signal Processing	**3**	**1**	**-**	**3**
4	16MB750	Managerial Economics and Financial Analysis	**3**	**1**	**-**	**3**
5.	16EE230 16EE231 16EE232	**Department Elective-I** Principles of Power Quality HVDC Transmission Systems Smart Grid technologies	**3**	**1**	**-**	**3**
6	16CE145 16ME313 16EC443 16CS511 16MB752	**Open Elective** Elements of Road Traffic Safety Non-Conventional Energy Resources Mat lab Programming Data Base Management Systems Intellectual Property Rights	**3**		**-**	**3**
7.	16EE233	Power Systems and Simulation Lab	**-**	**-**	**4**	**2**
8.	16EE234	Electrical Measurements Lab	**-**	**-**	**4**	**2**
Contact Periods / Week			**18**	**5**	**8**	
			Total/Week 31			**22**

IV B.Tech. – II Semester (E.E.E)

S.No	Course code	Subject	L	T	P	C
1	16MB751	Entrepreneurship Development	**3**		**-**	**3**
2	16EE235 16EE236 16EE237	**Department Elective-II** Advanced Control Theory FACTS Controllers Soft Computing Techniques	**3**	**1**	**-**	**3**
3	16EE238 16EE240 16EE241	**Department Elective-III** Utilization of Electrical Power High Voltage Engineering Special Electrical Machines	**3**		**-**	**3**
4	**MOOCS**	**Department Elective-IV** MOOC Courses- Offered by Swayam/NPTEL/NISTE - suggested by the department(Online Courses)			**-**	**3**
5	16EE242	Seminar	**-**	**4**	**-**	**2**
6	16EE243	Project Work	**-**	**-**	**20**	**10**
Contact Periods / Week			**09**	**05**	**20**	
			Total/Week 34			**24**

Note : L – Lecture hour ; T – Tutorial ; Drg – Drawing ; P- Practicals

Total credits:178

Year	1st year		2nd year		3rd year		4th year		Total
Semester	I sem	II sem	I sem	II sem	I sem	II sem	I sem	II sem	
Working hours	30	33	34	35	35	35	31	34	270
Credits	21	21	23	22	23	22	22	24	178

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY
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I B. Tech. – I Sem. (E.E.E)	**L**	**T**	**C**
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(16HS601) FUNCTIONAL ENGLISH
(Common to All Branches)

Course Objectives:

- To develop communication skills among the students.
- To construct proficiency in academic and social purpose to improve their grammatical accuracy
- To understand LSRW skills and inculcate the habit of reading for pleasure.
- To obtain study skills and communication skills in formal and informal situations.
- To use appropriate vocabulary

Course Outcomes:

Students will be able to

- Use LSRW skills through the prescribed text and develop their ability to communicate effectively.
- Articulate well among themselves and with Faculty.
- Construct compound sentences using common conjunctions.
- Manage to organize and deliver oral presentations.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively.

UNIT I

MINDSCAPES (Environmental Consciousness: Pollution - How To Regain Green Cover):

1. Learning English Language through Literature (Secret of work- Swami Vivekananda)
2. Present, Past and Future aspects
3. Introducing oneself

Grammar: Parts of speech-Kinds of sentences-Tenses
Vocabulary: Synonyms & Antonyms-Affixes – Phrasal verbs
Listening & Reading Activities
Writing: Paragraph writing-Note taking & Note making
Phonetics- Syllabification

UNIT II

MINDSCAPES (Emerging Technologies: Solar Thermal Power- Nano Technology):

1. Learning English Language through Literature (Stopping by Woods on a Snowy Evening- Robert Frost)
2. Set in the Past
3. Inter-personal skills Grammar – Articles – Past Events – Voice & Impersonal passive

voice – Gerund & -ing forms
to-infinitives
Vocabulary: Phrases – Idioms – word roots
Listening & Reading Activities
Writing: Letter writing-Informal-Formal
Phonetics – Accent

UNIT III

MINDSCAPES (Global Issues: Child Labor- E- Waste):

1. Learning English Language through Literature (What is my Name?-P.Satyavathi)
2. Describing a person, place and object
3. Possibilities

Grammar: Modals – Conditionals – Framing Questions – Compound nouns
Verbs
Vocabulary: One word substitute– Fixed expressions– Clauses
Listening & Reading Activities
Writing: Information transfer
Intonation: Falling & Rising

UNIT IV

MINDSCAPES (Space Trek: Hubble Telescope- Genesis of ISRO):

1. Learning English Language through Literature (Man in Black-Oliver Goldsmith)
2. Analytical thinking
3. Co-operative learning

Grammar: Concord–Reported speech-compare & contrast
Vocabulary: Numerical expressions-definitions-collocations
Listening & Reading
Writing: Summary-Essay writing-Making instructions
JAM

UNIT V

MINDSCAPES (Media Matters: History Of Media- Power of Media- Interviews):

1. Learning English Language through Literature (The Power of Prayer-Abdul Kalam)
2. Exploring creative ideas
3. Synthesis of sentences

Grammar: Simple, compound and complex-Spotting errors
Vocabulary: Discourse markers-Homonyms-Homophones-Homographs
Listening & Reading Activities
Writing: Writing recommendations-scrambled sentences
Convincing others

TEXT BOOKS:

1. *Mindscapes:* English for Technologists and Engineers- Orient Black Swan, 2014.
2. *Paths to Progress in English: Orient Black Swan*

REFERENCES:

1. *Raymond Murphy's Intermediate English Grammar with CD*, Raymond Murphy, Cambridge University Press, 2012.
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*, Anjana Agarwal, New Age International Publishers, 2011.
5. *Keep Talking*, F. Klippel, Cambridge University Press, 2013.
6. *Listening Extra*, Miles Craven, Cambridge University Press, 2008.
7. *Reading Extra*, Liz Driscoll, Cambridge University Press, 2004.
8. *Writing Extra*, Graham Palmer, Cambridge University Press, 2004.
9. *Speak Well*, Jayashree Mohanraj et al, Orient Blackswan, 2013.

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I B. Tech. – I Sem. (E.E.E)	**L**	**T**	**C**
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(16HS602) ENGINEERING MATHEMATICS-I
(Common to all Branches)

Course Objectives:

- To train the students thoroughly in Mathematical concepts of ordinary differential equations, multiple integrals, Laplace Transforms and their applications
- To prepare students for lifelong learning and successful careers using mathematical concepts of ordinary differential equations, multiple integrals, Laplace Transforms and their applications
- To develop the skill pertinent to the practice of the mathematical concepts including the student abilities to formulate and modeling the problems, to think creatively and to synthesize information

Course Outcomes:

- The students become familiar with the application of ordinary differential equations, multiple integrals, Laplace Transforms and their applications
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems with engineering applications

UNIT I

DIFFERENTIAL EQUATIONS: Exact and Non-exact (Integrating factors), Linear and Bernoulli differential equations, Applications to first order equations: Orthogonal Trajectories, Newton‘s Law of Cooling, Natural Law of Growth and Decay. Linear Differential Equations of second and higher order with constant coefficients. Method of variation of parameters. Applications of linear differential equations- Simple electric circuits.

UNIT II

Taylor‘s and Maclaurin‘s Series, Functions of several variables, Jacobian, Maxima and Minima of functions of two variables, Lagrange‘s method of undetermined Multipliers with three variables only. Radius of curvature.

UNIT III

MULTIPLE INTEGRALS: Evaluation of Double and Triple integrals, Change of order of integration, Change of variables. Simple applications to areas.

UNIT IV

LAPLACE TRANSFORM I: Laplace transforms of standard functions, First shifting Theorem, Transforms of derivatives and integrals, Unit step function, Second shifting theorem, Laplace transforms of Periodic functions.

UNIT V

LAPLACE TRANSFORM II: Inverse Laplace Transforms, Convolution theorem, Application of Laplace transforms to ordinary differential equations of first and second order.

TEXT BOOKS:

1. *Higher Engineering Mathematics*, B.S.Grewal, Khanna publishers-42nd Edition (2012).
2 *Engineering Mathematics* Volume-I, by T.K.V. Iyengar, S.Chand publication-12thEdition.

REFERENCES:

1. *Engineering Mathematics*, Volume - I, E. Rukmangadachari & E.Keshava Reddy, Pearson Publisher 1st Edition (2010)
2. *Engineering Mathematics*, Volume - I, by G.S.S.Raju, CENGAGE publisher (2013).
3. *Advanced Engineering Mathematics*, by Erwin Kreyszig, Wiley India-10th Edition (2012).
4. *Higher Engineering Mathematic*s, by B.V.Ramana, Mc Graw Hill publishers (2008).
5. *Advanced Engineering Mathematics*, by Alan Jeffrey, Elsevier-1st Edition (2001).

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I B. Tech. – I Sem. (E.E.E)	**L**	**T**	**C**
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(16HS603) ENGINEERING PHYSICS
(Common to CE, EEE & ME)

Course Objectives:

- To evoke interest on applications of superposition effects like interference & diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric wave guides along with engineering applications.
- To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays & non-destructive evaluation using ultrasonic techniques.
- To get an insight into the microscopic meaning of conductivity, classical & quantum free electron model & evaluation of band theory to distinguish materials & to understand electron transport mechanism in solids.
- To open new avenues of knowledge & understanding semiconductor based electronic devices, basic concepts and applications of semiconductors & magnetic materials have been introduced which find potential in the emerging micro device applications.
- To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them & their fascinating applications. Considering the significance of microminiaturization of electronic devices & significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties & applications in emerging technologies are elicited.

Course Outcomes:

- The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.
- The important properties of crystals like the presence of long range order and periodicity, structure determination using X-ray diffraction are focused with defects in crystals & ultrasonic non destructive techniques.
- The discrepancies between the classical estimates & laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.
- The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused.
- The properties and device applications of semiconducting & magnetic materials are illustrated.
- The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.

UNIT I

PHYSICAL OPTICS, LASERS AND FIBRE OPTICS: Physical Optics: Interference - Introduction - Interference in thin films by reflection – Newton's Rings. Diffraction - Introduction- Fraunhofer diffraction due to single slit and diffraction grating.

LASERS: Introduction - Characteristics of laser – Spontaneous and stimulated emission of radiation –-Einstein's relation, Population inversion – Excitation mechanism & optical resonator – ND: YAG laser - He-Ne laser, semiconductor diode laser -Applications of lasers.

FIBRE OPTICS: Introduction– Construction and working principle of optical fiber – Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in fibers -Optical fiber communication system – Applications of optical fibers in communications, sensors and medicine.

UNIT II

CRYSTALLOGRAPHY, ACOUSTICS AND ULTROSONICS: Crystallography**:** Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice –Crystal systems – Packing fractions of SC, BCC and FCC-Directions and planes in crystals – Miller indices – Inter planar spacing in cubic crystals – X-ray diffraction - Bragg's law.

Acoustics Intensity – Absorption coefficient and its determination –Reverberation – Reverberation time (qualitative treatment) – Factors affecting acoustics of buildings and their remedies. Ultrasonics Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

UNIT III

QUANTUM MECHANICS AND FREE ELECTRON THEORY: Quantum Mechanics**:** Introduction to matter waves – de'Broglie hypothesis - Heisenberg's uncertainty principle and its applications - Schrödinger's time independent and time dependent wave equation – Significance of wave function - Particle in a one dimensional infinite potential well .

Free Electron theory: Classical free electron theory - Equation for electrical conductivity - Quantum free electron theory - Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

UNIT IV

SEMICONDUCTORS AND MAGNETIC MATERIALS: Semiconductor Physics: Introduction – Intrinsic and extrinsic semiconductors (qualitative treatment), Drift & diffusion currents - Einstein's relation– Hall effect Direct & indirect band gap semiconductors. Magnetic materials: Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials – Hysteresis - Soft and hard magnetic materials and applications.

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 - Significance of nanoscale - Surface area and quantum confinement –Synthesis of nanomaterials: ball mill, chemical vapour deposition, sol-gel, plasma arcing –applications of nano materials

TEXT BOOKS:

1. *Engineering Physics* – K.Thyagarajan, 5th Edition, MacGraw Hill Publishers, NewDelhi, 2014.
2. *Engineering Physics* - Gaur R.K. and Gupta S.L. Dhanpat Rai Publishers, 2009

REFERENCES:

1. *Engineering Physics* - Mani Naidu S.,Pearson Publications, 2011.
2. *Engineering Physics* - Arumugam K.-PHI Learning Pvt., India, 2009.
3. *Engineering Physics* -Palanisamy P.K, SCITECH Publications, 2011.
4. *Engineering Physics* -Rajagopal K. PHI, New Delhi, 2011.
5. *Engineering Physics* – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, 10th Edition,S.Chand and Company, New Delhi, 2014

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I B. Tech. – I Sem. (E.E.E)	**L**	**T**	**C**
	3	**1**	**3**

(16CS501) COMPUTER PROGRAMMING
(Common to all Branches)

Course Objectives:

- To understand the core aspects of computer problem solving techniques
- To understand the programming language constructs
- To understand the programming paradigms

Course Outcomes:

- Able to design the flowchart and algorithm for real world problems
- Able to learn and understand new programming languages
- Able to construct modular and readable programs
- Able to write C programs for real world problems using simple and compound data types

UNIT I

OVERVIEW OF COMPUTERS AND PROGRAMMING: Electronic Computers Then and Now – Computer Hardware - Computer Software - Algorithms - Flowcharts - Software Development Method - Applying the Software Development Method. C Language Elements- Variable Declarations & Data Types Executable Statements – General form of a C Program- Expressions - Precedence and Associativity- Operators and Expression – Type Conversions

UNIT II

DECISION STATEMENTS: If Statement, If-else Statement, Nested- If-else Statement, Else if Ladder, Switch case – break – continue – go to Statements – Example Programs Loop Control Statements – for loop – while loop - do while – Example Programs

UNIT III

ARRAYS: Declaring and referencing Arrays – Array Subscripts, Using for loops for sequential access – Using Array elements as Function arguments – Array arguments – Multidimensional Arrays – Example Programs

STRINGS: Introduction – Declaring and Initializing String variables – Reading Strings from Terminals – Writing Strings to Screen – Arithmetic Operations on Characters – Putting Strings together – Comparison of two Strings – String Handling Functions – Table of Strings- Other Features of Strings.

UNIT IV

FUNCTIONS: Definition – Function without Arguments – Functions with input arguments – Functions with simple output parameters – Communication among Functions – Scope – Storage clauses – Type Qualifiers – Recursion

Pointers: Introduction – Understanding Pointers – Accessing the address of a variable – Declaring Pointers variables- Initialization of Pointer variables – Accessing a variable through its Pointer – Chain of Pointers – Pointer Expressions – Pointer Increment & Scale Factors – Pointers and Arrays – Pointers and Character Strings – Array of Pointers – Pointers as Function Arguments .- Function returning Pointers – Pointers to Function.

UNIT V

STRUCTURES: Introduction – Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization – Copying and Comparing Structure variables – Operations on Individual members – Arrays of Structures – Arrays with in Structures – Structures with in Structures – Structures and Functions – Unions –Bit fields – TYPEDEF – ENUM

File Management in C: Introduction – Types of Files – Defining and Opening a File – Closing a File – Input / Output Operations on Files – Error handling during IO Operations – Random access to files – Command line arguments. Preprocessor - #define and #include.

TEXT BOOKS:

1. Programming in C and Data Structures – Jeri R. Hanly, Elliot B Koffman, Ashok Kamthane, A Anand Rao – Pearson.(UNITS I, II and III)
2. Programming in C and Data Structures – E Balagurusamy - McGrawHill

REFERENCES:

1. Computer Fundamentals and C Programming - Dr. P. Chenna Reddy, ISBN: 9789351045885, Publisher: Pothi.com
2. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, Oxford University Press.
3. ―C from Theory to Practice‖- George S. Tselikis- Nikolaos D. Tselikas- CRC Press.
4. ―Programming with C‖- R S Bichkar- University Press.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education. (UNIT-I)

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

(16HS606) HUMAN VALUES AND PROFESSIONAL ETHICS
(Common to CE, EEE & ME)

Course Objectives:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Course Outcomes:

Students undergoing this course are able to

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

.**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 – Introduction to 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 – Engineers as responsible Experimenters – 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. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009
3. John R Boatright, ―Ethics and the Conduct of Business‖, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, ―Fundametals of Ethics for Scientists and Engineers‖, Oxford University Press, Oxford, 2001

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I B. Tech. – I Sem. (E.E.E) **P C**
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(16HS608) ENGINEERING PHYSICS LABORATORY
(Common to CE, EEE & ME)

Course Objectives:

- Will recognize the important of optical phenomenon like interference and diffraction.
- Will understand the role of optical fibre parameters and signal losses in communication.
- Will recognize the importance of energy gap in the study of conductivity and Hall- Effect in a semiconductor.
- Will understand the application of B-H curve.
- Will acquire a practical knowledge of studying the crystal structure in terms lattice constant.
- Will recognize the application of laser in finding the particle size and its role in diffraction studies.
- Will learn to synthesis of the nanomaterials and recognize its importance by knowing its nano particle size and its impact on its properties.

Course Outcomes:

- Would recognize the importance of optical phenomenon like interference and diffraction.
- Would have acquired the practical application knowledge of optical fibre, semiconductor, dielectric and magnetic materials, crystal structure and lasers by the study of their relative parameters.
- Would recognize the significant importance of nanomaterials in various engineering fields.

Any 10 of the following experiments has to be performed during the I year II Sem.

1. Determination of radius of curvature of a Plano-convex lens by forming Newton‘s rings.
2. Determination of wavelength of given source using diffraction grating in normal incidence method.
3. Determination of Numerical aperture, acceptance angle of an optical fiber.
4. Determination of the Energy gap of a Semiconductor diode.
5. Hall-Effect – Determination of mobility of charge carriers.
6. B-H curve – Determination of hysteresis loss for a given magnetic material.
7. Determination of Crystallite size using X-ray pattern (Powder) using Debye- Scheerer method.
8. Determination of particle size by using laser source.
9. Determination of dispersive power of a prism.
10. Determination of thickness of the thin wire using wedge Method.
11. Laser: Diffraction due to single slit.
12. Laser: Diffraction due to double slit.
13. Laser: Determination of wavelength using diffraction grating.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee‘s method.
15. Synthesis of nano material by any suitable method.

REFERENCES:

1. *Engineering Physics Practicals* – NU Age Publishing House, Hyderabad.
2. *Engineering Practical Physics* – Cengage Learning, Delhi.

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I B. Tech. – I Sem. (E.E.E) **P** **C**
4 **2**

(16CS502) COMPUTER PROGRAMMING LAB
(Common to all Branches)

Course Objectives:

- To make the student learn C Programming language.
- To make the student solve problems, implement those using C & C++ programming languages.
- To strengthen the ability to identify and apply the suitable data structure for the given real world problem.

Course Outcomes:

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

- Apply problem solving techniques of C to find solution.
- Use C language features effectively to implement solutions.
- Use C++ language features effectively to solve problems.
- Identify and develop apt searching and sorting technique for a given problem.
- Identity, design and develop the appropriate data structure for a given problem or application.

LIST OF EXPERIMENTS/TASKS:

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, to read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
3. Write a program to find the roots of a Quadratic equation.
4. Write a program to compute the factorial of a given number.
5. Write a program to check whether the number is prime or not.
6. Write a program to find the series of prime numbers in the given range.
7. Write a program to generate Fibonacci numbers in the given range.
8. Write a program to find the maximum and minimum of a set of numbers.
9. Write a program to reverse the digits of a number.
10. Write a program to find the sum of the digits of a number.
11. Write a program to find the sum of positive and negative numbers in a given set of numbers.
12. Write a program to check for number palindrome.
13. Write a program to evaluate the sum of the following series up to n terms

    e^x =1+x+x2/2!+x3/3!+x4/4!+--------
14. Write a program to generate Pascal Triangle.
15. Write a program to read two matrices and print their sum and product in the matrix form.

16. Write a program to read matrix and perform the following operations.
    i. Find the sum of Diagonal Elements of a matrix.
    ii. Print Transpose of a matrix.
    iii. Print sum of even and odd numbers in a given matrix.
17. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.
18. Write a program to insert a substring in to a given string and delete few characters from the string. Don‘t use library functions related to strings.
19. Write a program to split a „file‟ in to two files, say file1 and file2. Read lines into the file from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
20. Write a program to merge two files.
21. Write a program to read a set of strings and sort them in alphabetical order.
22. Write a program to read two strings and perform the following operations without using Built in string Library functions and by using your own implementations of functions.
    i. String length determination ii .Compare Two Strings
    ii. Concatenate them, if they are not equal iv. String reversing
23. Write programs using recursion for finding Factorial of a number, GCD, LCM, and solving Towers of Hanoi problem.
24. Write a program to exchange two numbers using pointers.
25. Write a program to read student records into a file. Record consists of roll no, name and Marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
26. A file consists of information about employee salary with fields employee id, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employee id, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions are user specified. Compute the Gross and Net salary of the employee and update the file.
27. Write a program to perform Base (decimal, octal, hexadecimal,…) conversions.
28. Write a program to find the square root of a number without using built-in library function.
29. Write C program to convert a string to number.
30. Write C program to generate multiplication tables from 11 to 20.

REFERENCES:

1. How to Solve it by Computer, R.G. Dromey, Pearson.
2. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. Let us C Yeswant Kanetkar, BPB publications
4. Pointers in C, Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.

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I B. Tech. – I Sem. (E.E.E) **P C**
4 2

(16ME301) ENGINEERING & IT WORK SHOP LAB
(Common to CE, EEE & ME)

Course Educational Objectives:

ENGINEERING WORKSHOP

- The course provides hands-on training in the trades of Carpentry, Fitting, House-wiring, Tin Smithy, Foundry. Overview of metal cutting processes, plumbing and welding is provided through live demonstrations.

IT WORKSHOP

- This course deals with practice sessions on PC hardware, Internet, World Wide Web, MS-Word, Excel, Power Point and Publisher. Demonstrations on installations of system software such as MS-Windows, Linux and device drivers, hardware and software troubleshooting, and protecting the personal computer from viruses and other cyber-attacks are include.

Course Outcomes:

ENGINEERING WORKSHOP

After completion of this course, a successful student will be able to :

- Utilize workshop tools for engineering practice.
- Employ skills for the production a component for real time applications.
- Appreciate the hard work and intuitive knowledge of the manual workers.

IT WORKSHOP

After completion of this course, a successful student will be able to:

- Can install the softwares in the computers
- Utilize skills for the development of application softwares
- Can protect personal computer from virus and other cyber attacks

LIST OF EXPERIMENTS

1. TRADES FOR EXERCISES

a. Carpentry shop: Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, Cross lap joint, Mortise and tenon T joint, Bridle T joint from soft wood stock.

b. Fitting shop: Two joints (exercises) from: Square joint, V joint, Half round joint or Dove tail joint out of 100 x 50 x 5 mm M.S. stock.

c. **Sheet metal shop**: Two jobs (exercises) from: Tray, Cylinder, Hopper or Funnel from out of 22 or 20 gauge G.I. sheet.

d. **House-wiring**: Two jobs (exercises) from: Wiring for ceiling rose and two lamps (bulbs) with independent switch, two way switch, controls with or without looping, wiring for stair case lamp, wiring for water pump with single phase starter.

e. **Foundry**: Preparation of two moulds (exercises): for a single pattern and a double pattern.

f. **Welding**: Preparation of two welds (exercises): Single V butt joint, Lap joint, Double V butt joint or T fillet joint.

2. TRADES FOR DEMONSTRATION:

a. Plumbing

b. Machine Shop

c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

REFERENCES:

1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009
2. Work shop Manual, P.Kannaiah & K.L.Narayana, SciTech Publishers.
3. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.

IT WORKSHOP

LIST OF EXPERIMENTS

1. Preparing your Computer Knowledge (5 weeks)

2. Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

3. Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working

parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

4. Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

5. Operating system features: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

6 Networking and Internet (4 weeks)

6.1 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.

6.2 Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.
If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

7. Antivirus: Students should download freely available Antivirus software, install it and use itto check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc

8. Productivity tools (6 weeks)

8.1 Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

8.2 Spreadsheet: 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.

8.3 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, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

REFERENCES:

1. Introduction to Computers, Peter Norton, Mc Graw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams‖, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining& Repairing PCs‖, Bigelows, TMH

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I B. Tech. – II Sem. (E.E.E)	**L**	**T**	**C**
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(16HS610) PROFESSIONAL ENGLISH
(Common to All Branches)

Course Description: The course content focuses on LSRW skills and vocabulary building to enrich their command over language. Relevant task based activities are also carried out to enhance their communication skills.

Course Objectives:

- To develop communication skills among the students
- To construct proficiency in academic and social purpose.
- To improve their grammatical accuracy.
- To understand LSRW skills and inculcate the habit of reading for pleasure.

Course Outcomes:

Students will be able to

- Use LSRW skills through the prescribed text and develop their ability to communicate effectively.
- Articulate well among themselves and with Faculty.
- Construct compound sentences using common conjunctions.
- Manage to organize and deliver oral presentations.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively

UNIT I

MINDSCAPES (Lessons From the past: Importance of the Past)

1. Learning English Language through Literature (*Playing the English Gentleman* M.K.Gandhi)
2. Oral presentation
3. Effective writing

Grammar: Relative clauses-Adjectives
Vocabulary: Sequencing words
Listening & Reading Activities
Writing: Analytical paragraph writing-Minutes of meeting

UNIT II

MINDSCAPES (Energy: Renewable and Non-renewable Sources - Alternative Sources)

1. Learning English Language through Literature. (*The Portrait of a Lady* -Kushwant Singh)
2. Preparing and presenting slides, Telephone etiquette

3. Making drafts
   Grammar: Adverbs - prepositions -cause and effect expressions
   Vocabulary: phrasal verbs - Technical vocabulary-Extended definitions
   Listening & Reading Activities
   Writing: Report writing

UNIT III

MINDSCAPES (Engineering Ethics: Biotechnology - Protection from Natural Calamities)

1. Learning English Language through Literature (*La Belle Dame Sans Mercy*-John Keats)
2. Poster presentation, Debate
3. Technical drafting
   Grammar: Using connectives-Gap filling exercise using appropriate tense form
   Vocabulary: Acronyms & Abbreviations
   Listening & Reading Activities
   Writing: Writing projects

UNIT IV

MINDSCAPES (Travel and Tourism: Atithi Devo Bhava- Tourism in India)

1. Learning English Language through Literature (*A Marriage Proposal*-Anton Chekov)
2. Group Discussion
3. Reading comprehension
   Grammar: Structure indicating purpose-Subject-verb agreement
   Vocabulary: emoticons-cloze test
   Listening & Reading
   Writing: Intensive and extensive

UNIT V

MINDSCAPES (Getting Job Ready: SWOT Analysis- Preparing for Interviews)

1. Learning from Literature (*Bird Sanctuary* -Sarojini Naidu)
2. Interview etiquette
3. Job application
   Grammar: Spotting errors, Gap filling exercises using ―gerunds‖ & present participle forms
   Vocabulary: verbal ability
   Listening & Reading Activities
   Writing: Covering letter, Resume, Curriculum vitae
   Convincing others

TEXT BOOKS:

1. *Mindscapes*: *English for Technologists and Engineers*, Orient Blackswan, 2014
2. *Paths to Progress in English:* Orient Black Swan

REFERENCES:

1. *Effective Tech Communication***,** Rizvi, Tata McGraw-Hill Education, 2007.
2. *Technical Communication,* Meenakshi Raman, Oxford University Press.
3. *English Conversations Practice,* Grant Taylor, Tata Mc GrawHill publications,2013**.**
4. *Practical English Grammar,* Thomson and Martinet, OUP, 2010.

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I B. Tech. – II Sem. (E.E.E)	**L**	**T**	**C**
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(16HS611) ENGINEERING MATHEMATICS-II
(Common to all Branches)

Course Objectives:

- To train the students thoroughly in Mathematical concepts of Matrices, Vector calculus, Fourier series, Fourier transforms and Partial differential equations
- To prepare students for lifelong learning and successful careers using mathematical concepts of Matrices, Vector calculus, Fourier series, Fourier transforms and Partial differential equations
- To develop the skill pertinent to the practice of the mathematical concepts including the Student abilities to formulate and modeling the problems, to think creatively and to Synthesize information

Course Outcomes:

- The students become familiar with the application of Matrices, Vector calculus, Fourier series, Fourier transforms and Partial differential equations
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems with engineering applications

UNIT I

MATRICES: Rank of a matrix, Echelon form, Normal form, Consistency of system of linear equations (Homogenous and Non-homogeneous), Eigen values, Eigen vectors, Cayley Hamilton theorem (Only statement) and its applications. Quadratic forms, Diagonolization.

UNIT II

VECTOR CALCULUS: Gradient, Divergence, Curl of a vector and related properties, Line, Surface and Volume integrals, Green‘s, Stoke‘s and Gauss divergence theorems (Only statement) and its applications.

UNIT III

FOURIER SERIES: Determination of Fourier coefficients- Fourier series- Even and odd functions, Fourier Series in an arbitrary interval, Periodic function, Half range sine and cosine series, Harmonic Analysis.

UNIT IV

Fourier integral theorem (only statement), Fourier sine and cosine integrals. Fourier transform, Fourier sine and cosine transforms, properties, Inverse transforms, Finite fourier transforms.

UNIT V

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, Method of separation of variables, Solution of one dimensional wave equation, Heat equation and two dimensional Laplace equation under initial and boundary conditions.

TEXT BOOKS:

1. *Higher Engineering Mathematics*, B.S.Grewal, Khanna publishers
2. *Engineering Mathematics Volume-I*, by T.K.V. Iyengar, S.Chand publication
3. *Mathematical Methods* by T.K.V. Iyengar, S.Chand publication

REFERENCES:

1. *Engineering Mathematics*, Volume - I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher 1st Edition (2010)
2. *Fourier Series and Integral Transforms*, by S.Sreenadh & S. Ranganatham, S.Chand Publication (2014)
3. *Engineering Mathematics*, Volume - I, by G.S.S.Raju, CENGAGE publisher.(2013)
4. *Advanced Engineering Mathematics*, by Erwin Kreyszig, Wiley India-10th Edition (2012)
5. *Advanced Engineering Mathematics*, by Erwin Kreyszig, Wiley India-10th Edition (2012)
6. *Higher Engineering Mathematics*, by B.V.Ramana, Mc Graw Hill publishers (2008)
7. *Advanced Engineering Mathematics*, by Alan Jeffrey, Elsevier-1st Edition (2001)

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I B. Tech. – II Sem. (E.E.E)	**L**	**T**	**C**
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(16HS604) ENGINEERING CHEMISTRY
(Common to CE, EEE & ME)

Course Objectives:

- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand the concepts of chemistry and apply to various materials for engineering applications.

Course Outcomes:

The student is expected to:

- Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
- Understand the electrochemical sources of energy
- Understand industrially based polymers, various engineering materials.
- Understand characteristics and applications of fuels and Lubricants.

UNIT I

ELECTROCHEMISTRY, CELL & CORROSION: Electrolytes- Strong and Weak electrolytes- Definition- examples. Electrolysis - Industrial applications of electrolysis. Cell- Galvanic cell, Batteries- Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries), Fuels cells - (Hydrogen-Oxygen and Methanol-Oxygen). Corrosion- Introduction, type of corrosion (Concentration cell corrosion, Galvanic corrosion), Chemical (Dry) and Electrochemical (Wet) Theory of corrosion, Galvanic series, factors affecting the corrosion (Metal and environment) Prevention- Cathodic protection (Sacrificial anode and impressed current), electroplating (Copper, nickel and chromium) and electroless plating (Copper and nickel).

UNIT II

WATER AND ITS TREATMENT: Hardness of water and its Units, Estimation of hardness by EDTA method.

Troubles of Boilers: Scale & Sludge, Priming and Foaming, and Boiler Corrosion.

Treatment of Boiler Feed water:

Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes.

UNIT III

FUEL TECHNOLOGY AND LUBRICANTS: Fuel Technology- Introduction, classification, characteristics of a good fuel, calorific value, liquid fuels, petroleum, refining of petroleum, knocking, octane number, cetane number, power alcohol, synthetic petrol, gaseous fuels, important gaseous fuels.

Lubricants – Definition, functions of lubricants, mechanism of lubrication, properties of lubricants – viscosity, flash and fire points, cloud and pour points, aniline points, neutralization number and mechanical strength.

UNIT IV

POLYMERS: Introduction- Basic concepts of polymerization, types of polymerization (Chain Growth – Addition, step growth (Condensation), Mechanism: Cationic , anionic, free radical and coordination covalent.

Plastomers – Thermosetting and thermoplastics, preparation, properties and engineering applications of PVC, Teflon, Bakelite and nylons.

Elastomers – Natural rubber, processing of natural rubbers, compounding of rubber.

Synthetic rubber- Preparation, properties and engineering applications of Buna-S, Buna-N, polyurethane, polysulfide (Thiokol) rubbers.

Conducting polymers- mechanism, synthesis and applications of polyacetyline, polyaniline.

Inorganic polymers: Basic introduction, silicones, polyphospazines applications.

UNIT V

ENGINEERING MATERIALS: Cement- composition of Portland cement, preparation (dry and wet process) setting and hardening of cement.

Refractories – introduction, classification, properties and applications.

Nanomaterials – Introduction-Carbon Nano Tubes, Fullerenes. Semi conductors, superconductors and quantum dots.

TEXT BOOKS:

1. *Engineering Chemistry*, First Edition, Jayaveera KN, Subba Reddy GV and Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013.
2. *A Text Book of Enigneering Chemistry*, 15th Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

REFERENCES:

1. *A Text book of Engineering Chemistry*, 12th Edition, SS Dhara, Uma, S. Chand Publications, New Delhi, 2010.
2. *Engineering Chemistry*, First edition, Chandra Sekhar K B, Das U N and Sujatha Mishra, SCITECH Publications India Pvt. Limited, 2010.
3. *Engineering Chemistry*, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.
4. *Concise Inorganic Chemistry*, 7th Edn, Lee J.D., Blackwel Science Publications Oxford, London, 2004.

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I B. Tech. – II Sem. (E.E.E)	**L**	**T**	**D**	**C**
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(16ME302) ENGINEERING GRAPHICS
(Common to CE, EEE & ME)

Course Objectives:

- To familiarize the students in basic concept of conic sections, projections and developments of Objects.
- To develop the imagination and drafting skills of students.

Course Outcomes:

Students undergoing this course are able to

- Frame ideas based on the conceptual modeling and design
- Provide good understanding of the methods involved in preparing various views in engineering drawings
- Can prepare 2D and 3D diagrams of various objects

INTRODUCTION (Not to be included for examination)

Drawing instruments and their use – Lettering - Dimensioning – Simple Geometrical constructions.

UNIT I

CONIC SECTIONS: Construction of Ellipse, Parabola, Hyperbola (General and special methods). Special Curves: Cycloids, Involutes.

UNIT II

POINTS: Projections of points

LINES: Projections of straight lines - Determination of true lengths and true inclinations – line inclined to both reference planes., traces.

UNIT III

PLANES: Projections of planes – Surface inclined to both reference planes

SOLIDS: Projections of simple solids (Prisms, pyramids, cylinder and cone) - Axis inclined to both the planes.

UNIT IV

SECTIONS: Sections of solids (prisms, pyramids, cylinder and cone) in simple vertical position by using cutting plane inclined to one reference plane and perpendicular to the other – true shape of the section.

DEVELOPMENTS: Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinder and cone.

UNIT V

ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS: Principles of Isometric projection- Isometric Scale- Isometric Views- Conversion of Isometric to orthographic views– Isometric projection of simple solids (Cube, Cylinder and Cone)

INTERPENETRATION/INTERSECTIONS OF SOLIDS: Simple solids.

COMPUTER AIDED DRAFTING: Introduction to drafting packages - orthographic views and projections and Isometric projections (demonstration only)

TEXT BOOKS:

1. *Engineering Drawing*, N.D.Bhatt, Charotar Publishers
2. *A text Book of Engineering Drawing*, K.L.Narayana, Kannaiah, Scitech Publishers, 2010
3. *Engineering Graphics with using AutoCAD,2007*. Jeyapoovan.T, Vikas Publishing House

REFERENCES:

1. *Fundamentals of Engineering Drawing*, Warren J.Luzadder and Jon. M.Duff Prentice Hall of India Pvt., Ltd., Eleventh Edition, 2001.
2. *Engineering Graphics*, Bhattacharyya, S.C.Bera, I.K .International Pvt Ltd. 2009.
3. *A text Book of Engineering Drawing and Graphic*, K.Venugopal New Age Publishing New Delhi, 2008,

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I B. Tech. – II Sem. (E.E.E)

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(16EE201) ELECTRICAL CIRCUITS

Course Objectives:

- *To understand the nature of different circuit elements, fundamental laws and network theorems, Electrical Circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline*
- *To understand about phasor concepts of single phase and Magnetic circuits.*
- *To understand the concepts of Network topology, Locus diagrams and Resonance.*

Course Outcomes:

- *After completing the course, the student should be able to do the following:*
- *Given a network, find the equivalent impedance by using network reduction techniques*
- *Given a circuit and the excitation, determine the real power, reactive power, power factor etc,.*
- *Determine the current through any element and voltage across any element*
- *Apply the network theorems suitably*

UNIT-I:

INTRODUCTION

Circuit concept R,L,C parameters, Voltage and Current sources, Independent and dependent sources, source transformation, Voltage-current relationship for passive elements (for different input signals, Square, ramp, saw tooth, triangular).

Kirchhoff‘s laws, network reduction techniques, series, parallel, series parallel, star-delta or delta-star transformation, Nodal analysis, Mesh analysis, Super node and super mesh for DC excitations.

UNIT-II:

AC CIRCUITS

R.M.S, Average values and form factor for different periodic waveforms, phase and phase difference of sinusoidal alternating quantities, steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance, Power triangle, power factor.

UNIT-III

LOCUS DIAGRAMS AND RESONANCE

Locus diagrams, series R-L, R-C, R-L-C and parallel combination with variation of various parameters, Resonance, series, parallel circuits, concept of bandwidth and Q factor.

UNIT-IV

MAGNETIC CIRCUITS

Magnetic circuits, Faraday‘s laws of electromagnetic induction, concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, Analysis of series and parallel magnetic circuits.

UNIT-V

NETWORK THEOREMS

Thevenin‘s, Norton‘s, Maximum power transfer and Millman‘s theorem‘s for DC and sinusoidal excitations, Tellegen‘s, superpositon, reciprocity and compensation theorem‘s for DC and Sinusoidal excitations.

TEXT BOOKS:

1. Circuits and networks by A. Sudhakar and Shyammohan SPalli, Tata McGraw, Hill.
2. Alexander and sadiku: Fundamentals of Electric circuits, Mc, graw Hill.

REFERENCE BOOKS:

1. Network analysis by M.E Van Valkenberg
2. Engineering circuit analysis by William Hayt and Jack E.Kemmerly, McGraw Hill Company, 6th edition.

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I B. Tech. – II Sem. (E.E.E) **P 4** **C 2**

(16HS607) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB
(Common to CE, EEE & ME)

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course objectives:

- To enable students to learn better pronunciation through stress on word accent, Intonation and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence.
- To train students to use language appropriately in both formal and informal situations.
- To enhance written communication among the students.

Course outcomes:

- To become active participants in the learning process and acquire proficiency in spoken English.
- To speak with clarity and confidence thereby enhances employability skills.
- To prepare effective job application

UNIT I

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

UNIT II

5. Word Stress
6. Syllabification
7. Rules of Word Stress
8. Intonation

UNIT - III

9. Situational Dialogues/ Role Play
10. Telephonic Communication
11. JAM

UNIT IV

12. Describing Persons/ places/ things

13. Oral Presentations
14. Debate

UNIT V

15. Group Discussion
16. Job application
17. Interview skills

Minimum Requirements for ELCS Lab:

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

2. The 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 with LAN with minimum 60 multimedia systems with the following specifications:

i) P – IV Processor
   a) Speed – 2.8 GHZ
   b) RAM – 512 MB Minimum
   c) Hard Disk – 80 GB

ii) Headphones of High quality

Suggested Software:

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills
4. Walden InfoTech Software.

REFERENCES:

1. A Textbook of English Phonetics for Indian Students 2nd Ed T. Balasubramanian. Macmillian), 2012
2. A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd
3. Speaking English Effectively, 2nd Edition Krishna Mohan & NP Singh, 2011. (McMillan).
4. A Hand book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books, 2011.
5. Spring Board Success, Sharada Kouhik, Bindu Bajwa, Orient Blackswan, Hyderabad, 2010.

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(16HS609) ENGNEERING CHEMISTRY LAB
(Common to CE, EEE & ME)

Course Objectives:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

Course Outcomes:

On completion of this course, students will have the knowledge in.

- Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

Any 10 of the following experiments has to be performed during the I year I Sem.

List of Experiments:

Determination of total hardness of water by EDTA method.

1. Determination of Copper by EDTA method.
2. Estimation of Dissolved Oxygen by Winkler‘s method.
3. Estimation of iron (II) using diphenylamine indicator (Dichrometry –Internal indicator method).
4. Determination of Alkalinity of Water.
5. Determination of acidity of Water.
6. Preparation of Phenol-Formaldehyde (Bakelite).
7. Determination of Viscosity of oils using Redwood Viscometer I.
8. Determination of Viscosity of oils using Redwood Viscometer II.
9. Determination of calorific value of gaseous fuels by Junker‟ s Calorimeter.
10. Conductometric estimation of strong acid using standard sodium hydroxide solution.
11. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
12. Potentio metric determination of iron using standard potassium dichromate.
13. Colorometric estimation of manganese.
14. pH meter calibration and measurement of pH of water and various other samples.

REFERENCES:

1. *Vogel’s Text book of Quantitative Chemical Analysis*, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. *Chemistry Practical– Lab Manual*, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.

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4 2

(16EE202) ELECTRICAL CIRCUITS LAB

Course Objectives:

To make the student learn about:

- *Experimental verification of theorems*

Course Outcomes:

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

- *Apply suitable theorems for circuit analysis and verify the results theoretically*

List of Experiments:

1. Verification of KCL & KVL for any network.
2. Verification of Superposition & Reciprocity theorems with analysis.
3. Verification of Thevenin's & Norton`s theorems with analysis.
4. Verification of Millmann‘s theorem with analysis.
5. Verification of Maximum power transfer theorem with analysis.
6. Verification of compensation theorem with analysis.
7. Analysis of RL & RC circuits for pulse excitation.
8. Determination of self, Mutual inductance & Coefficient of coupling of pair of coils.
9. Series & Parallel Resonance.
10. Locus diagrams of RL and RC series circuits.

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(16HS612) ENGINEERING MATHEMATICS-III
(Common to all branches)

Course Objectives:

- To train the students thoroughly in Mathematical concepts of Complex Analysis, Interpolation, Curve fitting, Numerical Differentiation and Integration and their applications
- To prepare students for lifelong learning and successful careers using mathematical concepts of Complex Analysis, Interpolation, Curve fitting, Numerical Differentiation and Integration and their applications
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information

.

Course Outcomes:

At the end of the course, students would be expected to:

- Have acquired ability to participate effectively in group discussions
- Have developed ability in writing in various contexts
- Have acquired a proper level of competence for employability
- Have acquired computational skills to solve real world problems in engineering

UNIT I

COMPLEX ANALYSIS-I: Analytic functions, Cauchy– Riemann equations, complex integration, Cauchy‘s theorem, Integral formula, Evaluation of Integrals.

UNIT II

COMPLEX ANALYSIS-II: Singularities, poles, Residues, Residues theorem, Evaluation of real integrals of the types $\int_0^{2\pi} f(\cos\theta, \sin\theta)\,d\theta$, $\int_{-\infty}^{\infty} e^{imx} f(x)\,dx$ - conformal mapping – Bilinear transformations- Transformation of e^z, Z^2, Sin z, and Cos z.

UNIT III

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS: The Bisection Method, The Method of False Position, Newton-Raphson Method.

INTERPOLATION: Newton‘s forward and backward interpolation formula, Lagrange‘s interpolation formula.

UNIT IV

CURVE FITTING: Fitting of a straight line, Second degree curve, Exponentional curve, Power curve by method of least squares.

NUMERICAL DIFFERENTIATION AND INTEGRATION: Trapezoidal rule, Simpson‘s 1/3 Rule, Simpson‘s 3/8 Rule.

UNIT V

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: Solution by Taylor‘s series, Picard‘s Method of successive Approximations, Euler‘s Method, Runge-Kutta second and fourth order methods.

TEXT BOOKS:

1. *Higher Engineering Mathematics,* B.S.Grewal, Khanna publishers.
2. *Advanced Engineering Mathematics,* Peter V.O‘Neil, CENGAGE publisher.

REFERENCES:

1. Engineering *Mathematics III* by T.K.V. Iyengar, S.Chand publications.
2. *Mathematical Methods* by T.K.V. Iyengar, S.Chand publications.
3. *Engineering Mathematics, Volume - III,* E. Rukmangadachari & E. Keshava Reddy Pearson Publisher.
4. *Advanced Engineering Mathematics* by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, and Oxford.

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(16HS605) ENVIRONMENTAL STUDIES
(Common to EEE, ECE & CSE)

Course Objectives:

- Students have got an idea about the importance of pollution free air, water, soil and food.
- They know about global environmental problems like Acid Rains, Global Warming, Green House Effects, Ozone layer depletion.
- To understand the impacts of developmental activities and mitigation measures along with the environmental policies and regulations.
- To recognize major concepts in environmental studies and demonstrate in-depth understanding the environment.

Course Outcomes:

- Based on this course, the Engineering Student will be able to understand/evaluate/develop technologies on the basis of Ecological principles and environmental regulations along with Legislation, Laws and Policies which in turn help in sustainable development.
- Take preventive measures to reduce air, water, soil pollutions and contaminants in food.
- Effectively carry out waste disposal at individual level.
- Involve in preservation of natural resources.

UNIT I

INTRODUCTION: Definition, Scope and Importance-Need for Public Awareness

NATURAL RESOURCES: Classification of 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 resources –Energy resources: Renewable and Non- Renewable sources of energy- Solar energy, Hydro electrical energy, Wind energy, Nuclear energy, etc.

UNIT II

ECOSYSTEMS: Concept of an ecosystem– structural features of ecosystem- Producers, Consumers and Decomposers–-Biogeochemical cycles- Ecological succession-Food chains, food webs and ecological pyramids – Energy flow in the ecosystem-Types of ecosystems (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems.

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 pollution and Nuclear pollution –Effects-Global warming, Acid Rain and 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 – pollution case studies.

UNIT V

ENVIRONMENTAL LEGISLATION, LAWS, POLICIES FOR SUSTAINABLE DEVELOPMENT: Environmental Legislation, Environmental Protection act – Air Prevention and Control of Pollution act–Water Prevention and control of Pollution act– Wildlife protection act – Forest conservation act – Municipal Solid Waste management, International conventions/Protocols : Earth summit, Kyoto protocol and Montreal Protocol. From Unsustainable to sustainable development, Role of NGO‘s for Sustainable development, Concepts of Green belt development, Role of IT in Environment-Remote Sensing and 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 (pond/river/hill slopes

TEXT BOOKS:

1. *A Text book on Environmental Sciences* by Kaushik A and Kaushik C P 5th edition, New age international publishers, 2015.
2. *Text Book of Environmental Science and Technology* by Anji Reddy M, BS Publications, 2007.

REFERENCES:

1. *Environmental Studies,* Anil Kumar and Arnab Kumar De, New Age International Publishers, New Delhi, 3rd Edition 2015.
2. *Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards*, R.K. Trivedi, Vol.I and II, Enviro Media.
3. *Environmental Studies* by Mukkanthi K, S.Chand Publishers, 2010.

4. *Environmental Studies-From Crisis to Cure*, Rajagopalan.R Oxford University Press, 2005.
5. *Text Book of Environmental Studies*, Erach Bharucha, University Grants Commission, University Press (India) Pvt.Ltd., Hyderabad, 2010.

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(16EE203) NETWORK ANALYSIS & SYNTHESIS

Course Objectives:

- *To understand about phasor concepts of three Phase circuits.*
- *To study transient behavior and Steady state analysis of DC and AC circuits.*
- *To understand the concepts of two, port networks, Filters and Attenuators.*

UNIT-I

THREE PHASE CIRCUITS

Three phase circuits: phase sequence, star and delta connection, relation between line and phase Voltages and currents in balanced systems, analysis of balanced and unbalanced three phase circuits measurement of active and reactive power.

UNIT-II

TRANSIENT ANALYSIS

Transient response of R-L, R-C, and R-L-C Series circuits for d.c.excitation, initial conditions, solution method using differential equations and Laplace transforms response of R-L and R-C networks to pulse excitation.

Transient response of R-L, R-C, and R-L-C Series circuits for sinusoidal excitations, initial conditions, solution method using differential equations and Laplace transforms.

UNIT-III

NETWORK TOPOLOGY

Definitions, graph, tree, basic cut set and basic tie set matrices for planar networks, loop and nodal methods of analysis of networks with dependent and independent voltage and current sources, duality and dual networks.

UNIT-IV

TWO PORT NETWORKS

Two port network parameters Z, Y, ABCD and hybrid parameters and their relations, Concept of transformed network, two port network parameters using transformed variables, cascaded networks.

UNIT-V

FILTERS & SYMMETRICAL ATTENUATORS

Classification of Filters, Filter Networks, Classification of Pass band Stop band, characteristic impedance in the pass and stop bands, Constant-K Low pass filter, high pass filter, m – derived, T-section, band pass filter and band elimination filter ,illustrative filters.

Symmetrical Attenuators, T-type Attenuators, π-Type Attenuators, Bridged T-type attenuator, Lattice Attenuators.

TEXT BOOKS:

1. Circuits and networks by A.Sudhakar and Shyamohan S.Palli, Tata McGraw, Hill
2. Alexander and sadiku: Fundamentals of Electric circuits, Mc, graw Hill.

REFERENCES:

1. Network analysis by M.E.Van Valkenberg, prantice hall India, 3rd edition.
2. Electric circuit analysis by C.L.Wadhwa, new age international.

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(16EC401) BASIC ELECTRONIC DEVICES

Course Objectives:

- *To give understanding on semiconductor physics of the intrinsic, p and n materials, characteristics of the p-n junction diode, applications of diode in electronic circuits, Characteristics of BJT,FET,MOSFET, characteristics of special purpose electronic devices.*
- *To familiarize students with DC biasing circuits of BJT, FET and analyzing basic transistor amplifier circuits.*

Course Outcomes:

- *Upon completion of the course, students will:*
- *Analyze the operating principles of major electronic devices, its characteristics and applications.*
- *Design and analyze the DC bias circuitry of BJT and FET.*
- *Design and analyze basic transistor amplifier circuits using BJT and FET.*

UNIT- I
PN JUNCTION DIODE

Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations, Open circuited p-n junction, Biased p-n junction, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

UNIT-II
SPECIAL SEMICONDUCTOR DEVICES

Zener Diode: Breakdown mechanisms, applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT , Photo transistor, IR Emitters, Solar cell, Schottky Barrier diode - Construction, operation and characteristics.

UNIT- III
RECTIFIERS AND FILTERS

Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, L-section filter, Π-section filter, Multiple L-section and Multiple Π- section filter ,comparison of various filter circuits in terms of ripple factors.

UNIT- IV

TRANSISTOR CHARACTERISTICS

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

FET: Types, JFET: construction, operation, characteristics, MOSFET: types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- V

TRANSISTOR BIASING AND THERMAL STABILIZATION

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

TEXT BOOKS:

1.Electronic Devices and Circuits, J. Millman, C. Halkias Tata Mc-GrawHill,4th Edition,2010.
2. Electronic Devices and Circuits, David A.Bell, Fifth Edition, Oxford University Press, 2009.
3. Electronic Devices and Circuits, R.L.Boylestadand Louis Nashelsky Pearson Publications, 9th Edition, 2006

REFERENCES:

1. Integrated Electronics, Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.
2. Electronic Devices and Circuits, Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.
3. Electronic Devices and Circuits, BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu Pearson, 2nd edition.

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(16EE210) GENERATION OF ELECTRIC POWER

***Course Objectives**:*

To make the student learn about:

- *Structure, essential components and their layout in thermal power station*
- *Selection of site for thermal power station*
- *Selection of site for hydro power generation*
- *Various aspects and issues involved in Nuclear power generation*
- *Electric power generation from renewable energy sources as sun, wind and ocean*
  Cost of generation and tariff methods

Course Outcomes:

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

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

UNIT I

THERMAL POWER GENERATING SYSTEMS

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

UNIT II

HYDRO & NUCLEAR POWER GENERATING SYSTEMS

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

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

UNIT III

SOLAR & WIND POWER GENERATING SYSTEMS

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

Wind Power Generation: Role and potential of Wind Energy Option, Horizontal and Vertical Axis Wind Mills, Performance Characteristics, Power, Speed & Torque, Speed Characteristics, Pitch & Yaw Controls, Power Electronics Application, Economic Aspects.

UNIT IV

BIOGAS & GEOTHERMAL POWER GENERATING SYSTEMS

Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters, Characteristics of Bio-Gas, Utilization, Economic and Environmental Aspects of biogas geothermal power generating systems.

Geothermal and Ocean Power Generation: Principle of Geothermal Energy Methods of Harnessing, Principle of Ocean Energy, Tidal and Wave Energy, Mini Hydel Plants, Economic Aspects.

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, Numerical Problems. Costs of Generation and their Division Into Fixed, Semi, Fixed and Running Costs. Tariff Methods: Desirable Characteristics of a Tariff Method, Flat Rate, Block, Rate, Two-Part, Three –Part, and Power Factor Tariff Methods and Numerical Problems.

TEXT BOOKS:

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

REFERENCES:

1. Renewable Energy Resources, John Twidell and Tony Weir, Second Edition, Taylor and FrancisGroup, 2006.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., NewDelhi 2004.
4. Wind Electrical Systems by S. N. Bhadra, D. Kastha & S. Banerjee, Oxford University Press2013.

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(16EE211) ELECTRICAL MACHINES –I

Course Objectives*:*

To make the students learn about:

- *The constructional features of DC machines and different types of winding employed in DC machines*
- *The phenomena of armature reaction and commutation*
- *Characteristics of generators and parallel operation of generators*
- *Methods for speed control of DC motors and applications of DC motors*
- *Various types of losses that occur in DC machines and how to calculate efficiency*
- *Testing of DC motors*

Course Outcomes:

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

- *Calculate the e.m.f. generated on open circuit and find terminal voltage on load*
- *Diagonise the failure of DC generator to build up voltage*
- *Compute the load shared by each generator when several generators operate in parallel*
- *Determine the gross torque and useful torque developed by DC motor*
- *Identify suitable method and conditions for obtaining the required speed of DC motor*
- *Calculate the losses and efficiency of DC generators and motors*

UNIT-I:

ELECTROMECHANICAL ENERGY CONVERSION

Introduction: Laws of magnetism, Electromechanical Energy Conversion,Forces and Torque in Magnetic Field Systems,Energy Balance,Energy in a Singly Excited Magnetic Field System, Determination of Magnetic Force and Torque from energy, Co-Energy, Determination of Magnetic Force and Torque from co-energy,Multi Excited Magnetic Field Systems, Forces and Torque in system with permanent magnets, Dynamic Equations, Problems.

UNIT-II:

D.C. GENERATORS

D.C. Generators, Principle of Operation, Constructional Features,A rmature Windings, Lap and Wave Windings, Simplex and Multiplex Windings, Use of Laminated Armature, E.M.F Equation, Numerical Problems, Parallel Paths, Armature Reaction, Cross Magnetizing and DeMagnetizing AT/Pole, Compensating Winding, Commutation, Reactance Voltage, Methods of Improving Commutation.

UNIT-III:

CHARACTERISTICS OF D.C GENERATORS

Methods of Excitation, Separately Excited and Self Excited Generators, Build-Up of E.M.F, Critical Field Resistance and Critical Speed, Causes for Failure to Self Excite and Remedial Measures, Load Characteristics of Shunt, Series and Compound Generators, Parallel Operation of D.C Series Generators, Use of Equalizer Bar and Cross Connection of Field Windings, Load Sharing.

UNIT-IV:

D.C. MOTORS

D.C Motors, Principle of Operation, Back E.M.F, Torque Equation, Characteristics and application of Shunt, Series and Compound Motors, Armature Reaction and Commutation. Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods, Ward-Leonard System, Braking of D.C Motors, 2- point, 3- Point and 4- Point Starters, Calculation of Starters Steps for D.C Shunt Motors.

UNIT-V:

TESTING OF DC MACHINES

Losses, Constant & Variable Losses, power stages, Calculation of Efficiency, Condition for Maximum Efficiency, Methods of Testing, Direct, Indirect, BrakeTest, Swinburne‘sTest, Hopkinson‘s Test, Field‘s Test, Retardation Test, separation of stray losses in a d.c. motor test.

TEXT BOOKS:

1. Electric Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw,Hill Publishers, 3rd Edition, 2004.
2. Electrical Machinery Fundamentals by Stephen J Chapman, Mc Graw Hills, 2005.

REFERENCE BOOKS:

1. Performance and Design of D.C Machines,by Clayton & Hancock, BPB Publishers, 2004.
2. Electrical Machines,S.K. Battacharya, TMH Edn Pvt. Ltd., 3rd Edition, 2009.
3. Electric Machinary,A. E. Fritzgerald, C. Kingsley and S. Umans, Mc Graw,Hill Companies,5th Editon, 2003.
4. Electrical Machines,M.V Deshpande, Wheeler Publishing, 2004.
5. Electrical Machines,P.S. Bimbhra., Khanna Publishers, 2011.
6. Electromechanics,I, Kamakshaiah S., Overseas Publishers Pvt. Ltd, 3rd Edition, 2004

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(16EE204) NETWORK ANALYSIS AND SYNTHESIS LAB

List of Experiments:

1. Determination of Z & Y parameters of two port network.
2. Determination of Transmission and Hybrid parameters.
3. Measurement of Active Power for Star and Delta Connected Balanced Loads.
4. Measurement of Reactive Power for Star and Delta Connected Balanced Loads.
5. Measurement of three phase power by two wattmeter method for balanced & unbalanced Loads.
6. Design and frequency response of constant _k' low pass & high pass filters.
7. Design and frequency response of Band pass filter.
8. Determination of phase of a sinusoidal signal when passed through RL and RC Circuits.
9. PSPICE simulation of DC circuits (Thevenin's equivalent, Transfer function).
10. DC Transient Response.

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(16EC405) BASIC ELECTRONIC DEVICES LAB

***Course Objectives**:*

- *This Lab provides the students to get an electrical model for various semiconductor devices. Students can find and plot V- I characteristics of all semiconductor devices. Student learns the practical applications of the devices.*

Course Outcomes:

- *Students able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices*

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions):

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB s
2. Identification, Specifications and Testing of Active Devices, Diodes, BJTs, Low power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, SCR, UJT.
3. Study and operation of
   - Multimeters (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - Study and Operation of CRO.

(For Laboratory examination – Minimum of 10 experiments)

1. Forward and Reverse bias characteristics of PN Junction diode
2. Zener diode characteristics and Zener as Voltage Regulator.
3. Input and Output characteristics of Transistor in CB Configuration.
4. Input and Output characteristics of Transistor in CE Configuration.
5. Half Wave Rectifier With and without filter.
6. Full wave Rectifier With and without filter.
7. FET characteristics
8. Measurement of h parameters of transistor in CB, CE, CC configurations
9. Frequency response of CE Amplifier.
10. Frequency response of CC Amplifier.
11. Frequency response of Common Source FET Amplifier.
12. SCR Characteristics.
13. UJT Characteristics.

Equipment required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30v.
2. CROs - 0-20M Hz.
3. Function Generators - 0-1 M Hz.
4. Multimeters -
5. Decade Resistance and Capacitance Boxes
6. Electronic components
7. Micro Ammeters (Analog or Digital)- 0-20 μA, 0-50μA,0-100μA, 0-200μA.
8. Voltmeters (Analog or Digital) - 0-5V, 0-10V,0-25V.

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(COE-I) COMPREHENSIVE ONLINE EXAMINATION -I

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(16CS503) DATA STRUCTURES THROUGH C
(AUDIT COURSE)
(Common to CE, EEE, ME & ECE)

Course Objectives:

- Understand different data structures
- Understand searching and sorting techniques

Course Outcomes:

- At the end of the course, students will be able to:
- Design algorithms to implement various data structures.
- Understand and program stacks and list data structures.
- Write programs to implement different types of queues.
- Understand and make use of hash tables in applications like dictionary, spell checker etc.,
- Understand why height balanced trees are advantageous over other data structures.

UNIT I

INTRODUCTION AND OVERVIEW: One Dimensional array- Multi Dimensional array- pointer arrays. **Linked lists**: Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list- Application of linked lists.

UNIT II

STACKS: Introduction-Definition-Representation of Stack-Operations on Stacks-Applications of Stacks. **Queues**: Introduction, Definition- Representations of Queues-Various Queue Structures- Applications of Queues.

UNIT III

TREES: Basic Terminologies- Definition and Concepts- Representations of Binary Tree- Operation on a Binary Tree- Types of Binary Trees-Binary Search Tree, Heap Trees

GRAPHS: Introduction- Graph terminologies- Representation of graphs- Operations on Graphs- Application of Graph Structures: Shortest path problem- topological sorting.

UNIT IV

SORTING : Sorting Techniques- Sorting by Insertion: Straight Insertion sort- List insertion sort- Binary insertion sort- Sorting by selection: Straight selection sort- Heap Sort- Sorting by Exchange- Bubble Sort- Shell Sort- Quick Sort-Sorting by Mergin: Simple Merging-Binary Merge-Merge Sort.

UNIT V

SEARCHING: Linear Search Techniques: Linear Search with Array- Linear Search with Linked List- Linear Search with ordered list- Binary Search- Fibonacci Search.

TABLES: Hash Tables: Hashing Techniques- Collision Resolution Techniques- Closed Hashing- Open Hashing.

TEXT BOOKS:

1. *Classic Data Structures*, Second Edition by Debasis Samanta, PHI.
2. *Data Structures A Pseudo code Approach with C*, Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.

REFERENCES:

1. *Fundamentals of Data Structures in C* – Horowitz, Sahni, Anderson-Freed, Universities Press, Second Edition.
2. *Outlines – Data Structures* – Seymour Lipschutz – McGrawHill- Revised First Edition.
3. *Data structures and Algorithms using C++*, Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education.

SIDDHARTH INSTITUTE OF ENGINEERING &TECHNOLOGY
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II B.Tech. - II Sem. (E.E.E)	**L**	**T**	**C**
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(16HS613) PROBABILITY &STATISTICS
(Common to EEE, CE, ME & CSE)

Course Objectives:

- *To train the students thoroughly in Mathematical concepts fundamentals of probability, test of hypothesis, Test of significance and ANOVA*
- *To prepare students for lifelong learning and successful careers using mathematical concepts of probability, test of hypothesis, Test of significance and ANOVA*
- *To develop the skill pertinent to the practice of the mathematical concepts including the Student abilities to formulate and modeling the problems, to think creatively and to Synthesize information*

Course Outcomes:

At the end of the course, students would be expected to:

- *Have acquired ability to participate effectively in group discussions*
- *Have developed ability in writing in various contexts*

Have acquired a proper level of competence for employability

UNIT-I

Probability: Introduction, Conditional probability, Baye‘s theorem, Random variables, Discrete and continuous Distributions, Expectation, Varience, Moments, Moment generating functions

UNIT-II

Distributions, Binomial, Poisson, Normal, Uniform, Exponential and Gamma distributions, related properties and applications

UNIT-III

Test of Hypothesis: Population and Sample, Confidence interval of mean from Normal distribution, Null and Alternative hypothesis, Level of significance

Test of significance: Test based on normal distribution, Z test for means and proportions, Small samples t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).

UNIT-IV

Analysis of variance one way classification and two way classification (Latin square Design and RBD)

UNIT-V

Statistical Quality Control: Concept of quality of a manufactured product, Defects and Defectives, Causes of variations, Random and assignable, The principle of Shewhart Control

Chart-Charts for attribute and variable quality characteristics, Constructions and operation of X- bar Chart, R-Chart, P-Chart and C-Chart.

Text Books:

1. Statistical methods by S.P. Gupta, S.Chand publications.
2. Probability & Statistics by T.K.V. Iyengar, S.Chand publications.

Reference Books:

1. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.
3. Probability & Statistics for Science and Engineering by G.Shanker Rao, Universities Press.
4. Probability and Statistics for Engineering and Sciences by Jay L.Devore, CENGAGE.
5. Probability and Statistics by R.A. Jhonson and Gupta C.B

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II B.Tech. - II Sem. (E.E.E)	**L**	**T**	**C**
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(16CE112) FLUID MECHANICS & HYDRAULIC MACHINERY

Course Objectives:

- *To understand the basic concepts of Fluid properties and fluid statics.*
- *To understand the applications of fluid kinematics and dynamics.*
- *To understand the behavior of pipe flow and losses in pipe flow.*
- *To understand the concepts of flow measurements and boundary layer flows.*
- *To understand the working principles of hydraulic machinery.*

Course Outcomes:

After completion of this course the student will be able to,

- *How to find frictional losses in a pipe when there is a flow between two places.*
- *Know types of flow and its measurements and applications.*
- *Identify the suitable pump required for different purposes.*
- *Classify the turbines and design criteria based on water availability.*

UNIT I

Fluid Properties: Dimensions and units, Definition of a fluid, Physical properties of fluids, Density, Specific weight, Specific volume, Specific gravity, Compressibility, Vapour pressure, Surface tension and capillarity and Viscosity.

Fluid Statics: Pascal‘s law, Pressure variation in a static fluid, Atmospheric, gauge and absolute pressures, Measurement of pressure, Piezometer, U–tube and inverted U–tube manometers and Bourdon‘s pressure gauge, Hydrostatic forces on plane and curved surfaces, Center of pressure.

UNIT II

Fluid Kinematics: Types of flow, Streamline, Streak line, Path line, Stream tube ,Control volume ,Continuity equation in one and three dimensional forms, Stream function and velocity potential function, Flow net, Acceleration of a fluid particle, Local and convective accelerations, Tangential and normal accelerations.

Fluid Dynamics: Euler‘s equation of motion along a streamline, Bernoulli‘s energy equation, Energy correction factor, Impulse, momentum equation, Momentum correction factor, Force on a bend, Energy gradient line, Hydraulic gradient line, Analysis of free liquid jets, Forced vortex and free vortex.

UNIT III

Analysis of Pipe Flow: Reynold's experiment, Reynold's number, Minor losses in pipe flow, Darcy–Weisbach 1equation, Variation of friction Factor, Moody's chart, Pipes in series, Pipes in parallel, Boundary Layer Theory.

Flow Measurement: Velocity measurement by Pitot tube and Pitot static tube, Discharge measurement by Venturimeter and orifice meter, Orifices and mouthpieces

UNIT IV

Dimensional Analysis And Similitude: Introduction, dimensions; dimensional homogeneity; Methods of dimensional analysis, Rayleigh's method; Buckingham - Pi theorem. Similitude, Types of Similarities, Model Laws

UNIT V

HYDRAULIC TURBINES: Elements of hydroelectric power plants, Heads and efficiencies of turbines, Classification of turbines, Pelton Wheel, Modern Francis turbine, Kaplan turbine. Main components and working principle, Expressions for work done and efficiency, Working proportions and design of each

CENTRIFUGAL PUMPS: Classification and types of pumps, Components and working of a centrifugal pump, Work done by the impeller, Heads and efficiencies, Net positive suction head(NPSH), Priming ,Priming devices, Minimum starting speed, Multistage pumps, Pumps in series and parallel, Submersible pumps, Limiting suction head, Cavitation, Expression for specific speed.

TEXT BOOKS:

1. Hydraulics and Fluid Mechanics Including Hydraulics Machines, 20th Edition, Dr.P.N. Modi & Dr. S.M. Seth, Standard Book House
2. A Textbook of Fluid Mechanics and Hydraulic Machines, 9th Edition, Dr. R. K. Bansal, Laxmi Publications

REFERENCES:

1. Fluid Mechanics, 9th Edition, Victor Streeter, E. Benjamin Wylie, K.W. Bedford, McGraw Hill Education
2. Fluid Mechanics and Machinery, 1st Edition, C.S.P.Ojha, P.N.Chandamouli & R.Berndtsson, Oxford University Press
3. Fluid Mechanics and Hydraulic Machines, 1st Edition, S. C. Gupta, Pearson India Education Services Pvt. Ltd.
4. Fluid Mechanics and Machinery, 1st Edition, Rama Durgaiah D., New Age International

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II B.Tech. - II Sem. (E.E.E)	**L**	**T**	**C**
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(16EE214) ELECTROMAGNETIC FIELDS

Course Objectives:

To make the student learn about:

- *The laws concerning static electric fields: Coulomb's law, Gauss law; the laws concerning static magnetic fields: Biot, savart law, Ampere circuital law*
- *The equations concerned with static electric fields*
- *The equations concerned with static magnetic fields*
- *The difference between the behaviors of conductors and dielectrics in electric fields*
- *The energy stored and energy density in (i) static electric field (ii) magnetic field*
- *Electric dipole and dipole moment, magnetic dipole and dipole moment*

Course Outcomes:

After going through this course the student acquires:

- *Knowledge on basic principles, concepts and fundamental laws of electromagnetic fields.*
- *The knowledge to understand 3, dimensional coordinate systems, electrostatics, magneto statics, time, varying fields and interaction between electricity and magnetism.*

UNIT-I

INTRODUCTION TO CO-ORDINATE SYSTEMS & VECTOR ALGEBRA

Scalars & Vectors, Basic Operations in vector algebra, Co-ordinate systems, Rectangular, Cylindrical & Spherical co-ordinates and their representation in three dimensional spaces. Conversion of points and vectors from one co-ordinate system to another co-ordinate system.

UNIT-II

ELECTROSTATICS

Electrostatic Fields, Coulomb's Law, Electric Field Intensity(EFI) due to Line, Surface a nd Volume charges, Work Done in Moving a Point Charge in Electrostatic Field, Electric Potentialdue to point charges, line charges and Volume Charges, Properties of Potential unctions, Potential Gradient, Gauss's Law, Application of Gauss's Law, Maxwell's First Law, Laplace's Equation and Poisson's Equations, Solution of Laplace's Equation in one Variable. Electric Dipole, Dipole Moment, Potential and EFI due to Electric Dipole, Torque on an Electric Dipole in an Electric Field, Capacitance, Capacitance of Parallel Plate and Spherical Capacitors**.**

UNIT- III

CONDUCTORS AND DIELECTRICS

Behavior of Conductors in an Electric Field,Conductors and Insulators, Electric Field

Inside a Dielectric Material, Polarization, Dielectric Conductors and Dielectric Boundary Conditions, Energy Stored and Energy Density in a Static Electric Field, Current Density, Conduction and Convection, Current Densities, Ohm's Law in Point Form, Equation of Continuity.

UNIT-IV

MAGNETO STATICS

Static Magnetic Fields, Biot, Savart Law, Magnetic Field Intensity(MFI) due to a StraightCurrent Carrying Filament, MFI due to Circular, Square Filament, Solenoid Current CarryingWire, Relation Between Magnetic Flux, Magnetic Flux Density and MFI, Maxwell's SecondEquation. Ampere's Circuital Law and Its Applications Viz., MFI Due to an Infinite Sheet of Current and a Long Current Carrying Filament, Point Form of Ampere's Circuital Law, Maxwell's Third Equation, Magnetic Force, Moving Charges in Magnetic Fields, Lorentz Force Equation, Force onCurrent Element in a Magnetic Field, Force on a Straight and Long Current Carrying Conductorin a Magnetic Field, Force Between two Straight and Parallel Current Carrying Conductor in aMagnetic Field, Magnetic Dipole and Dipole moment, A Differential Current Loop as a Magnetic Dipole, Torque on a Current Loop Placed in a Magnetic Field.

UNIT-V

MAGNETIC POTENTIAL & TIME VARYING FIELDS

Scalar Magnetic Potential and Vector Magnetic Potential and its Properties, Vector m agneticPotential due to Simple Configuration, Vector Poisson's Equations, Self and Mutual Inductances, Neumann's Formulae, Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane, Energy Stored and Intensity in a Magnetic Field. Time Varying Fields, Faraday's Law of Electromagnetic Induction, It's Integral and Point Forms, Maxwell's Fourth Equation. Statically and Dynamically Induced E.M.F's, Simple Problems, Modified Maxwell's Equations for Time Varying Fields, Displacement Current

TEXT BOOKS:

1. Engineering Electromagnetics by William.H.Hayt, Mc.Graw,Hill, 2010.
2. Field Theory, Gangadhar, Khanna Publications, 2003.

REFERENCE BOOKS:

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

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II B.Tech. - II Sem. (E.E.E)	**L**	**T**	**C**
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(16EC411) ANALOG ELECTRONIC CIRCUITS

Course Objectives:

- *The aim of this course is to familiarize the student with the analysis and design of basic transistor amplifier circuits, Oscillators, Multi-vibrators and wave shaping.*

Course Outcomes:

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

- *Methods of biasing transistors & Design of simple amplifier circuits.*
- *Mid – band analysis of amplifier circuits using small - signal equivalent circuits*

  To determine gain, input impedance and output impedance.
- *Method of calculating cutoff frequencies and to determine bandwidth.*
- *Design and analyse different Oscillator circuits.*
- *Design of circuits for linear wave shaping and Multi-vibrators.*

UNIT-I

Multistage Amplifiers

BJT and FET RC Coupled Amplifiers, Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

UNIT-II

Feedback Amplifiers

Concept of Feedback Amplifiers, Effect of Negative feedback on the amplifier Characteristics, Four Feedback Amplifier Topologies, Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

UNIT-III

Sinusoidal Oscillators

Condition for oscillations, LC Oscillators, Hartley, Colpitts, Clapp and Tuned Collector Oscillators, Frequency and amplitude Stability of Oscillators, Crystal Oscillators, RC Oscillators, RC Phase Shift and Weinbridge Oscillators.

UNIT-IV

Large Signal Amplifiers

Class A power Amplifier, Maximum Value of Efficiency of Class A Amplifier, Transformer coupled amplifier, Push-Pull Amplifier, Complimentary Symmetry Circuits (Transformer Less Class B Power Amplifier), Phase Inverters, Transistor Power Dissipation, Thermal Runaway, Heat Sinks.

UNIT V

Linear wave shaping: High pass, Low pass RC circuits-response for sinusoidal, Step, Pulse, Square and Ramp inputs, Clippers and Clampers.

Multi-Vibrators: Analysis of Diode and transistor switching times, Analysis and Design of Bistable, Monosatable and Astable Multi-vibrators, Schmitt trigger Using Transistors.

TEXT BOOKS:

1. Integrated Electronics – Millman and Halkias
2. Pulse, Digital & Switching Waveforms by Jacob Milliman, HarbertTaub and Mothiki S Prakash Rao, 2nd edition 2008, Tata McGraw Hill Companies

REFERENCES:

1. K.Lal Kishore, ―Electronic Circuit Analysis‖, Second Edition, BSP
2. Electronic Devices and Circuits, G.S.N. Raju, IK International Publications, New Delhi, 2006
3. Electronic Devices and Circuits – Mottershead
4. A. Anand Kumar, ―Pulse and Digital Circuits‖, PHI, 2005.

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II B.Tech. - II Sem. (E.E.E)	**L**	**T**	**C**
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(16EE215) ELECTRICAL MACHINES-II

Course Objectives:

To make the student learn about:

- Constructional details of transformer and its operation (i) on no load (ii) on load
- Predetermination of regulation and efficiency of transformer from OC and SC test results
- Parallel operation of transformers
- Constructional details, principle of operation and the importance of slip in Induction motor operation
- The slip, torque characteristics and torque calculations of Induction motor
- Methods of starting and speed control of Induction motor

Course Outcomes:

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

- Draw the equivalent circuit of transformer
- Conduct O.C, S.C tests and predetermine the regulation and efficiency of transformer
- Compute the load shared by each transformer when several transformers operate in parallel
- Draw the circle diagram of a three phase Induction motor and predetermine the performance characteristics
- Determine the starting torque, maximum torque, slip at maximum torque using given data

UNIT-I:

SINGLE PHASE TRANSFORMERS

Single Phase Transformers, Constructional Details, Types, Hystersis and Eddy Current Losses, Emf Equation, Operation on No Load and on Load, Phasor Diagrams, Equivalent Circuit, Losses and Efficiency, Regulation. All Day Efficiency, Effect of Variations of Frequency & Supply Voltage on Iron Losses.

UNIT-II:

PERFORMANCE OF SINGLE PHASE 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.

UNIT-III:

THREE PHASE TRANSFORMERS AND INDUCTION MOTORS

Three Phase Transformers, Connections, Y/Y, Y/Δ, Δ/Y, Δ/Δ and Open Δ, Third Harmonics in Phase Voltages, Three Winding Transformers, Tertiary Windings, Scott Connection.

Polyphase Induction Motors, Construction Details of Cage and Wound Rotor Machines, Production of a Rotating Magnetic Field, Principle of Operation, Rotor Emf and Rotor Frequency, Rotor Reactance, Rotor Current and Pf at Standstill and During Operation.

UNIT-IV:

3-PHASE INDUCTION MOTOR CHARACTERISTICS

Rotor Power Input, Rotor Copper Loss and Mechanical Power Developed and Their Inter Relation, Torque Equation, Deduction From Torque Equation, Expressions for Maximum Torque and Starting Torque, Torque Slip Characteristic, Generator Operation, Double Cage and Deep Bar Rotors, Equivalent Circuit, Phasor Diagram, Crawling and Cogging, Circle Diagram, No Load and Blocked Rotor Tests, Predetermination of Performance.

UNIT-V:

STARTING AND SPEED CONTROL OF INDUCTION MOTORS

Starting Methods and Starting Current and Torque Calculations, Speed Control, Change of Frequency, Pole Changing and Methods of Consequent Poles, Cascade Connection, Injection of an EMF induction generator, principle of operation

TEXT BOOKS:

1. Electrical Machinery & Transformers by Irving Kosow –Pearson Publishers, Second Edition, 2012
2. Electric Machines –by I.J.Nagrath & D.P.Kothari, Tata Mc Graw Hill, 7th Edition.,2005
3. Electrical machines, PS Bimbra, Khanna Publishers.

REFERENCE BOOKS:

1. Performance and Design of AC Machines by MG.Say, BPB Publishers, 2002.
2. Theory of Alternating Current Machinery, by Langsdorf, Tata McGraw, Hill Companies, 2nd edition, 2008
3. Electromechanics, II (transformers and induction motors) S. Kamakshaiah, Hitech Publishers, 2005
4. Electric Machinery, A.E. Fitzgerald, C.Kingsley and S.Humans, Mcgraw Hill Companies, 6th edition, 2003

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II B.Tech. - II Sem. (E.E.E) **P C**
4 2

(16EE217) ELECTRICAL MACHINES-I LAB

Course Objectives:

The student has to learn about:

- *No load and load characteristics of DC generators*
- *Various tests on DC motors*
- *The speed control techniques of DC motors*
-

Course Outcomes:

The student should be able to do the following:

- *Conduct experiments to obtain the no, load and load characteristics of D.C. Generators*
- *Conduct tests on D.C. motors for predetermination of efficiency*
- *Conduct tests on D.C. motors for determination of efficiency*
- *Control the speed of D.C. motor in a given range using appropriate method*
- *Identify the reason as to why D.C. Generator is not building up voltage*

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Minimum of Ten Experiments should be conducted from the following List:

1. Study of DC machine parts (identification of armature, field windings, brushes, Commutator etc,.) And finding Armature resistance R_a.
2. Load Test on DC Shunt Generator. Determination of Characteristics.
3. Brake Test on DC Shunt Motor. Determination of Performance Curves.
4. Load Test on DC Compound Generator. Determination of Characteristics.
5. Magnetization Characteristics of DC Shunt Generator. Determination of Critical Field Resistance and Critical Speed.
6. Fields Test on DC Series Machines. Determination of Efficiency.
7. Swinburne‘s Test
8. Brake Test on DC Compound Motor. Determination of Performance Curves.
9. Load Test on DC Series Generator. Determination of Characteristics.
10. Retardation Test on DC Shunt Motor. Determination of Losses at Rated Speed.
11. Separation of Losses in DC Shunt Motor.
12. Speed Control of DC Shunt Motor
13. Hopkinson‘s Test on DC Shunt Machines. Predetermination of Efficiency.

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4 2

(16EC414) ANALOG ELECTRONIC CIRCUITS LAB

***Course Objectives**:*

- *Help students make transition from analysis of electronic circuits to design of electronic circuits.*
- *To understand the Analysis of transistor at high frequencies.*
- *To understand the concept of designing of tuned amplifier.*
- *The student will construct and analyze voltage regulator circuits*
- *To understand Different types of linear wave shaping circuits.*
- *To understand and processing of Non Linear wave shaping circuits.*
- *To learn about Limiting and storage circuits and their applications*

Course Outcomes:

- *The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.*
- *Designing and analyzing the transistor at high frequencies*
- *To understands Different types of linear wave shaping circuits.*
- *To understand and processing of Non Linear wave shaping circuits*
- *To learn about Limiting and storage circuits and their applications*

Minimum of Ten Experiments to be conducted

1. Common Emitter Amplifier
2. Common Source Amplifier
3. A Two Stage RC Coupled Amplifier.
4. Current shunt and Voltage Series Feedback Amplifier
5. Cascade Amplifier
6. Wien Bridge Oscillator using Transistors
7. RC Phase Shift Oscillator using Transistors
8. Linear wave shaping.
9. Non Linear wave shaping – Clippers.
10. Non Linear wave shaping – Clampers.
11. Astable Multivibrator.
12. Monostable Multivibrator.

Components Required:

Regulated Power Supply (0-30V)
CRO_s
Functions Generators.
Multimeters.
Components

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4 2

(16CE116) FLUID MECHANICS AND HYDRAULIC MACHINERY LAB
(Common to CE & ME)

Course Objectives:

- *To learn the concepts of Venturimeter & Orifice meter*
- *To learn the concepts of notch's*
- *To learn the basic concepts of turbines*
- *To learn the basics concepts of different types of pumps.*

Course Outcomes:

Students undergoing this course are able to

- *Calibrate Venturimeter & Orifice meter*
- *Calculate losses in flows*
- *Estimate the efficiency of different pumps.*
- *Study the performance of different turbines.*

LIST OF EXPERIMENTS

***Cycle 1:**

1. Verification of Bernoulli's equation.
2. Calibration of Coefficient of discharge for Venturimeter.
3. Calibration of Coefficient of discharge for Orifice meter.
4. Calibration of Friction factor. (major losses experiment)
5. Determination of loss of head due to sudden contraction. (minor losses experiment)
6. Calibration of Discharge over Notches (Rectangular/Triangular Notch.)
7. Determination of Coefficient of discharge for a small orifice / mouthpiece by a constant head method / variable head method.

***Cycle 2:**

8. Impact of jet on vanes.
9. Performance test on Pelton wheel turbine.
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Study on Hydraulic jump.
13. Performance test on Kaplan turbine

***Minimum Four experiments** must be conducted in the lab from each cycle.

LIST OF EQUIPMENT:

1. Venturimeter Setup.
2. Orifice meter setup.
3. Friction factor and Minor losses test setup.
4. Impact of jets.
5. Pelton wheel and Francis turbines.
6. Centrifugal pumps.
7. Bernoulli‘s theorem setup.
8. Hydraulic jump test setup.
9. Kaplan turbine.
10. Rectangular and Triangular notch setups
11. Small orifice and mouth piece setup.

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(COE-II) COMPREHENSIVE ONLINE EXAMINATION -II

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(16HS614) COMPREHENSIVE SOFT-SKILLS
(AUDIT COURSE)
(Common to All Branches)

Course Description:
Soft Skills is an intangible idea in which the qualities like attitude, ability, integrity, reliability, positivity, flexibility, dependability, punctuality, management, cooperation, habits and practices are combined proficiently to capitalize on a person‘s work efficacy. Soft Skills do the work of combining all these components in accurate share into skills and shaping them into competencies. Companies opt for, maintain and prop up persons, who are trustworthy, ingenious, principled and good communicators and who are prepared to work under stress. These lessons are developed with a view to create awareness of the importance of the soft skills and assist the learners to improve them.

Course Objectives:
The main objectives of this course are:
- To help the students understand interpersonal skills.
- To support them in building interpersonal skills.
- To enhance the ability to work with others.

Course Outcomes:
- To know the importance of Soft Skills.
- To apply Soft Skills in the different environment.
- To enrich the different levels of Soft Skills to develop their personality.

UNIT I

Non verbal Communication – Body Cues – Smiling, Posture, Gesture, Eye-contact – Stage appearance – Interpersonal and Intrapersonal skill Telephonic Etiquette – Dos and Don'ts of Telephonic Conversation

UNIT II

Self exploration – Self Discovery – Self acceptance – Self esteem – Self confidence – Personal grooming – Attitudes – Confidence building. Interpersonal relationship in the present context – Kinds of relationships – Team building – Formation of team

UNIT III

Vision and Goal setting – Personal goal – Career goal – Types of Organization – Deep dive of company profiles – Win-win situation – Proactive skills – Entrepreneurial skills and model start-ups- Developing Mind skills – quizzes – General knowledge – Puzzles – Reading Comprehension - Spell Bee - Seminar – Who is who? – Biographies

UNIT IV

Flight Leadership: Assessing Leadership qualities – Experiential learning of leadership skills exercise in team work Time and Stress Management: Importance of Time Management – The art of prioritizing and scheduling – Stress and Source of Stress Types of Stress – Managing stress

UNIT V

Change: Coping skills – Critical and Adaptive Mindsets – Changes in Career/ Life/ people – Just A Minute – Mock GDs and Mock Interviews

REFERENCES:

1. *Business Communication*, Aruna Koneru
2. *Effective Tech Communication*, Rizvi, Tata McGraw – Hill Education, 2007.
3. *Reading Extra*, Liz Driscoll, Cambridge University Press, 2004.
4. *Speak Well*, Jayashree Mohanraj et al, Orient Blackswan, 2013.

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III B. Tech. - I Sem. (EEE)	3	1	3

(16EE216) Linear Control Systems

COURSE OBJECTIVES:

To make the students learn about: Merits and demerits of open loop and closed loop systems; the effect of feedback. The use of block diagram algebra and Mason's gain formula to find the effective transfer function. Transient and steady state response , time domain specifications. The concept of Root loci. Frequency domain specifications, Bode diagrams and Nyquist plots. The fundamental aspects of modern control.

COURSE OUTCOMES:

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

- *Evaluate the effective transfer function of a system from input to output using (i) block diagram reduction techniques (ii) Mason's gain formula.*
- *Compute the steady state errors and transient response characteristics for a given system and excitation.*
- *Determine the absolute stability and relative stability of a system.*
- *Draw root loci.*
- *Design a compensator to accomplish desired performance.*
- *Derive state space model of a given physical system and solve the state equation.*

UNIT - I

CONTROL SYSTEMS CONCEPTS

Introduction to linear Control Systems , Classification of control systems - Open Loop and closed loop control systems, merits and demerits , effects of feedback control systems.

Mathematical models – Definition and properties of transfer function, mechanical,electrical systems and electro mechanical systems, electrical analogous systems. Block diagram reduction methods, signal flow graph, Mason's gain formula- DC servo motor, AC servo motor, synchro pair and its applications.

UNIT- II

TIME RESPONSE ANALYSIS

Introduction- Standard test input signals – Time response of first and second order systems - Time domain specifications, Characteristic Equation of Feedback control systems, Transient and steady state response of second order systems- Error constants, Steady state error and gernalized error constants– Introduction to controllers - proportional, integral and derivative Controllers.

UNIT-III

STABILITY ANALYSIS IN CONTROL SYSTEMS

The concept of stability – Routh's and Hurwiz stability criterion – difficulties in the formation of Routh table and problems.The Root Locus concept, Rules of Root Locus, construction of root loci-effects of adding poles and zeros of G(s)H(s) on the root loci.

UNIT-IV

FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications, Determination of Frequency domain specifications-Frequency response plots- Polar plots, Nyquist Plots, Bode Plots ,Gain margin and Phase margin – Stability Analysis.

Compensation Networks –Introduction to Compensation networks, Types of compensators-Lead, Lag and Lead-Lag Compensators.

UNIT-V

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from physical systems, diagonalization, solution of state equations - state transition matrix and it's properties. Concept of controllability and observability and problems.

TEXT BOOKS:

1. *Control Systems Engineering* byI. J. Nagrath and M. Gopal.New Age International Limited, Publishers, 2nd edition. 2008
2. *Control Systems* by A. Anand Kumar, Eastern Economy Edition -PHI learning Private Ltd. 2011.

REFERENCES:

1. *Control Systems Engineering* by Norman S. Nise John wiley & sons, inc. 6th Edition. 2011.
2. *Control Systems by* A. Nagoor Kani, RBA Publications, Second Edition, 2009.
3. *Automatic Control Systems* by B. C. Kuo, John wiley and son's. 8th edition 2003
4. *Modern Control Engineering* by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.

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(16EE218) Electrical Power Transmission Systems

Course Objective:

This course is an extension of Generation of Electric Power course. It deals with basic theory of transmission lines modeling and their performance analysis. Also this course gives emphasis on mechanical design of transmission lines, cables and insulators.

Course Outcomes:

- *Compute the transmission line parameters.*
- *Model a given transmission line.*
- *Estimate the performance of a given transmission line.*
- *Analyze the effect of over voltages on transmission lines.*
- *Explain the construction, types and grading of underground cables and analyze cable Performance*

UNIT I

TRANSMISSION LINE PARAMETERS

Types of Conductors: ACSR, Bundled and Standard 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, Effect of Ground on Capacitance and Problems.

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, Interpretation of the Long Line Equations – Representation of Long lines – Equivalent T and Equivalent – π – surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation – Ferranti effect , Charging current and Problems.

UNIT III

OVERHEAD LINE 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

SAG AND TENSION CALCULATIONS

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, problems and its 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 Intersheath Grading and problems

TEXT BOOKS:

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

REFERENCES:

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

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(16EE219) Power Electronics

Course Objective:

With the advent of semiconductor devices, revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters and choppers and their analysis.

Course Outcomes:

- *After going through this course, the student acquires knowledge about:*
- *Basic operating principles of power semiconductor switching devices.*
- *The operation of power electronic converters and their control.*
- *Basic operating principles of choppers and their control.*

UNIT – I

POWER SEMI CONDUCTOR DEVICES

Introduction - Thyristors, Silicon Controlled Rectifiers (SCR‘s) ,BJT, Power MOSFET, Power IGBT and their characteristics and other thyristors, Basic theory of operation of SCR, Static characteristics, Turn on and turn off methods, Dynamic characteristics of SCR,

COMMUTATION CIRCUITS

Turn on and Turn off times ,Salient points - Two transistor analogy , SCR, R and RC Triggering , UJT firing circuit, Series and parallel connections of SCR‘s, Snubber circuit details, Specifications and Ratings of SCR‘s, BJT, IGBT, Numerical problems, Line Commutation and Forced Commutation circuits.

UNIT – II

SINGLE PHASE :HALF CONTROLLED CONVERTERS

Phase control technique – Single phase Line commutated converters, Midpoint and Bridge connections, Half controlled converters with Resistive, RL loads and RLE load,

FULL CONTROLLED CONVERTERS

Full controlled converters with, Resistive, RL loads -Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode- Effect of source inductance, problems

UNIT – III

THREE PHASE LINE COMMUTATED CONVERTERS

Introduction to Three phase converters, Three pulse and six pulse converters , Mid point and bridge connections average load voltage With R and RL loads, Effect of Source inductance, Dual converters (both single phase and three phase), Waveforms ,Problems.

UNIT – IV

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, Derivation of RMS load voltage, current and power factor wave forms, Firing circuits, problems,

CYCLO CONVERTERS

Cyclo converters, Single phase midpoint cyclo converters with Resistive and inductive load - Principle of operation, Bridge configuration of single phase cyclo converter-Principle of operation, Waveforms.

UNIT – V

CHOPPERS

Choppers - Time ratio control and Current limit control strategies ,Step down choppers Derivation of load voltage and currents with R, RL and motor loads- Step up Chopper –four quadrant operation of dc drives,

INVERTERS

Inverters - Single phase inverter, Basic series inverter, Basic parallel Capacitor inverter bridge inverter, Waveforms, Voltage control techniques for inverters Pulse width modulation techniques, problems.

TEXT BOOKS:

1. *Power Electronics* by M. D. Singh & K. B. Kanchandhani, Tata Mc Graw – Hill Publishing company, 1998.
2. *Power Electronics* by P. S. Bimbhra, Khanna Publications, 2012
3. *Power Electronics* by Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998.
4. *Principles of Power Electronics* by John G. Kassakian, Martin F.Schlecht and George C. Verghese, Pearson.

REFERENCES:

1. *Power Electronics* – by Vedam Subramanyam, New Age International (P) Limited, 3rd Edition.
2. *Power Electronics* - Essentials & Applications by L. Umanand, Wiley India Pvt. Ltd.

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(16EE220) Electrical Machines – III

Course Objective:

This subject is the extension of Electrical Machines which was learned in the previous course. In this course basic principle of synchronous machines and their analysis, characteristics will be explained. And also it gives the various applications for domestic and industrial purpose. Finally principle of operation and applications of single phase motors are explained.

Course Outcome:

- *student understands the constructional details of synchronous machines, their load characteristics, able to solve the problems on regulation, parallel operation of alternation.*
- *students should be able understand the working principle methods of application of synchronous motor*
- *student should be able to understand principle operation of AC series motor, universal motor reluctance motor, stepper motor, BLDC motor.*

UNIT - I:

SYNCHRONOUS GENERATORS

Constructional features of round rotor and salient pole machines. Armature windings - integral slot and fractional slot, distributed and concentrated, single layer and multi layer, winding factors. EMF equation, harmonics in generated EMF, suppression of harmonics. Armature reaction, leakage reactance, synchronous reactance (X_S) and impedance(Z_S), Determination of Z_S, phasor diagrams. Operating characteristics and ratings of alternators and problems.

UNIT - II:

REGULATION OF SYNCHRONOUS GENERATOR

Synchronous impedance method (EMF method), Ampere turns method (MMF method), ZPF method and new ASA method(expand zpf asa). Salient pole alternators, two-reaction theory, experimental determination of X_d and X_q (slip test), phasor diagrams, regulation of salient pole alternators. Power flow equations in synchronous generator and problems.

UNIT - III:

PARALLEL OPERATION OF SYNCHRONOUS GENERATORS

Methods of synchronizing alternators. Synchronizing current, power and torque. Effect of reactance, change of excitation and mechanical power input, unequal voltages. Load sharing between alternators. Synchronous machines on infinite bus bars. Time period of oscillation and problems.

UNIT - IV:

SYNCHRONOUS MOTORS

Principle of operation, phasor diagram, variation of current and power factor with excitation, synchronous condenser, power flow in synchronous motor. Circle diagram - excitation and power circles. Hunting and its suppression. Methods of starting - auxiliary-motor, damper winding, synchronous - induction motor and problems.

UNIT - V:

FRACTIONAL KILOWATT MOTORS

Single phase induction motor - constructional features, double revolving field theory, split-phase motors, shaded pole motor. Construction, principle, characteristics and applications of AC series motor, universal motor, reluctance motors, stepper motor (types), AC and DC servo motors.

TEXT BOOKS:

1. *Electrical Machinery by* P.S. Bimbhra, Khanna Publishers, New Delhi, 7th edition, 2011.
2. *Theory and performance of Electrical Machines* by JB Gupta,S.K. KATARIA and Sons, New Delhi, 14th edition, 2011.

REFERENCES:

1. *The Performance and Design of A.C.Machines* by M.G. Say, CBS publishers, New Delhi, 3rd edition, 2002.
2. *Generalized Theory of Electrical Machines* by P.S. Bimbhra, Khanna Publishers, Delhi, 7th edition, 2005.
3. *Electrical Machines by* R.K.Rajput, Electrical Machines, Laxmi Publications (P) Ltd, New Delhi, 15th edition, 2012.

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(16EC402) Switching Theory and Logic Design

Course Objectives:

- *The Objective of this course is to familiarize the student with fundamental principles of digital design.*
- *Acquire the skills to manipulate and examine Boolean algebraic expressions, logical operations, Boolean functions and their simplifications.*
- *Acquaint with classical hardware design for both combinational and sequential logic circuits.*

Course Outcomes:

- *Ability to define different Number system and perform Number base conversions.*
- *Able to simplify the Boolean functions & design using Logic gates*
- *Understand the gate-level minimization techniques.*
- *Design sequential and combinational circuits.*
- *To understand and design memory systems like RAM,ROM,PLA,PAL*

UNIT I

BINARY SYSTEMS: Binary Numbers, Octal and Hexadecimal Numbers, Number Base Conversions, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Digital Systems.

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–LEVELMINIMIZATION: The Map Method, Four Variable K-Map, Five-Variable K-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

COMBINATIONALLOGIC GATES: Introduction to Combinational Logic Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, De-Multiplexers.

UNIT IV

SYNCHRONOUSSEQUENTIALLOGIC GATES: Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, Registers, Shift Registers, Ripple counters, Synchronous 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. *Switching & Finite Automata theory* – Zvi Kohavi, TMH, 2nd Edition.
2. *Digital Design* – Morris Mano, PHI, 3rd Edition, 2006.
3. *Switching Theory and Logic Design*-A.Anand kumar, 2008, PHI

REFERENCES:

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

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(16EC417) Linear IC Applications

Course Objectives:

- *Design of OPAMPS, Classification of OPAMPs.*
- *To study and design various linear applications of OPAMPs.*
- *To study and design various nonlinear applications of OPAMPs*

Course Outcomes:

- *Understand the basic building blocks of linear integrated circuits and its characteristics.*
- *Analyze the linear, non-linear and specialized applications of operational amplifiers.*
- *Understand the theory of ADC and DAC.*
- *Realize the importance of Operational Amplifier.*

UNIT – I

Differential Amplifiers: Introduction to Differential amplifier configurations, Balanced and unbalanced output differential amplifiers, current mirror, level Translator.

Operational amplifiers: Introduction, Block diagram, Ideal op-amp& Characteristics, Equivalent Circuit, Voltage Transfer curve, open loop op-amp configurations, Virtual Ground Concept, Introduction to dual OP-AMP TL082 as a general purpose JFET-input Operational Amplifier.

UNIT-II

Feed back Amplifiers: Introduction, feedback configurations, voltage series feedback, voltage shunt feedback and differential amplifiers, Practical op-amp& Characteristics.

Frequency response: Introduction, compensating networks, frequency response of internally compensated op-amps and non-compensated op-amps, High frequency op-amp equivalent circuit, open loop gain Vs frequency, closed loop frequency response, circuit stability, slew rate.

UNIT-III

Linear Applications: DC and AC amplifiers, peaking amplifier, summing, scaling and averaging amplifiers, analog multipliers, instrumentation amplifier, voltage to current converter, current to voltage converter, integrator, differentiator.

Active Filters: First, Second and Third order Butterworth filter and its frequency responses, Tow-Thomas biquad filter.

UNIT-IV

Non-Linear Applications: Oscillators, Phase shift and wein bridge oscillators, Square, triangular and sawtooth wave generators, Comparators, zero crossing detector, Schmitt trigger, characteristics and limitations.

Specialized applications: 555 timer IC (monostable & astable operation) & its applications, PLL, operating principles, Monolithic PLL, applications, analog multiplier and phase detection, Wide bandwidth precision analog multiplier MPY634 and its applications.

UNIT V

Converters: Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope type , Over-sampling A/D Converters.

TEXT BOOKS:

1. *Linear Integrated Circuits* by D. Roy Chowdhury, New Age International (p) Ltd,2nd Edition, 2003.
2. *Op-Amps & Linear ICs* by Ramakanth A. Gayakwad, PHI, 3rd & 4th edition, 1987.

REFERENCES:

1. *Operational Amplifiers and Linear Integrated Circuits* by K.LalKishore, Pearson Education,2007.
2. *Operational Amplifiers & Linear Integrated Circuits by* R.F.Coughlin & Fredrick Driscoll, 6th Edition, PHI.
3. *Operational Amplifiers & Linear ICs by* David A. Bell, Oxford University Press, 2nd edition, 2010.
4. *Integrated Circuits by* Kamal Prakash Pandey & Chandra Bhan, Educational & Technical Publications, 2013.

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(16EE221) Electrical Machines – II Lab

Lab Objective:

The main objective of this lab is to develop the practical knowledge on AC machines for the students which are studied in the previous semester & this semester theoretically.

Minimum of Ten Experiments should be conducted from the following List:

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner‘s Test on a Pair of Single Phase Transformers
3. Scott Connection of Transformers
4. No-Load & Blocked Rotor Tests on Three Phase Induction Motor
5. Regulation of a Three –Phase Alternator by Synchronous Impedance & M.M.F. Methods
6. V and Inverted V Curves of a 3 Phase Synchronous Motor.
7. Equivalent Circuit of a Single Phase Induction Motor
8. Determination of Xd and Xq of a Salient Pole Synchronous Machine
9. Parallel Operation of Single Phase Transformers
10. Separation of Core Losses of a Single Phase Transformer
11. Brake Test on Three Phase Induction Motor
12. Regulation of Three-Phase Alternator by Z.P.F. and A.S.A Methods
13. Load Test on Single Phase Transformer
14. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
15. Efficiency of a three-phase alternator

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(16EE222) Control Systems And Simulation Lab

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 a 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.

REFERENCES:

1. Comprehensive lab manual- Control systems by Dr.G.V.Marutheswar,Dr.Ch.Chengaiah, BS Publications Hyderabad.
2. Simulation of Electrical and electronics Circuits using PSPICE by M.H.Rashid, M/s PHI Publications.
3. PSPICE A/D users manual Microsim, USA.
4. PSPICE reference guide Microsim, USA.
5. MATLAB and its Tool Books users manual and Mathworks, USA.

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(16EE223) Power Semiconductor Drives

Course Objective:

This course is an extension of Power Electronics applications to AC and DC drives. Control of DC motor drives with single phase and three phase converters and choppers are given in detail. The control of AC motor drives with variable frequency converters and variable voltage are presented.

Course Outcomes: *The student should be able to:*

- *Identify the choice of the electric drive system based on their applications*
- *Explain the operation of single and multi quadrant electric drives*
- *Analyze single phase and three phase rectifiers fed DC motors as well as chopper fed DC motors*
- *Explain the speed control methods for AC-AC & DC-AC converters fed to Induction motors and Synchronous motors with closed loop, and open loop operation*

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. Power semiconductor controlled drives by G K Dubey, Prentice Hall, 1989.
2. Power Electronic Circuits, Devices and applications by M.H. Rashid, PHI, 2005.76

REFERENCES*:*

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

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(16EE224) Electrical and Electronic Measurements

Course Objective:

Electrical measurements course introduces the basic principles of all measuring instruments. It also deals with the measurement of voltage, current Power factor, power, energy and magnetic measurements and Digital Meters.

Course Outcome:

After successful completion of the course, student will be

- *Able to develop an understanding of construction and working of different measuring instruments*
- *Able to develop an understanding of construction and working of different AC and DC bridges and its applications*
- *Familiar with C.T and P.T and its applications*
- *Familiar with various measuring instruments used to detect electrical quantities such as power and energy.*

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

DC BRIDGES: Bridge Balance condition, Method of Measuring Low, Medium and High Resistance – Sensitivity of wheatstone Bridge – kelvin and Kelvins double bridge, Loss of Charge Method, Problems.

AC BRIDGES: Measurement of Inductance - Maxwell‘s Bridge, Anderson Bridge. Measurement of Capacitance and Loss Angle - De Sauty Bridge. Wien‘s Bridge – Schering Bridge, Problems.

UNIT III

MEASUREMENT OF POWER AND ENERGY

Single Phase Dynamometer Wattmeter, LPF and UPF, Double Element and Three Element dynamometer type 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: Current Transformers and Potential Transformers Construction, Principle of operation and characteristics.

Potentiometers: Principle and Operation of D.C. Crompton's Potentiometer–Standardization –Measurement of unknown Resistance, Current, Voltage. A.C. Potentiometers-Polar and Coordinate types - Standardization – Applications.

UNIT V

MAGNETIC MEASUREMENTS

Ballistic Galvanometer – Equation of Motion – Flux Meter – Constructional Details, Comparison with Ballistic Galvanometer. Cathode Ray Oscilloscope- Cathode Ray tube- Time base generator-Horizontal and Vertical Amplifiers –Application of CRO – Measurement of Phase , Frequency, Current & Voltage- Lissajous Patterns .

DIGITAL METERS

Basic principle and operation of digital meters- Applications.

TEXT BOOKS:

1. *Electrical & Electronic Measurement & Instruments* by A.K.Sawhney, Dhanpat Rai & Co. Publications, 2007.
2. *Electrical Measurements and measuring Instruments* by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011.

REFERENCES:

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

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(16EE225) Switch Gear and Protection

Course Objective:

This course introduces all varieties of Circuit Breakers and Relays for protection of Generators, Transformers and feeder bus bars from over voltages and other hazards. It emphasis on neutral grounding for overall protection.

Course Outcomes:

- *Student gains knowledge on different Protective Equipments or Power Systems*
- *Know about various protective systems- how it works and where it works?*
- *Different applications o f the relays, circuit breakers, grounding for different elements of power system is also discussed in the subject.*
- *Ability to express Oil circuit Breaker, Air Blast circuit Breakers, SF6 Circuit Breaker.*
- *Ability to identify DMT,IDMT type relays*

UNIT- I

CIRCUIT BREAKERS: Elementary Principles of Arc Interruption, Recovery, Restriking Voltage and Recovery Voltages.- Restriking Phenomenon, Average and Max. RRRV, and Problems - Current Chopping and Resistance Switching - CB Ratings and Specifications, Problems, Auto Reclosers. Types of Circuit Breakers- Description and Operation -Minimum Oil Circuit Breakers, Air Blast Circuit Breakers, Vacuum and SF6 Circuit Breakers and applications.

UNIT- II

RELAYS

Introduction-Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection – Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Directional and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT Static Relays. Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays and their Flow Charts

Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays, Advantages and Disadvantages and applications.

UNIT -III

PROTECTION OF GENERATORS AND TRANSFORMERS

Protection of Generators against Stator Faults, Rotor Faults, and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection, Problems on percentage Winding. **Protection of Transformers**: Percentage Differential Protection, Problems and Design of CTs Ratio, Buchholz Relay Protection.

UNIT- IV

PROTECTION OF FEEDERS & LINES

Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line, 3-Zone Protection Using Distance Relays, Carrier Current Protection. Protection of Bus Bars.

UNIT -V

PROTECTION AGAINST OVER VOLTAGES AND GROUNDING

Generation of Over Voltages in Power Systems.-Protection Against Lightning Over Voltages – Valve Type and Zinc-Oxide Lightning Arresters - Insulation Coordination –BIL.

Methods of neutral grounding: solid resistors – reactors –arcing grounds and grounding practices.

TEXT BOOKS:

1. *Power System Protection and Switchgear* by Badri Ram, D.N Vishwakarma, TMH Publications, 2011
2. *Switchgear and Protection* by Sunil S Rao, Khanna Publishers, 1992.
3. *Power System Engineering*‖ by Chakrabarti, M.L.Soni, P.V.Gupta,U.S.Bhatnagar, Dhanpat rai & Co. Publishers

REFERENCES:

1. *Power system protection and switch gear* by Bhuvanesh Oza, TMH, 2010.
2. *Electrical power System Protection* by C. Christopoulos and A. Wright, 2nd Edition, Springer International Edition, 1999
4. *Electrical Power Systems* by C.L.Wadhwa, New Age international (P) Limited, Publishers, 2012.

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(16EE226) Power System Analysis

Course Objectives:

Study about the Y bus and Z bus of a Power System, Power flow studies by various methods. It also deals with short circuit analysis and analysis of power system for steady state and transient stability.

Course Outcomes: *The student should be able to:*

- *Understand the mathematical models of power system components*
- *Understand the methods for Load flow.*
- *Understand the fault calculations for various types of faults.*
- *Understand the power system stability concepts.*

UNIT- I

POWER SYSTEM NETWORK MATRICES

Representation of Power System Elements, Graph Theory: Definitions, primitive network ,Bus Incidence Matrix, Formation of Ybus by Direct and Singular Transformation Methods, Problems.

Formation of ZBus: Partial Network, Algorithm for the Modification of ZBus Matrix for Addition Element for the Following Cases: Addition of Element from a New Bus to Reference, Addition of Element from a New Bus to an Old Bus, Addition of Element Between an Old Bus to Reference and Addition of Element Between Two Old Busses Modification of ZBus for the Changes in Network, Problems.

UNIT- II

SHORT CIRCUIT ANALYSIS

Per-Unit System of Representation. Per-Unit Equivalent Reactance Network of a Three Phase Power System, Problems.

Symmetrical Fault Analysis: Short Circuit Current and MVA Calculations, Fault Levels, Application of Series Reactors, Problems. Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero Sequence Components: Voltages, Currents and Impedances.

Sequence Networks: Positive, Negative and Zero sequence Networks, Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults on unloaded alternator, Problems.

UNIT- III

POWER FLOW STUDIES

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static Load Flow Equations – Load Flow Solutions using Gauss Seidel Method: Acceleration Factor, Load Flow Solution with and without P-V Buses, Algorithm and Flowchart. Numerical Load

flow Solution for Simple Power Systems(3 Bus & 5 Bus System) Determination of Bus Voltages, Injected Active and Reactive Powers and Finding Line Flows/Losses for the given Bus Voltages. Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Load flow Methods – DC Load Flow.

UNIT –IV

TRANSIENT STATE STABILITY ANALYSIS

Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion Application of Equal Area Criterion, Critical Clearing Angle Calculation. Solution of Swing equation by 4^{th} order Range – Kutta Method - Methods to improve Stability - – Recent Methods of maintaining stability

UNIT –V

STEADY STATE STABILITY ANALYSIS

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability.

TEXT BOOKS:

1. *Computer Methods in Power Systems*, Stagg El – Abiad & Stags, Mc Graw-hill Edition.
2. *Modern Power system Analysis* by I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing Company, 2^{nd} edition.
3. *Power System Analysis* by Nagsarkar and Sukhija, OXFORD University Press.

REFERENCES:

1. *Power System Analysis* by Grainger and Stevenson, Tata McGraw Hill.
2. *Computer Techniques in Power System Analysis* by M A Pai, Second Edition, TMH.

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(16EC423) Micro Processors and Micro Controllers

Course Objectives:

- *To understand the architecture of 8085 microprocessor.*
- *To learn 8086 architecture Instruction set*
- *To learn and understand 8051 Architecture assembly Language programming*

Course Outcomes :

- *After completion of this subject the students will be able to:*
- *Do programming with 8086 microprocessors*
- *Understand concepts of Intel x86 series of advanced processors*
- *Able to understand the basic concepts of 8051 architecture*
- *Design and implement some specific real time applications Using 8051 Microcontroller*

UNIT- I

Introduction to microprocessors - 8085 Architecture-Block Diagram, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagram, Instruction Set of 8085- Instruction & Data Formats- Addressing Modes- Instructions.

UNIT- II

Overview of 8086 architecture, Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration, Physical Memory Organization, Advanced Processors – 80286, 80386 and Pentium Processors.

UNIT-III

Introduction to Micro controllers, Architecture of 8051, Registers, Pin Description, Connections, Input and Output Ports, Memory Organization, Addressing Modes, Counters & Timers, Serial data Communication.

UNIT-IV

Programming of 8051- Assembly language Programming, Assembler directives, Instruction set - Moving Data, Logical operations – Byte level and bit level operations, Rotate and swap operations, Arithmetic operations, Jump and call Instructions, Interrupts and Returns.

UNIT-V:

Interfacing of 8051 – keyboard, Displays, ADC converters, Multiple interrupts – 8051 Data Communication modes and applications.

TEXT BOOKS:

1. *Microprocessor architecture programming & applications with the 8085* by S.Ramesh Gaonkar, PRI Publishers. 6th Edition
2. *Advanced Microprocessors & Peripheral interfacing* by Ray Bhurchandi, 3rd edition, McGraw hill Publications
4. *The INTEL Microprocessors* by Brey, 6th edition, PHI Publishers
5. *The 8051 Microcontroller and architecture* by Kenneth J. Ayala, PRI Publishers 2nd edition

REFERENCES:

1. *Microprocessor and Microcontrollers by* N.Senthil Kumar, M.Saravanan, S.Jeevanathan, Oxford Publishers. 1st Edition, 2010
2. *The X86 Microprocessors , Architecture, Programming and Inerfaci*ng by Lyla B. Das, Pearson Publications, 2010

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(16HS615) Advanced English Language and Communication Skills Lab

Course Description

The introduction of the Advanced Professional Communication Skills Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- *To improve the students' fluency in English, through a well-developed vocabulary*
- *To enable them listening spoken English at normal conversational speed by educated English speakers*
- *To respond appropriately in different socio-cultural and professional contexts.*
- *To communicate effectively and appropriately in real life situation.*
- *To develop drafting skills among the students.*
- *To develop and integrate use of the four language skills.*
- *To enhance employability skills*

UNIT I

COMMUNICATIVE COMPETENCY:

1. Functional English(Introducing yourself & others, Making Requests, Agreeing, Disagreeing)
2. Reading Comprehension
3. Listening Comprehension
4. Vocabulary for competitive purpose

UNIT II

TECHNICAL WRITING

1. Curriculum vitae
2. Cover Letter
3. E-mail writing

UNIT III

PRESENTATIONAL SKILLS

1. Oral presentation
2. Power point presentation
3. Extempore – Public Speaking
4. Stage Dynamics

UNIT IV

CORPORATE SKILLS

1. Dress code
2. Telephonic skills
3. Net-etiquette
4. Personality Development

UNIT V

GETTING READY FOR JOB

1. Group Discussion
2. Interview skills
3. JAM

Outcomes

- Flair in Writing and felicity in written expression.
- To enhance job prospects.
- Improving Effective Speaking Abilities.
- To prepare effective Interview techniques.

Minimum Requirements for Advanced Professional Communication Skills Lab:

The English Language Lab shall have two parts:

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

   Specifications:

   i) P- IV Processor
      a) Speed 2.8 GHZ
      b) RAM – 512 MB Minimum
      c) Hard Disk – 80 GB

   ii) Headphones of High quality

Suggested Software:

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – Part II
3. K – Van Advanced Communication Skills
4. 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*, Anjana Agarwal, New Age International Publishers, 2011.
5. *Listening Extra*, Miles Craven, Cambridge University Press, 2008.
6. *Reading Extra*, Liz Driscoll, Cambridge University Press, 2004.
7. *Writing Extra*, Graham Palmer, Cam Cambridge University Press, 2004.
8. *Speak Well*, Jayashree Mohan raj et al, Orient Black swan, 2013.

Mode of Evaluation: Written Examination, Day-to-day Assessment

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(16EE227) Power Electronics and Simulation Lab

Course Objectives:

The characteristics of power electronic devices with gate firing circuits. Various forced commutation techniques. The operation of single-phase voltage controller, converters, cyclo converter and Inverters circuits with R and RL loads. The operation of three-phase converter and cyclo converter circuits with R and RL loads.

Course Outcomes:

Test the turn on –turn off characteristics of various power electronic devices.
Test and analyze firing circuits for SCRs
Test different types of voltage controllers, converters and Inverters with R and RL loads

Any Eight of the Experiments in Power Electronics Lab

1. Study of 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. Forced Commutation Circuits (Class A, Class B, Class C, and Class D)
6. DC Jones Chopper with R And RL Loads
7. Single Phase Parallel Inverter with R and RL Loads
8. Single Phase Cycloconverter with R and RL Loads
9. Single Phase Half Controlled Converter with R Load
10. Three Phase Fully Controlled Bridge Converter with R-Load
11. Three Phase Cycloconverter with R and RL Loads
12. Single Phase Dual Converter with RL Loads

Any Two Simulation Experiments With PSPICE/PSIM

PSPICE Simulation of Single-Phase Full Converter Using RLE Loads and Single-Phase AC Voltage
Controller Using RLE Loads
PSPICE Simulation of Resonant Pulse Commutation Circuit and Buck Chopper
PSPICE Simulation of Single Phase Inverter with PWM Control

REFERENCES:

1. Simulation of Electric and Electronic circuits using PSPICE – by M.H.Rashid, PHI.
2. PSPICE A/D user " s manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user " s manual and – Mathworks, USA.

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(16EC428) Micro Processors & Micro Controllers Lab

***Course Objective*:**

- To become skilled in Assembly Language programming.
- To understand and learn 8051 microcontroller.
- To learn 8051 Programming.

***Learning Outcome*:**

- Able to write Assembly Language programs.
- Able to develop 8051 Programs.
- Able to understand Peripheral devices interfacing.

Minimum **Ten** Experiments to be conducted (**Five** from each section)

I) Practice on Microprocessor fundamentals

1) Micro processors and Architectures
2) Registers
3) Addressing Modes
4) Instruction set

II) Microcontroller 8051 Trainer kit

Programs using the following Instruction set

1. Arithmetic operations.
2. Logic operations
3. Bit Manipulation operations
4. Conditional & Unconditional Branching operations

Interfacing using 8051 Trainer kit:

1. Keypad
2. Displays
3. Sensors
4. Traffic Light controller
5. Actuators

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(16EE228) Power System Operation and Control

Course Objectives:

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 Generators and Automatic controllers.*
4. *It Emphasizes on Single Area and Two Area Load Frequency Control and Reactive Power Control.*

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

- *Develop the mathematical models of turbines and governors*
- *Address the Load Frequency Control problem*
- *Explain how shunt and series compensation helps in reactive power control*
- 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, General transmission line loss formula 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, GOVERNOR

Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.

Modelling of Governor: Mathematical Modelling 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 – Load Frequency Control and Economic dispatch control.

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

REFERENCES:

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

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(16EE229) Electrical Distribution Systems

Objectives:

1. *To demonstrate knowledge on different types of loads and distribution feeders,different parameters and protection schemes for distribution feeders.*
2. *To analyze different feeder configurations, optimal capacitor placement, the criteria for economical power factor and different grounding methods for protection*
3. *To design proper rating of capacitor to improve power factor.*
4. *To demonstrate skills in evaluating* the *load parameters of different types of loads and voltage drop, losses and fault currents in distribution system.*

Course Outcomes:

- *Know different types of distributions systems and their design*
- *Usage of protective devices and their installation with coordination.*
- *Ability to calculate coincidence factor, contribution factor, Loss factor*
- *Ability to calculate radial distribution substation*

UNIT- I:
INTRODUCTION TO DISTRIBUTION SYSTEMS

Introduction to distribution systems, load modeling 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. Classification of distribution systems - radial, loop, ring main. Comparison of DC Vs AC and under-ground Vs over-head distribution systems.

UNIT-II:
DC AND AC DISTRIBUTION SYSTEMS

Voltage drop calculations and problems in DC distributors – radial DC distributor fed at one end, at both the ends (equal/unequal voltages) and ring main distributor. Voltage drop calculations and problems in AC distributors – power factors referred to receiving end voltage and respective load voltages.

UNIT - III:
SUBSTATIONS

Classification of substations - indoor and outdoor, gas and air insulated substations. Substation layout - different bus bar schemes, location of substations - rating of distribution substations, service area with 'n' primary feeders. Neutral Grounding - Grounded and ungrounded systems, effects of ungrounded neutral on system performance, methods of

neutral grounding - solid, resistance, reactance and Arc suppression coil (Peterson coil) grounding.

UNIT- IV:

POWER FACTOR CORRECTION

Causes of low power factor, methods of improving power factor – power capacitors, series and shunt capacitors (fixed and switched) for power factor correction, most economical power factor for constant KW load and constant KVA type loads, economic justification for capacitors, procedure to determine the optimum capacitor allocation - numerical problems.

UNIT - V:

DISTRIBUTION AUTOMATION

Introduction to Distribution automation-Project planning, 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. *Electric Power Distribution System Engineering* by Turan Gonen, Mc Graw-Hill Book Company, 2nd edition, 2012
2. *Principles of Power System by* V.K.Mehta, Rohit Mehta, Principles of Power System, S.Chand & Company Ltd, revised edition, 2013

REFERENCES:

1. *Generation, Distribution and Utilization of Electrical Energy* by Wadhwa, C. L., New Age International, 1993.
2. *Electric Power Distribution* by A.S.Pabla,Tata Mc Graw-Hill Publishing Company, 4th edition, 1997
3. *Power System Engineering* by M.L.Soni, P.V.Gupta, V.S. Bhatnagar, A.Chakravarthy, Dhanpat Rai and Co Private Limited, 2007.

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(16EC422) Digital Signal Processing

***Course Objectives*:**

- This course will introduce the basic concepts and techniques for processing signals on a computer. By the end of the course, students will be familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
- The course emphasizes intuitive understanding and practical implementations of the theoretical concepts.
- To produce graduates who understand how to analyze and manipulate digital signals and have the fundamental MATLAB programming knowledge to do so.

***Course Outcomes**:*

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

- Able to obtain different Continuous and Discrete time signals.
- Ability to develop Fast Fourier Transform (FFT) algorithms for faster realization of signals and systems.
- Able to design Digital IIR filters from Analog filters using various techniques (Butterworth and Chebyshev).
- Able to design Digital FIR filters using window techniques, Fourier methods and frequency sampling techniques.
- Ability to design different kinds of interpolator and decimator.

UNIT-I

Review of discrete-time signals and systems: Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems.

Discrete Fourier Transform: Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Linear filtering methods based on DFT, Frequency analysis of signals using the DFT.

UNIT-II

Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, A linear filtering approach to computation of the DFT- the Goertzel, and the Chirp-z transform algorithms, Quantization errors in the computation of DFT.

UNIT-III

Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Frequency sampling, and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, Conversion from Lattice structure to direct form, lattice – Ladder structure.

UNIT-IV

IIR filter Design-Design of Infinite Impulse Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

UNIT-V

FIR filter Design-Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters –Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Design of optimum equi-ripple linear phase FIR filters, Comparison of design methods for linear phase FIR filters,

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4th ed., 2007.
2. Sanjit K Mitra, "Digital signal processing, A computer base approach," TataMcGraw Hill, 3rd edition, 2009.

REFERENCES:

1. A.V. Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.
2. B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.
3. Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications," Academic Press, Second Edition, 2013.

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(16MB750) Managerial Economics and Financial Analysis

Course Objective: - *The objectives of this course are to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to enrich analytical skills in helping them take sound financial decisions for achieving higher productivity.*

Course Outcome*: -The thorough understanding of Managerial Economics and Analysis of Financial statements facilitates the technocrats –cum- entrepreneurs to take up decisions effectively and efficiently in the challenging Business Environment.*

UNIT I - INTRODUCTION TO MANAGERIAL ECONOMICS

Managerial Economics - Definition, nature and scope – contemporary importance of Managerial Economics - Demand Analysis: Determinants- Law of Demand - Elasticity of Demand. Significance –Types – measurement of elasticity of demand - Demand forecasting- factors governing demand Forecasting- methods of demand forecasting –Relationship of Managerial Economics with Financial Accounting and Management.

UNIT II - THEORY OF PRODUCTION AND COST ANALYSIS

Production Function – Short-run and long- run production - Isoquants and Isocosts, MRTS, least cost Combination of inputs - Cobb-Douglas production function - laws of returns - Internal and External Economies of scale – **Cost Analysis**: Cost concepts - Break-Even Analysis (BEA) – Managerial Significance and limitations of BEA - Determination of Break Even Point , Problems

UNIT III - INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT

Market structures: Types of Markets - Perfect and Imperfect Competition - Features, Oligopoly -Monopolistic competition. Price-Output determination - Pricing Methods and Strategies. New Economic Environment- Economic systems – Economic Liberalization – Privatization and Globalization

UNIT IV - CAPITAL AND CAPITAL BUDGETING

Concept of Capital - Over and under capitalization – Remedial measures - Sources of Short term and Long term capital - Estimating Working Capital requirement – Capital budgeting – Features of Capital Budgeting proposals – Methods and Evaluation of Capital budgeting – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method ,problems.

UNIT V - INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS

Financial Accounting – Concept - emerging need and importance - Double-Entry Book Keeping-Journal - Ledger – Trial Balance - Financial Statements - - Trading Account – Profit & Loss Account –Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Techniques – Liquidity, Leverage, Profitability, and Activity Ratios ,problems.

TEXT BOOKS:

1. Managerial Economics and Financial Analysis, by Aryasri,4/e, TMH, 2009.
2. Managerial Economics by Varshney &Maheswari:, Sultan Chand, 2009.

REFERENCES:

1. Financial Accounting and Analysis by Premchand Babu, Madan Mohan, Himalaya, 2009
2. Managerial Economics and Financial Analysis by S.A. Siddiqui and A.S. Siddiqui, 2009.
3. Principles of Business Economics by Joseph G. Nellis and David Parker,Pearson, 2/e, New Delhi
4. Managerial Economics in a Global Economy by Domnick Salvatore, Cengage,2009.
5. Managerial Economics by H.L.Ahuja ,S.Chand, 3/e, 2009

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(16EE230) Principles of Power Quality
(ELECTIVE-I)

Course Objective:

1. *Understand the various power quality phenomenon, their origin and monitoring and mitigation methods.*
2. *Understand the effects of various power quality phenomenon in various equipments.*

Course Outcomes:

- *Understand the basic concept of Power quality issues.*
- *Understand the basic concept Power quality terminology*
- *Understand the basic concepts of Power quality Monitoring.*
- *Understand the basic concepts of custom power devices.*

UNIT I
INTRODUCTION

Definition of Power Quality- Power Quality Terminology –evaluation procedure, responsibilities of the suppliers and users of electric power 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. *Electrical Power Systems Quality by Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, McGraw Hill,2003.*
2. *Power Quality in Power System and Electrical Machines by Eswald.F.Fudis and M.A.S. Masoum Academic Press, 2013.*

REFERENCES:

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

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(16EE231) HVDC Transmission Systems
(ELECTIVE-I)

Course Objectives:

Static power converters Control of HVDC converter systems Origin, effects, classification and elimination of harmonics The occurrence of faults, and transients in HVDC system and their protection.

Course Outcomes:

- *Compare HVDC and HVAC transmission systems*
- *Understand the operation of various converters used in HVDC transmission systems*
- *Devise means to suppress / eliminate harmonics.*
- *Design HVDC and AC Filters*

UNIT I
INTRODUCTION TO HVDC TRANSMISSION

HVDC Transmission: Technical And Economical Comparision of HVAC ond HVDC Transmission, Types of DC Links, Power Handling Capabilities of HVDC Lines, Basic Conversion Principles, Static Converter Configuration.

UNIT II
STATIC POWER CONVERTER ANALYSIS

Static Power Converters: 3 Pulse, 6 Pulse & 12 Pulse Converters, Converter Station and Terminal Equipment Commutation Process, Rectifier and Inverter Operation, Equivalent Circuit for Rectifier, Inverter and HVDC Link.

UNIT III
CONTROL OF HVDC CONVERTER SYSTEMS

Control of HVDC Converter Systems: Principle of DC Link Control – Constant Current, Constant Extinction Angle and Constant Ignition Angle Control and Voltage Dependent Current Control. Individual .Phase Control and Equidistant Firing Angle Control

UNIT IV
HARMONICS AND FILTERS

Origin of Harmonics in HVDC Systems, Classification of Harmonics, Harmonics Elimination, Suppression Methods, Design of HVDC AC & DC Filters etc.

UNIT V

TRANSIENTS, FAULTS AND PROTECTION OF HVDC SYSTEMS

Origin of over Voltages in HVDC Systems, Over Voltages due to DC and AC Side Line Faults - Converter Faults, Over Current Protection- Valve Group and DC Line Protection. Over Voltage Protection of Converters, Surge Arresters etc.

TEXT BOOKS:

1. K.R.Padiyar, High Voltage Direct current Transmission, Wiley Eastern Ltd, 1993.

2. S.kamaksaiah, V.Kamaraju Mc Graw hill company, 2011.

REFERENCES:

1. *E.Uhlamann, Power Transmission by Direct Current Springer-Verlag, Berlin, 1975.*
2. *S Rao, EHVAC, HVDC Transmission & Distribution Engineering, KhannaPublishers, 2001.*

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(16EE232) Smart Grid Technology
(ELECTIVE-I)

Course Objectives:

1. *To know the basic concepts of Smart Grid, Micro Grid; Design and Analysis.*
2. *To learn about Wide Area Monitoring Systems (WAMS), PMU, AMI, Smart Meters etc.*
3. *To understand performance analysis and stability analysis of the Smart Grid.*
4. *To learn the renewable energy resources and Storages integrated with Smart Grid.*

Course Outcomes: *The student should have learnt about:*

- *How to meet the standards for information exchange and for smart metering*
- *How to preserve data and Communication security by adopting encryption and decryption procedures.*
- *Monitoring, operating, and managing the transmission and distribution tasks under smart grid environment*

UNIT–I:
INTRODUCTION TO SMART GRID:
Comparison of Power grid and Smart grid - Power system enhancement - communication and standards - General View of smart Grid Market Drivers - Stakeholder Roles and Function-Measures - Representative Architecture - Functions of Smart Grid Components - Wholesale energy market in Smart grid - Smart vehicles in Smart grid.

UNIT–II:
SMART GRID COMMUNICATION AND MEASUREMENT TECHNOLOGY:
Communication and Measurement Monitoring - Phasor Measurement Unit(PMU) - Smart Meters - Wide Area Monitoring Systems (WAMS) - Advanced Metering Infrastructure (AMI) - GIS and Google Mapping Tools - Multiagent Systems (MAS) Technology.

UNIT–III:
PERFORMANCE ANALYSIS TOOLS FOR SMART GRID DESIGN:
Introduction to Load Flow Studies - Challenges to Load Flow in Smart Grid and Weaknesses of the Present Load Flow Methods - Load Flow State of the Art: Classical, Extended Formulations, and Algorithms - Load Flow for Smart Grid Design - Contingencies Studies for the Smart Grid.

UNIT–IV:

STABILITY ANALYSIS TOOLS FOR SMART GRID:

Voltage Stability Analysis Tools - Voltage Stability Assessment Techniques - Voltage Stability Indexing - Analysis Techniques for Steady - State Voltage Stability Studies - Application and Implementation Plan of Voltage Stability - Angle Stability Assessment in Smart Grid - Approach of smart grid to State Estimation - Energy management in smart grid.

UNIT–V:

MICRO GRID , RENEWABLE ENERGY SOURCES AND STORAGE:

Concept of Micro-grid, Design and Analysis, Distributed generation and Distributed automation, Renewable Energy Resources-Sustainable Energy Options for the Smart Grid including Solar Energy, Wind Energy, Biomass, Fuel Cell etc.- Penetration and Variability Issues Associated with Sustainable Energy Technology - Demand Response Issues - Electric Vehicles and Plug-in Hybrids - PHEV Technology - Environmental Implications - Storage Technologies.

TEXT BOOKS:

1. *Fundamentals of design and analysis* by James Momoh, John Wiley & sons Inc, IEEE press 2012.
2. *Smart Grid: Technology and Applications* by Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, John Wiley &sons inc,2012.
3. *Smart Grid: Integrating Renewable,Distributed & Efficient Energy* by Fereidoon P.Sioshansi, Academic Press, 2012.
4. *Micro grid, Architecture and Control* by Nikos Ziargyriour by IEEE Press, Wiley Publications

REFERENCES:

1. Clark W.Gellings, ‐The Smart grid: Enabling energy efficiency and demand response‖ Fairmont Press Inc, 2009.
2. Jean Claude Sabonnadiere, Nouredine Hadjsaid, ―Smart Grids‖, Wiley Blackwell.
3. Ali Keyhani, Mohammad N. Marwali, Min Dai ―Integration of Green and Renewable Energy in Electric Power Systems‖, Wiley.
4. Stuart Borlase,‖Smart Grids (Power Engineering)‖, CRC Press.

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(16CE145) Elements of Road Traffic Safety
(Open Elective)

Course Objectives:

The main objective of this course is to make student aware about the accident statistics globally and in India specifically, its causes and measure to overcome the situation. The traffic regulation, parking problems, understanding of road signs, signals and marking are also taught; so that the student is well informed about all safety measures that a traffic engineer need to understand.

Course Outcomes:

After completion of this course the student:

- *Can clearly understand the accident scenario, causes and measure to be taken*
- *Can know the traffic regulations*
- *Can understand the parking problems and can give solutions*
- *Can get an awareness of traffic signs, signals and road markings*
- *Can understand the need of street light and their proper disposition on road*

UNIT – I

ROAD ACCIDENTS – CAUSES & PREVENTION: Road Accidents & Traffic Engineering – Accident Situation in India – International Comparison of Road Accidents – Road & its Effects on Accidents – The Vehicle – The Driven – Skidding – Speed in Relation of Safety – Weather & its Effects on Accidents – Pedestrian Safety -Cyclists – Motor Cycle & Scooter Rider – Parking & Its Influence on Accident – Legislation, Enforcement, Education & Propaganda – Cost of Road Accidents

UNIT – II

REGULATIONS OF TRAFFIC: Basic Principals of Regulation – Regulation of Speed – Regulation of Vehicles – Regulations Concerning the Driver – Regulations Concerning Traffic – Parking Regulations – Enforcement of Regulations

PARKING: Traffic & Parking Problems – Ill-Effects of Parking – Zoning & Parking Space Requirement Standards – Design Standards for On-Street Parking Facilities – Traffic Regulatory Measures for On-Street Parking – Off-Street Parking Facilities – Peripheral Parking Schemes – Loading & Unloading Facilities – Truck Terminals – Long Distance Bus Terminals

UNIT – III

TRAFFIC SIGNS: Importance of Traffic Signs – Need for International Standardization – The Situation in India – General Principals of Traffic Signing – Types of Traffic Signs –

Danger Signs (Warning Signs or Cautionary Signs) – Prohibitory Signs – Mandatory Signs – Informatory Sings – Indication Signs – Direction Signs, Advance Direction Signs & Place Identification Signs – Overhead Sings – Route Marker Sings – Location, Height & Maintenance of Traffic Sings

UNIT – IV

TRAFFIC SIGNALS: Advantages & Disadvantages of Traffic Signals – Signal Indications – Signal Face – Illustration of the Signals – Number & Location of Signals Faces – Amber Period, Red/Amber Period & Inter Green Period – Fixed Time Signals & Vehicle Actuated Signals – Determination of Optimum Cycle Length & Signal Settings for an Intersection with Fixed Time Signals – Warrants for Signals – Co-ordinated Control of Signals – Signal Approach Dimensions – Area Traffic Control – Delay at Signalized Intersection

UNIT – V

ROAD MARKINGS: Function – Types of Road Marking – General Principals of Longitudinal Pavement Markings – Material & Color – Centre Lines – Traffic Lane Lines – No Overtaking Zone Markings – Pavement Edge Lines – Carriageway Width Reduction Transition Marking – Obstruction Approach Markings – Stop Lines – Pedestrian Crossings – Cyclist Crossings – Route Direction Arrows – Word Messages – Markings at Approaches to Intersections – Parking Space Limits – Object Markings

STREET LIGHTING: Need for Street Lighting – Definition of Common Terms – Some Laws of Illumination – Mounting Height – Spacing – Lantern Arrangements – Type of Lamps – Lamp Installation of ‗T' Junctions & Cross Roads – Illumination of Traffic Rotaries – Lighting of Bends – Lighting of Dual Carriageways – Lighting of Roads Carrying Only Local Traffic – Lighting Bridges – Tunnel Lighting – Maintenance of Lighting Installation

TEXT BOOKS:

1. *Traffic Engineering & Transport Planning* by K. R. Kadiyali 8th Edition, Khanna Publishers

REFERENCES:

1. *Highway Engineering* by Dr S.K. Khanna & Dr. C.E.G. Justo, 8th Edition, New Chand & Bros, Roorkee

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(16ME313) Non- Conventional Energy Resources
(Open Elective)

Course Objectives:

- *To Understand and analyze the pattern of renewable energy resources Suggest methodologies / technologies for its utilization Economics of the utilization and environmental aspects.*

Course Outcomes:

- *Upon completion of this course, the students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources.*

Pre-requisite:

- *Basic Engineering Thermodynamics*
- *Environmental Science and Engineering*

UNIT I

Introduction -World Energy Use – Classification of Energy's-Reserves of Energy Resources – Environmental Aspects of Energy Utilization– Need of Renewable Energy– Renewable Energy Scenario in Andrapradesh, India and around the World.

UNIT II

Solar Energy -Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

UNIT III

Wind Energy - Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects.

UNIT IV

Bio – Energy- Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration - Biomass Applications

UNIT V

Other Sources of Energy - Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage - Fuel Cell Systems – Hybrid Systems.

TEXT BOOKS:

1. *Non-Conventional Energy Sources* by Rai. G.D, Khanna Publishers, New Delhi, 2011.
2. *Renewable Energy Sources* by Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.

REFERENCES:

1. *Solar Energy* by Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
2. *Renewable Energy, Power for a Sustainable Future* by Godfrey Boyle,Oxford University Press, U.K., 1996.
3. *Solar Energy – Fundamentals Design, Modelling& Applications* by Tiwari. G.N., Narosa Publishing House, New Delhi, 2002.
4. *Wind Energy Conversion Systems* by Freris. L.L., Prentice Hall, UK, 1990.
5. *Wind Energy Systems* by Johnson Gary, L., Prentice Hall, New York, 1985
6. *Introduction to Biofuels* David M. Mousdale , CRC Press, Taylor & Francis Group, USA 2010
7. *Fundamentals, Technologies and Applications* by Chetan Singh Solank, PHI Learning Private Limited, New Delhi, 2009.

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(Open Elective)

(16EC443) MATLAB Programming

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Course Objectives:

- Understand the MATLAB Desktop, Command window and the Graph Window
- Be able to do simple and complex calculation using MATLAB
- Be able to carry out numerical computations and analyses
- Understand the mathematical concepts upon which numerical methods
- Ensure you can competently use the MATLAB programming environment
- Understand the tools that are essential in solving engineering problems

UNIT-I

Introduction to MATLAB, MATLAB Interactive Sessions, Menus and the toolbar, computing with MATLAB, Script files and the Editor Debugger, MATLAB Help System, Programming in MATLAB

UNIT-II

Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays.

UNIT-III

Functions & Files Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

UNIT-IV

Programming with MATLAB Program Design and Development Relational Operators and Logical Variables Logical Operators and Functions Conditional Statements for Loops while Loops the switch Structure Debugging MATLAB Programs Applications to Simulation, Problems

UNIT-V

Plotting Functions Additional Commands and Plot Types Interactive Plotting in MATLAB Three-Dimensional Plots Summary, Problems

TEXT BOOKS:

1. G. H. Golub and C. F. Van Loan, ―Matrix Computations‖, 3rd Ed., Johns Hopkins University Press, 1996.
2. B. N. Datta, ―Numerical Linear Algebra and Applications‖, Brooks/Cole, 1994 (out of print)
3. L. Elden, ―Matrix Methods in Data Mining and Pattern Recognition‖, SIAM Press, 2007 Misc.

REFERENCES:

1. NA-digest, http://www.netlib.org/na-digest-html
2. Society for Industrial and Applied Mathematics (SIAM), see http://www.siam.org
3. Google ―MATLAB Primer‖ or ―MATLAB Tutorial‖ and you should be able to access lots of free MATLAB.

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(16CS511) DATABASE MANAGEMENT SYSTEMS

Course Objective:

- To provide the student with clear conceptual understandings related to databases.
- After this course, the student should gain knowledge in the relational model, SQL, database design storage & indexing, failure recovery and concurrency control.

Course Outcome:

- Students can design the simple database, and can use the SQL instructions in developing the database applications.
- Can apply the ER concepts to design the databases.
- Advanced concepts like triggers, assertions and constraints can be applied effectively in designing the business applications

UNIT-I

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems. **Introduction to Data base design:** ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views Destroying/ altering Tables and Views.

UNIT-II

Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus - Expressive Power of Algebra and calculus.

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 - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT-III

Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions -

Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT-IV

Transaction Management - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability.

Concurrency Control - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity.

Recovery System-Failure Classification-Storage Structure-Recovery and Atomicity - Log - Based Recovery - Recovery with Concurrent Transactions - Buffer Management – Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems.

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs Linear Hashing.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGraw Hill Education, 3rd Edition, 2003
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006.

REFERENCES:

1. Database Systems, 6th edition, RamezElmasri, Shamkat B. Navathe, Pearson Education, 2013.
2. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
3. Introduction to Database Systems, C.J. Date, Pearson Education.
4. Database Management Systems, G.K. Gupta, McGrawHill Education
5. Introduction to Programming with Java, J.Dean & R.Dean, McGraw Hill education.

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(16MB752) Intellectual Property Rights
(Open Elective)

UNIT - I:

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT - II:

Trade Marks: Purpose and function of trade marks, 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 screte litigation.

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 & REFERENCES:

1. *Intellectual property right,* Deborah, E. Bouchoux, cengage learning.
2. *Intellectual property right - Unleashing the knowledge economy*, prabuddhaganguli, Tata McGraw Hill Publishing Company Ltd.

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(16EE233) Power Systems and Simulation Lab

Objectives: The objectives of this course include:

- To do the experiments (in machines lab) on various power system concepts like determination of sequence impedance, fault analysis, finding of subtransient Reactances
- To draw the equivalent circuit of three winding transformer by conducting a suitable experiment
- To develop the MATLAB program for formation of Y and Z buses.
- To develop the MATLAB programs for gauss-seidel, Newton – Raphson, and fast decouples load flow studies
- To develop the SIMULINK model for single area load frequency 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 bus formation using MATLAB
7. Z Bus formation using MATLAB
8. Gauss-Seidel load flow analysis using MATLAB
9. Newton –Raphson load flow analysis using MATLAB
10. Fast decoupled load flow analysis using MATLAB
11. Develop a Simulink model for a single area load frequency problem and Simulate the same
11. Short circuit analysis for line to ground fault and line to line fault using MATLAB

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(16EE234) Electrical Measurements Lab

Course Objective:

Calibration of various electrical measuring/recording instruments. Accurate determination of resistance, inductance and capacitance using D.C and A.C Bridges. Measurement of parameters of choke coil

Course Outcomes:

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

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

1. Calibration and Testing of Single Phase Energy Meter
2. Calibration of Dynamometer Power Factor Meter
3. Crompton D.C. Potentiometer – Calibration of PMMC Ammeter and PMMC Voltmeter
4. Kelvin‘s Double Bridge – Measurement of 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. 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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(16MB751) Entrepreneurship Development

Course objective:
The objective of the course is to make the students aware of the importance of entrepreneurship opportunities available in the society for the entrepreneur.

***Course outcome**: Creates thorough understanding of the entrepreneurship concepts among the young engineering students to venture into creating jobs rather than seeking jobs.*

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.
Understanding of Social Entrepreneurship, Women Entrepreneurship, Corporate Entrepreneurship and Intrapreneurship, Rural and Urban Entrepreneurship.

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 Organisation: 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. Business Start-ups, Sources of information for Start-up Entrepreneurs in India. Intellectual Property Rights (IPRs): Patents, trademarks, copyrights, and trade secrets. 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.

Source of financing: Debt capital, seed capital, venture capital, Loans available for starting ventures in India, Role of government agencies in small business financing.

Unit-V:

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

TEXT BOOKS:

1. *Entrepreneurship*, 8/e, Robert D Hisrich, Mathew J.Manimala, Michael P Peters, Dean A Shepherd, McGraw Hill Education.
2. *The Dynamics of Entrepreneurial Development and Management*, VasanthDesai, Himalaya Publishing House, Mumbai.

REFERENCES:

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

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(16EE235) Advanced Control Theory
(ELECTIVE-II)

Course Objective:

This subject deals with controllers, state space, describing function, phase plane and stability analysis including controllability, observability and pole placement design. It also deals with modern control and introduction to nonlinear systems.

Course Outcomes

- *Able to represent mathematical model of a system in state space.*
- *Understand the properties of state transition matrix and its importance.*
- *Able to design state feedback controllers.*
- *Understand the representation of nonlinear systems and their characteristics.*
- *Able to analyze the stability of given practical system through Lyapunov, Routh Hurwitz criterion etc.*

UNIT – I

DESIGN OF LINEAR CONTROLLERS

Introduction to design using compensators. Design of Lag Compensator, Lead Compensator and Lead-Lag Compensator using Root Locus Technique. Types of linear controllers. Design of PI, PD and PID controllers using Root Locus Technique. Feedback Compensation.

UNIT – II

EIGENVALUES & STATE TRANSITION MATRIX:

Derivation of transfer function from state model, diagonalization, Eigen values, Eigen vectors, generalized Eigenvectors. Solution of state equation, state transition matrix and its properties, computation using Laplace transformation, power series method, Cayley-Hamilton method

UNIT - III

CONTROLLABILITY & OBSERVABILITY: POLE PLACEMENT TECHNIQUES:

Concept of controllability & observability, stability improvements by state feedback, necessary & sufficient conditions for arbitrary pole placement, and design of state observer, Reduced order and Full order Observer and Problems.

UNIT - IV

NONLINEAR SYSTEMS:

Introduction, behavior of nonlinear system, common physical nonlinearity-saturation, friction, backlash, deadzone, relay, Phase plane method, singular points, stability of nonlinear

system, limit cycles, construction of phase trajectories, Describing Function Method and Stability.

UNIT - V

STABILITY ANALYSIS

Definitions, Equilibrium Points, Liapunov stability criteria, Liapunov functions, direct method of Liapunov & the linear system, Hurwitz criterion & Liapunov's direct method, construction of Liapunov functions for nonlinear system by Krasovskii's method & variable gradient method.

TEXT BOOKS:

1. *Control system Engineering* by I. J. Nagarath & M. Gopal, - 3rd edition, New Age international (P) Ltd.
2. *Modern Control Engineering* by Katsuhiko Ogata- PHI 2003

REFERENCES:

1. *State Space Analysis of Control Systems* by Katsuhiko Ogata -Prentice Hall Inc
2. *Automatic Control Systems* by B. C. Kuo & Farid Golnaraghi, 8th edition, John Wiley & Sons 2003.
3. *Digital control & state variable methods* by M. Gopal - 2nd edition, TMH 2003
4. *Control Engineering theory and practice* by M. N. Bandyapadhyay PHI, 2007
5. *Modern control systems* by Dorf & Bishop- Pearson education, 1998

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(16EE236) FACTS Controllers
(ELECTIVE-II)

Course Objectives:

The objectives of the course are to make the students learn about: The basic concepts, different types, and applications of FACTS controllers in power transmission. The basic concepts of static shunt and series converters The working principle, structure and control of UPFC Technical and economic aspects of HVAC and HVDC transmission and their comparison.

Course Outcomes: *After completing this course the student will be able to:*

- *Understand various control issues, for the purpose of identifying the scope*
- *and for selection of specific FACTS controllers.*
- *Apply the concepts in solving problems of simple power systems with FACTS controllers.*

UNIT – I FACTS CONCEPTS

Flow of power in AC parallel paths and Meshed systems, Basic types of FACTS controllers, Brief description and Definitions of FACTS controllers

UNIT- II VOLTAGE AND CURRENT SOURCED CONVERTERS

Concept of Voltage Sourced Converters, Single Phase Full Wave Bridge Converter, Three Phase Full
Wave Bridge Converter
Concept of Current Sourced Converters, Thyristor based converters, Current Sourced Converter with
Turn off Devices, Current Sourced –Vs- Voltage Sourced Converters

UNIT – III STATIC SHUNT COMPENSATORS

Objectives of shunt compensation, Methods of controllable VAR generation, Static VAR compensators, SVC and STATCOM, comparison

UNIT – IV STATIC SERIES COMPENSATORS

Objectives of series compensation, variable impedance type - thyristor switched series capacitors (TCSC), switching converter type series compensators – static series synchronous compensator (SSSC) – power angle characteristics.

UNIT – V COMBINED COMPENSATORS

Introduction, unified power flow controller (UPFC), Basic operating principle, Independent real and reactive power flow controller, control structure

TEXT BOOKS:

1. *Concepts and Technology of Flexible AC Transmission Systems - Understanding FACTS: Narain G. Hingorani, Laszlo Gyugyi - Standard Publishers Distributors - IEEE Press – First Edition – 2001.*

REFERENCES*:*

1. *Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press Series on Power Engineering, R. Mohan Mathur, Rajiv K. Varma, 2002.*
2. *Flexible AC Transmission Systems, Yong Hua Song, Allan T Johns, Published by The Institute of Electrical Engineers, 1999, London, UK.*

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(16EE237) Soft computing Techniques
(ELECTIVE-II)

Course Objectives :

1.This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.

2. It deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components.

3. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented. This subject is very important and useful for doing Project Work.

4. The main objective of this course is to provide the student with the basic understanding of neural networks and fuzzy logic fundamentals.

Course Outcomes :

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

- *Understand the basic concept of biological neural networks*
- *Understand the basic concept of artificial neural networks*
- *Create Neural Network models for electrical engineering.*
- *Understand the basic concepts of fuzzy logic.*
- *Create Fuzzy models for electrical engineering.*

UNIT - I:

FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS

Neural networks - introduction, artificial neural network, advantages, biological neural network, architectures of artificial neural networks -activation functions, important terminologies of ANN, McCulloch - Pitts neuron model, learning strategies - supervised, unsupervised, reinforced.

UNIT - II:

SUPERVISED, UNSUPERVISED NETWORKS

Learning rules - Hebbian learning rule, perceptron learning rule, delta learning rule, widrow - hoff learning rule, Back propagation neural network-architecture, training algorithm, learning factors - initial weights, l eaning constant, Perceptron Neural Network- architecture,training algorithm. Applications of Neural Networks to Electrical Engineering.

UNIT - III:

ASSOCIATIVE MEMORIES

Introduction, Bidirectional Associative Memory (BAM) - architecture, discrete BAM - testing algorithm, analysis of hamming distance, energy function and storage capacity. Discrete Hopfield network architecture and training algorithm.

UNIT - IV:

CLASSICAL AND FUZZY SETS

Introduction to classical sets-properties–Fuzzy vs crsip-Fuzzy sets , Membership functions, basic fuzzy set operation ,properties of fuzzy sets- Fuzzy relations –Fuzzy Cartesian product, operations on fuzzy relations.

UNIT -V:

FUZZY LOGIC SYSTEMS

Fuzzification – Fuzzy quantifiers, fuzzy inference, fuzzy rule based system - development of rule base and decision making system - Defuzzification to crisp sets - Fuzzification and Defuzzification methods. Applications of Fuzzy logic systems in Electrical Engineering.

TEXT BOOKS:

1. *Principles of Soft computing* by S.N. Sivanandam, S.N. Deepa, Wiley India private Ltd., 2nd edition, 2013.
2. *Fuzzy Logic with Engineering Application* by Timothy J Ross, McGraw Hill Inc.1997.

REFERENCES:

1. *Introduction to Artificial Neural Networks* by Jacek M. Zurada, Jaico Publishing House.
2. *Neural Networks - A Comprehensive Foundation* by Simon Haykin, Prentice- Hall Inc, 1999.

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(16EE238) Utilization of Electrical Power
(Elective-III)

Course Objective:

This course deals with the Electric Drives and various methods for utilization of electrical energy by illumination, Electrical heating, Welding, Electrolytic Process and Electric Traction.

Course Outcomes:

After completion of this course the students are able

- *To understand the basic concepts of illumination engineering and design the various lighting schemes.*
- *To understand the concepts of electric heating and welding equipments used in industries.*
- *To study about the various characteristics of electrical drives and to select the particular electrical drive for the given application.*
- *To understand the basic idea of electrical traction systems and its control.*
- *To evaluate the specific energy consumption and tractive effort of the given traction system.*

UNIT – I

ILLUMINATION

Introduction, terms used in illumination, laws of illumination, polar curves, and sources of light, Incandescent Lamp, Sodium Vapour Lamp, Fluorescent Lamp, Requirement of Good Lighting Scheme – Types, Design and Calculation of Illumination, Street Lighting and Factory Lighting –Problems.

UNIT-II

Electric heating: Introduction, Advantages of electric heating, Types-resistance heating, induction heating and dielectric heating, Applications.

Electric welding: Introduction, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding, Electrolysis - Faraday‘s Laws, Applications of Electrolysis, Power Supply for Electrolysis.

UNIT – III

ELECTRIC DRIVES

Types of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, selection of electric drives for particular applications, types of loads-continuous, intermittent and variable loads, load equalization.

UNIT –IV

ELECTRIC TRACTION – I

Introduction - Systems of electric traction, Comparison between A.C. and D.C. traction, Special features of traction motor- methods of electric braking-plugging rheostat braking and regenerative braking, Mechanics of train movement, Speed-time curves for different services – trapezoidal and quadrilateral speed time curves and problems.

UNIT – V

ELECTRIC TRACTION-II

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion – Problems.

TEXT BOOKS:

1. *Utilization of Electric Energy* by E. Openshaw Taylor, University press.
2. *Art & Science of Utilization of electrical Energy* by Partab, Dhanpat Rai & Sons.

REFERENCES:

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

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(16EE240) High Voltage Engineering
(Elective-III)

Course Objective:

The course serves as an introduction to high voltage engineering, including basics of electical breakdown, high voltage generation, high voltage test systems, measurement and analysis techniques as applied to power system apparatus such as cables, insulators, transformers, and generators

Course Outcomes:

- *Understand fundamental concepts of high voltage AC, DC, and impulse generation.*
- *Learn the techniques employed in high voltage measurements.*
- *Apply analytical and numerical techniques for electric field calculations in high voltage systems.*
- *Learn the fundamental concept of electric breakdown in liquids, gases, and solids.*
- *Become familiar with non-destructive test techniques in high voltage engineering.*

UNIT I

BREAK DOWN IN GASEOUS, LIQUID & SOLID DIELECTRICS

Introduction to HV Technology, Gases As Insulating Media, Collision Process, Ionization Process, Townsend‘s Criteria Of Breakdown in Gases, Paschen‘s Law, Liquid As Insulator, Pure and Commercial Liquids, Breakdown in Pure and Commercial Liquids.Intrinsic Breakdown, Electromechanical Breakdown, Thermal Breakdown, Breakdown of Solid Dielectrics in Practice, Breakdown in Composite Dielectrics, Solid Dielectrics Used in Practice.

UNIT II

GENERATION OF HV AC AND DC VOLTAGES

HV AC-HV Transformer: Need for Cascade Connection and Working of Transformers Units Connected in Cascade. Series Resonant Circuit- Principle of Operation and Advantages - Tesla Coil - HV DC Voltage Doubler Circuit, Cockroft- Walton Type High Voltage DC Set - Calculation of High Voltage Regulation, Ripple and Optimum Number of Stages for Minimum Voltage Drop.

UNIT III

GENERATION OF IMPULSE VOLTAGES

Introduction to Standard Lightning and Switching Impulse Voltages - Analysis of Single Stage Impulse Generator-Expression for Output Impulse Voltage - Multistage Impulse Generator Working of Marx Impulse Generator, Rating of Impulse Generator - Components of Multistage Impulse Generator - Triggering of Impulse Generator By Three Electrode Gap Arrangement -

Trigatron Gap and Oscillograph Time Sweep Circuits, Generation of Switching Impulse Voltage - Generation of High Impulse Current.

UNIT IV

MEASUREMENT OF HIGH VOLTAGES:

Electrostatic Voltmeter-Principle, Construction and Limitation - Chubb and Fortescue Method for HV AC Measurement - Generating Voltmeter- Principle, Construction - Series Resistance Micro Ammeter for HV DC Measurements - Standard Sphere Gap Measurements of HVAC, HVDC And Impulse Voltages - Factors Affecting The Measurements - Potential Dividers-Resistance Dividers Capacitance Dividers -Mixed RC Potential Dividers. Measurement of High Impulse Currents - Rogowsky Coil.

UNIT V

HIGH VOLTAGE TESTING TECHNIQUES

Dielectric Loss and Loss Angle Measurements Using Schering Bridge - Transformer Ratio Arms Bridge.

Need for Discharge Detection and PD Measurements Aspects - Factors Affecting The Discharge Detection, Discharge Detection Methods-Straight and Balanced Methods. Tests on Isolators, Circuit

Breakers, Cables, Insulators and Transformers.

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 4th Edition, 2004.

2. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.

REFERENCES:

1. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition, 2000.

2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.

3. High Voltage Technology by L. L. Alston, OXFORD University Press, Second Edition, 2009.

4. *High Voltage Engineering Problems & S*olutions, R. D. Begamudre, New Age *International Publishers, First Edt., 2010*

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(16EE241) Special Electrical Machines
(Elective-III)

Course Objective:

This subject gives an extension of electrical machines which are already learned in the previous courses. It mainly concentrate on constructional details and principle of operation of special machines for various domestic and industrial applications which are widely used in the present days.

UNIT I

SPECIAL TYPES OF D. C. MACHINES

Series Booster – Shunt Booster – Non – Reversible Booster – Reversible Booster- Armature Excited

Machines – Rosenberg Generator – The Amplidyne and Metadyne - Rototrol and Regulex– Third Brush Generator – Three – Wire Generator - Dynamometer.

UNIT II

STEPPER MOTORS

Constructional Features – Principle of Operation – Variable Reluctance Motor – Hybrid Motor – Single And Multi Stack Configurations – Torque Equations – Very Slow-Speed Synchronous Motor for Servo Control – Modes of Excitations – Characteristics – Drive Circuits – Microprocessor Control of Stepping Motors – An Open Loop And Closed – Loop Control of Step Motor - Application of Stepping Motors- 5– Phase Hybrid Stepping Motor – Single – Phase Stepping Motor, The Construction, Operating

UNIT III

SWITCHED RELUCTANCE MOTORS

Constructional Features – Rotary And Linear SRMs - Principle of Operation – Torque Production – Differences Between SR and Conventional Reluctance Motors - Steady State Performance Prediction- Analytical Method - Design of Stator and Rotor and Pole Arcs in SR Motor, Determination Of L(Θ) – Θ Profile – Power Converters and Their Controllers – Methods of Rotor Position Sensing – Sensor Less Operation – Closed Loop Control of SRM - Characteristics

UNIT IV

BRUSHLESS DC MOTOR

Types of Construction – Principle of Operation of BLDM – Sensing and Switching Logic Scheme, Sensing, Logic Controller, Lockout Pulses – Power Converter Circuit – Theoretical Analysis and Performance Prediction, Modeling and Magnet Circuit, D-Q Analysis of BLDM – Transient Analysis – Formulation in Terms of Flux Linkages As State Variables –

Approximate Solutions for Current and Torque Under Steady State – Theory of BLDM As Variable Speed Synchronous Motor (Assuming Sinusoidal Flux Distribution) – Methods of Reducing Torque Pulsations, 1800 Pole Arc and 1200 Current Sheet.

UNIT V

PERMANENT MAGNET MATERIALS & LINEAR INDUCTION MOTOR

Introduction, Hysteresis Loops and Recoil Line – Stator Frames (Pole – And Yoke – Part) of Conventional PM DC Motors, Equivalent Circuit of a PM – Development of Electronically Commutated DC Motor From Conventional DC Motor . Development of a Double Sided LIM From Rotary Type IM – A Schematic of LIM Drive for Electric Traction – Development of One Sided LIM With Back Iron – Field Analysis of a DSLIM: Fundamental Assumptions.

TEXT BOOKS:

1. K. Venkataratnam, Special Electrical Machines, University Press, 2009.

REFERENCES*:*

1. R. K. Rajput, Electrical machines, 4th Edition, Laxmi Publications, 2010. [For Chapters I and II refer Chapter VIII of this book]
2. V. V. Athani, Stepper Motors: Fundamentals, Applications and Design, New Age International Pub.,1997.
3. N. Mohan, Undeland & Robbins, Power Electronics - Converters, Applications & Design, Wiley India, Student Edition., 2002.
4. Johan E. Gibson and F. B. Teuter, Control System Components, Mc Graw Hill Edition.
5. M. G. Say & E. O. Taylor, D. C. Machines, 2nd Edition, ELBS., 1986.

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Elective – IV
MOOCS

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(16EE242) SEMINAR

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(16EE243) PROJECT WORK

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