hsSR ENGINEERING COLLEGE (Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING
(RA15) COURSE STRUCTURE:: B. TECH.
(Applicable from the batch admitted during 2015-16 academic year and onwards)

L: Theory, T: Tutorial, P/D: Practical/Drawing, C: Credits,
CIE: Continuous Internal Evaluation, SEE: Semester End Examination

I Year I Semester									
S. No.	**Course Code**	**Course**	**Hours /Week**				**Marks**		**Total**
			L	**T**	**P/D**	**C**	**CIE**	**SEE**	
1	HS101	English –I	2	-	-	2	50	50	100
2	BS101	Mathematics - I	4	-	-	4	30	70	100
3	BS103	Engineering Physics - I	3	-	-	3	30	70	100
4	BS106	Environmental Studies	3	-	-	3	50	50	100
5	ES107	Computer Programming	4	-	-	4	30	70	100
6	ES101	Introduction to Engineering	2	-	-	2	50	50	100
7	BS107	Engineering Physics Lab	-	-	3	2	30	70	100
8	ES106	Product Design Studio	-	-	3	2	30	70	100
9	ES108	Computer Programming Lab	-	-	3	2	30	70	100
		*Audit Course	-	-	2	-	-	-	-
Total						**24**	**330**	**570**	**900**

I Year II Semester									
S. No.	**Course Code**	**Course**	**Hours /Week**				**Marks**		**Total**
			L	**T**	**P/D**	**C**	**CIE**	**SEE**	
1	HS102	English –II	2	-	-	2	50	50	100
2	BS102	Computational Mathematics	3	1	-	3	30	70	100
3	BS104	Engineering Physics - II	3	-	-	3	30	70	100
4	BS105	Engineering Chemistry	3	-	-	3	30	70	100
5	ES110	Data Structures	3	-	-	3	30	70	100
6	ES105	Engineering Drawing with CAD	2	-	3	4	30	70	100
7	HS103	English Language Communication Skills Lab	-	-	3	2	30	70	100
8	BS108	Engineering Chemistry Lab	-	-	3	2	30	70	100
9	ES111	Data Structures Lab	-	-	3	2	30	70	100
		*Audit Course	-	-	2	-	-	-	-
Total						**24**	**290**	**610**	**900**

*Audit Course: Sports/ Yoga / NSS/ Arts/ Dance/ Music/ Sketching

II Year I Semester									
S. No.	**Course Code**	**Course**	**Hours /Week**				**Marks**		**Total**
			L	**T**	**P/D**	**C**	**CIE**	**SEE**	
1	HS104	Economics and Finance for Engineers	3	-	-	3	30	70	100
2	BS109	Mathematics – II	3	-	-	3	30	70	100
3	ES112	Foundations to Product Design	3	-	-	3	50	50	100
4	EC101	Electronic Devices and Circuits	4	-	-	4	30	70	100
5	EE101	Electrical Circuits-I	4	1	-	4	30	70	100
6	EE102	Electromagnetic Theory	3	1	-	3	30	70	100
7	BS111	Computational Mathematics Lab	-	-	3	2	30	70	100
8	EC102	Electronic Devices and Circuits Lab	-	-	3	2	30	70	100
9	MC101	Business Communication and Public Speaking	1	-	1	-	-	-	-
Total						**24**	**260**	**540**	**800**

II Year II Semester									
S. No.	**Course Code**	**Course**	**Hours /Week**				**Marks**		**Total**
			L	**T**	**P/D**	**C**	**CIE**	**SEE**	
1	HS105	Engineering Ethics	2	-	-	2	30	70	100
2	ES113	Mechatronics	4	-	-	4	30	70	100
3	EC107	Linear IC Applications	3	-	-	3	30	70	100
4	EE103	Electrical Circuits-II	4	-	-	4	30	70	100
5	EE104	Power Systems-I	4	-	-	4	30	70	100
6	EE105	DC Machines and Transformers	3	1	-	3	30	70	100
7	ES114	Mechatronics Lab	-	-	3	2	30	70	100
8	EE106	Electrical Circuits and Simulation Lab	-	-	3	2	30	70	100
9	MC102	Gender Sensitization	-	-	2	-	-	-	-
Total						**24**	**240**	**560**	**800**

III Year I Semester									
S. No.	**Course Code**	**Course**	**Hours /Week**				**Marks**		**Total**
			L	**T**	**P/D**	**C**	**CIE**	**SEE**	
1	OE	**Open Elective – 1**	3	-	-	3	30	70	100
2	HS106	Technical Writing	2	-	-	2	30	70	100
3	EC106	Digital Electronics	3	-	-	3	30	70	100
4	EE107	Power Systems-II	3	1	-	3	30	70	100
5	EE108	Induction Motors and Synchronous Machines	4	-	-	4	30	70	100
6	EE109	Control Systems	3	-	-	3	30	70	100
7	EE115	DC Machines and Transformers Lab	-	-	3	2	30	70	100
8	EE116	Control Systems and Simulation Lab	-	-	3	2	30	70	100
9	EE119	Media Project	-	-	-	2	100	-	100
						24	**340**	**560**	**900**

III Year II Semester									
S. No.	**Course Code**	**Course**	**Hours /Week**				**Marks**		**Total**
			L	**T**	**P/D**	**C**	**CIE**	**SEE**	
1	OE	**Open Elective – 2**	3	-	-	3	30	70	100
2	EC151	Microprocessors and Interfacing	4	-	-	4	30	70	100
3	EE110	Power Electronics	4	-	-	4	30	70	100
4	EE111	Power System Operation and Control	4	1	-	4	30	70	100
5	EC122 EE112 EE113 EE114	**Professional Elective –1** 1. PLC and Robotics 2. Solar Thermal PV Systems 3. Neural and Fuzzy Systems 4. SCADA	3	-	-	3	30	70	100
6	EC152	Microprocessors and Interfacing Lab	-	-	3	2	30	70	100
7	EE117	Induction Motors and Synchronous Machines Lab	-	-	3	2	30	70	100
8	EE118	Power Electronics and Simulation Lab	-	-	3	2	30	70	100
Total						**24**	**240**	**560**	**800**

IV Year I Semester									
S. No.	**Course Code**	**Course**	**Hours /Week**				**Marks**		**Total**
			L	**T**	**P/D**	**C**	**CIE**	**SEE**	
1	HS107	Project Management	3	-	-	3	30	70	100
2	CS104	Object Oriented Programming Concepts through Java	3	-	-	3	30	70	100
3	EE120	Computer Methods in Power Systems	3	1	-	3	30	70	100
4	EE121 EE122 EE123 EE124	**Professional Elective – 2** 1. Electrical Measurements and Instrumentation 2. Digital Control Systems 3. Wind Energy Systems 4. Optimization Techniques	3	-	-	3	30	70	100
5	EC125 EE125 EE126 EE127	**Professional Elective – 3** 1. VLSI Design 2. High Voltage Engineering 3. Switch Gear and Protection 4. Reliability Engineering	3	-	-	3	30	70	100
6	EC153 EE128 EE129 EE130	**Professional Elective –4** 1. Principles of Signal Processing 2. Modern Control Theory 3. Special Machines 4. Utilization of Electrical Energy	3	-	-	3	30	70	100
7	CS109	Object Oriented Programming Concepts through Java Lab	-	-	3	2	30	70	100
8	EE138	Power Systems Simulation Lab	-	-	3	2	30	70	100
9	EE139	Certification Course / Mini Project / App Development	-	-	-	2	100	-	100
Total						**24**	**340**	**560**	**900**

IV Year II Semester									
S. No.	**Course Code**	**Course**	**Hours /Week**				**Marks**		**Total**
			L	**T**	**P/D**	**C**	**CIE**	**SEE**	
1	OE	**Open Elective -3**	3	-	-	3	30	70	100
2	CS102 EE131 EE132 EE133	**<u>Professional Elective – 5</u>** 1. Computer Architecture and Organization 2. HVDC Transmission 3. Power semiconductor Drives 4. FACTS	3	-	-	3	30	70	100
3	EC118 EE134 EE136 EE137	**<u>Professional Elective –6</u>** 1. Embedded Systems 2. Electrical Distribution Systems 3. Energy Storage Systems 4. Smart Grid	3	-	-	3	30	70	100
4	EE140	Technical Seminar	-	-	2	1	50	-	50
5	EE141	Major Project /Practice School	-	-	-	14	50	100	150
Total						**24**	**190**	**310**	**500**

Note: Based on the industry demand, additional relevant course(s) may be added under Professional Elective(s) and Open Elective(s).

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LIST OF OPEN ELECTIVES - EEE

S. No.	Course Code	Course	Offered by the department
1	OE101	Philosophy	H&Sc
2	OE102	Psychology*	H&Sc
3	OE103	Sociology	H&Sc
4	OE104	Design Thinking and Innovation*	Business Management
5	OE105	Technology Entrepreneurship*	Business Management
6	OE106	Marketing for Engineers	Business Management
7	OE107	Business Analytics	Business Management
8	OE108	Engineering Project in Community Services (EPICS)*	CE, ME, EEE, ECE, CSE
9	OE109	Smart Cities	CE, ME, EEE, ECE, CSE
10	OE110	Cognitive Engineering*	CE, ME, EEE, ECE, CSE
11	OE111	Intellectual Property Rights	CE, ME, EEE, ECE, CSE
12	OE112	Disaster Management	CE
13	OE113	Pollution and Control Engineering	CE
14	OE114	Scripting Languages	CSE
15	OE115	Cyber Laws	CSE
16	OE116	Fundamentals of Data Base Management Systems	CSE
17	OE117	Introduction to Operating Systems	CSE
18	OE118	Hybrid Electric Vehicles	EEE
19	OE122	Basics of Thermodynamics	ME
20	ME111	Operations Research	ME / MATHS
21	ME138	Renewable Energy Sources	ME / EEE

***Activity based course*

(HS101) ENGLISH – I
(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	2	-	-	2	50	50	100

COURSE OBJECTIVES:
Students will be able to
1. Recall and improve the language proficiency of the students in English.
2. Paraphrase and interpret the ideas and thoughts in a dynamic way.
3. Prioritize the importance of practical learning of English.
4. Distinguish the various levels of Listening, Speaking, Reading and Writing skills in
5. Construct statements in writing and speaking in a professional manner.

COURSE OUTCOMES:
At the end of the course, students will develop an ability to
1. Recall essentials of communication methods.
2. Sketch flawless grammar usage.
3. Design effective ideas for presentations.
4. Prioritize the importance of various speaking methods as per situations.
5. Compile effective paragraphs and essays.
6. Develop critical thinking.
7. Evaluate the effectiveness in improving speaking levels.
8. Develop technical and no-technical terminology

UNIT –I
Chapter entitled '***Animals****'* from Unlock Reading & Writing Skills – Cambridge University Press Unlock Listening and Speaking Skills - Cambridge University Press
L-Listening for Sounds, Stress and Intonation from ***Animals****'* from Unlock Listening and Speaking Skills
S-Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)
R- Reading for Subject/ Theme from ***Animals*** from Unlock Reading & Writing Skills
W- Writing Paragraphs
G-Types of Nouns and Pronouns
V- Homonyms, Homophones & Homographs

UNIT –II
Chapter entitled **"Customs and Traditions"** from Unlock Reading & Writing Skills - Cambridge University Press, Unlock Listening and Speaking Skills - Cambridge University Press
L – Listening for themes and facts from **Customs and Traditions"** from Unlock Listening and Speaking Skills
S – Apologizing, interrupting, requesting and making polite conversation
R- Reading for theme and gist, **Customs and Traditions"** from Unlock Reading & Writing Skills
W- Describing people, places, objects, events
G- Verb forms

V- Noun, Verb, Adjective and Adverb

UNIT –III

Chapter entitled **History,** from Unlock Reading & Writing Skills – Cambridge University Press, Unlock Listening and Speaking Skills - Cambridge University Press
L – Listening for main points and sub-points for note taking from **History,** from Unlock Listening and Speaking Skills
S – Giving instructions and directions; Speaking of hypothetical situations
R – Reading for details Comprehension- from **History,** from Unlock Reading & Writing
W – Note-making, Information transfer, Punctuation
G – Present tense
V – Synonyms and Antonyms

UNIT –IV

Chapter entitled **Transport,** from Unlock Reading & Writing Skills – Cambridge University Press, Unlock Listening and Speaking Skills - Cambridge University Press
L -Listening for specific details and information from **Transport,** from Unlock Listening and Speaking Skills
S- Narrating, expressing opinions and telephone interactions
R -Reading for specific details and information- from chapter entitled **Transport,** from Unlock Reading & Writing Skills
W- Writing e-mails
G- Past and Future tenses
V- Vocabulary - Idioms and Phrasal verbs

UNIT –V

L- Critical Listening and Listening for speaker's tone/ attitude from Environment from Unlock Listening and Speaking Skills
S- Group discussion and Making presentations
R- Critical reading, reading for reference - Chapter entitled **Environment,** from Unlock Reading & Writing Skills
W- Project Proposals, Project Reports, Research Papers
G- Adjectives, Prepositions and Concord
V- Collocations and Technical vocabulary

- **Exercises from the texts not prescribed will also be used for classroom tasks.**

TEXT BOOKS:

1. Carolyn Westbrook, "Unlock Reading & Writing Skills 3 – B1 English Profile", Cambridge University Press.
2. Sabina Ostrowska, "Unlock Listening and Speaking Skills 3 - B1 English Profile", Cambridge University Press.

REFERENCE BOOKS:

1. Raymond Murphy, "Murphy's Essential English Grammar" with CD, Cambridge University Press.
2. David Green, "Contemporary English Grammar Structures and Composition", MacMillan Publishers, New Delhi.
3. Edgar Thorpe & Showick Thorpe, "Basic Vocabulary", Pearson Education.
4. Meenakshi Raman, "Technical Communication", Oxford University.

(BS101) MATHEMATICS-I

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. State the mean value theorems, fundamental theorem of Integral calculus.
2. Calculate the maxima &minima of functions of several variables and solve the problems with and without constraints.
3. Classify the different types of Ordinary differential equation (O.D.E) and interprets the concept to practical problems.
4. Analyze the second & higher order Linear differential equations.
5. Calculate the Complimentary function and Particular integrals of different types of functions.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Calculate the extreme values of functions of several variables.
2. Test the given function for its saddle points.
3. Examine the conditions for the existence of absolute, minimum &extreme values.
4. Solve the different types of differential equations (D.E) by using appropriate solving methods.
5. Apply the solution methods to solve linear, non-linear,orthogonal trajectories and to different practical physical, mathematical problems.
6. Construct the simple O.D.E models for real world problems.
7. Evaluate the double and triple integrals in a given region of integration by using change of variables.
8. Analyze the Properties of β, Γ (Beta, Gamma function) and evaluates the improper integrals using these functions.

UNIT-I

Differential and Integral Calculus: Review of Differentiation and integration. Mean Value Theorems: Rolle's theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's theorem – Maclaurin's theorem (all theorems without proofs)-verification and applications. Functions of several variables: Functional dependence and independence – Jacobian of function of several variables – maxima & minima of functions of several variables (two & three only) with and without constraints.

UNIT-II

Ordinary Differential Equations of First Order and First Degree: Formation of a differential equation – solution methods – variable separable method – homogeneous & non-homogeneous – exact & non exact differential equations – linear differential equations – Bernoulli's differential equations – applications – orthogonal trajectories – Newton's law of cooling – law of natural growth & decay.

UNIT-III

Higher Order Linear Differential Equations: Linear differential equations of second and higher order with constant coefficients – solution – finding complimentary function and particular integral – RHS of the type e^{ax} , $\sin ax$, $\cos ax$, x^n , $e^{ax}v(x)$, $x^n v(x)$ and method of variation of parameters.

UNIT – IV

Multiple Integrals: Double integrals: evaluation, region of integration, change of order of integration, change of variables. Triple integrals: evaluation change of variables, (cylindrical and spherical co-ordinates) - applications to areas, volumes.

UNIT-V

Special Functions: Beta functions – Gamma functions – properties – relation between beta and gamma functions – evaluation of improper integrals using beta and gamma functions.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", - John wiley & Sons, 605 Third Avenue, New York.
2. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2-B Nath Market, Nai Sarak, Delhi.

REFERENCE BOOKS:

1. Michael D.Greenburg, "Advanced Engineering Mathematics" , Pearson Education.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", CL- Engineering.
3. R.K.Jain, S.R.K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House, New Delhi.

(BS103) ENGINEERING PHYSICS - I

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recall the fundamental principles of electromagnetism.
2. Develop familiarity with the physical concepts and facility with the mathematical methods of quantum mechanics.
3. Justify the origin of energy bands in solids by knowing Kronig-Penny model.
4. Discuss the characteristics, three quantum processes, gaslaser and semiconductor laser principles.
5. Classify the types of optical fibers and attenuation in optical fibers.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Discuss the physical significance of divergence and curl.
2. Analyze Maxwell's equations in differential form.
3. Apply the Bloch theorem and draw the band structure of solids on the basis of Kronig-Penny model.
4. Judge the laser applications based on characteristics of laser.
5. Explain the working of He-Ne laser and semiconductor laser.
6. Solve the particle in one dimensional potential box problem using schrodinger time independent wave equation.
7. Criteria for low loss optical fibers.
8. Estimate the advantages of optical fiber communication over conventional communication.

UNIT - I: Electrodynamics

Introduction to electrostatics, Coulomb's law, Gauss law of electrostatics, Introduction to magnetostatics, Biot-Savart law, Ampere's law, Gauss law of magnetostatics, Time varying electric and magnetic fields - Faraday's laws of electromagnetic induction, Lenz's law, Displacement current, Differential form of Maxwell's equations, Physical significance of Maxwell's equations, Electromagnetic waves– wave equation, Electromagnetic energy density, Poynting theorem.

UNIT - II: Quantum Mechanics

Classical mechanics and its limitations, Planck's radiation law – Wien's law and Rayleigh-Jean's law, de Broglie hypothesis, Matter waves, Davisson-Germer experiment, Heisenberg's uncertainty principle, Consequences of uncertainty principle. Equation of motion of matter waves – Schrodinger time independent wave equation, Physical significance and properties of wave function, Particle in one dimensional box and extension to three dimensions, Tunnelling effect (qualitative) – Applications.

UNIT - III: Band theory of solids

Electron in periodic potential, Bloch theorem, Kronig-Penny model (qualitative), Origin of energy bands in solids, Effective mass of an electron, Distinction between conductors, semi conductors and insulators, Direct and indirect band gap semi conductors

UNIT - IV: LASER and Holography

Characteristics of laser, Absorption and emission of radiation, Einstein's coefficients and relation between them, Block diagram of laser, Types of lasers - He-Ne laser and semiconductor laser, Classes of laser, Applications of laser, Holography - Recording of hologram and reconstruction of image, Applications of holography

UNIT - V: Fiber Optics

Introduction to optical fiber, Acceptance angle and Acceptance cone, Numerical aperture, Types of optical fibers – Single mode step index, Multi mode step index and Multi mode graded index, Attenuation in optical fibers, Advantages of optical communication, Application of optical fibers

TEXT BOOKS:

1. M.N. Avadhanulu & P.G. Kshirasagar, "A Text book of Engineering Physics" S. Chand & Company Ltd.
2. R.K. Gaur & S.L. Gupta, "Engineering Physics", Dhanpat Rai Publications (P) Ltd.

REFERENCE BOOKS:

1. David J. Griffiths, "Engineering Physics", Prentice Hall of India (P) Ltd.
2. A. Beiser & S. Mahajan "Concepts of Modern Physics", McGraw Hill Education, India (P) Ltd.
3. P.K. Palanisamy, "Engineering Physics", SciTech Publications, India (P) Ltd.
4. P. Madhusudhan Rao, "Applied Physics for Engineers", Academic Publishing Company.

(BS106) ENVIRONMENTAL STUDIES

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	3	-	-	3	50	50	100

COURSE OBJECTIVES:

Students will be able to

1. Recall the importance of environment and its related issues.
2. Discuss about biogeochemical cycles and biodiversity.
3. Predict threats to the flora and fauna of biodiversity.
4. Evaluate environmental impact, its prediction methods.
5. Create awareness towards global environmental issues, population growth, and use of energy resources, sustainability and waste management.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Memorize the concept of environment and its related issues.
2. Paraphrase about components of ecosystem and environment cycles.
3. Compute loss of biodiversity.
4. Categorize the values and conservation of biodiversity.
5. Prioritize energy resources, sustainability, pollution and its types.
6. Estimate global environmental issues and waste management.
7. Recommend solutions to population growth, natural disasters and waste management.
8. Formulate the impacts of environment and its assessment.

UNIT-I : Ecosystems

Introduction to Environmental Studies. Concept of ecosystem: Introduction, Types of ecosystems- forest and aquatic ecosystems-lentic (pond), lotic (river) and estuaries, Structure-Biotic (Producers, Consumers and Decomposers) and Abiotic, Functions-energy flow in an ecosystem, Food chain- significance (bio magnification- pest & pest control-case study-DDT, Arsenicosis Disease), Food web, Ecological Pyramids-Pyramids of Energy, pyramid of number and pyramid of biomass, Bio-Geochemical Cycles- Hydrological Cycle, Carbon Cycle, Nitrogen Cycle, Evolution in the ecosystem: Ecological succession-xerosere and hydrosere.

UNIT-II: Biodiversity and Its Conservation

Definition, types, values-productive use, consumptive value, social value, ethical value, aesthetic value and option value, biodiversity Vs bio productivity, biodiversity Vs biotechnology, threats to biodiversity: Habitat loss, poaching of wildlife, Invasive species (Exotic), list of endangered and endemic species, Conservation of biodiversity- In situ and Ex situ with examples.

Field Work:

- Pond, river, hill slope ecosystems etc.
- Study of common plants, insects and birds etc.

UNIT-III: Renewable Energy
Energy resources-Growing energy needs, Renewable-Solar energy, hydroelectric power, wind energy, bio-energy (bio-ethanol, methane, hydrogen), tidal energy and geothermal energy.

Sustainable development
Concept, threats to sustainability, strategies for achieving sustainability, green building concept.

Population growth and Its Consequences
Health Consequences, Population growth in rich & poor Nations–Their problems and demographic transition.

UNIT-IV: Pollution
Pollution-Introduction, Types- air and water – causes, effects and control measures-Air pollution sampling techniques, waste water treatment-aerobic and anaerobic(treatment of sludge process-composting pasteurization), alternate treatment systems, septic system, composting, septic system.

Global Environmental Issues
Urban environmental problems, Global warming (Climate change- Carbon sequestration-Plants, soil and oceans, green house gases), Acid rain, Ozone layer depletion and Bio fuels Vs Food crisis, Fukushima Daiichi nuclear disaster, Ganga action plan, Protocols-Kyoto and Montreal.

UNIT-V: Waste Management
Wealth from the Waste-fly ash, Solid waste treatment methods-Composing, vermincomposting, incineration, pyrolysis, autoclaving, land filling and recycling, collection, handling rules and segregation of municipal solid waste, bio-medical waste and e-waste.

Environmental Impact Assessment (EIA)
Definition, Impact - Classification of impacts (positive and negative), prediction methods of EIA- adhoc and matrix method.

Field Work:
- Local area for documentation on Sustainable development and Population-Health Consequences.
- Local polluted site - Urban/ Rural / Industrial/ Agricultural.

Note: Field work - Visit to a local area to document environmental assets/ pollution sites.

TEXT BOOKS:

1. Richard T. Wright, Dorothy F. Boorse., "Environmental Science", Towards a sustainable Future12/E, PHI Learning Pvt. Ltd., M97, Ashok Goshal, Connaught circuit, New Delhi.
2. Erach Barucha, "Environmental Studies", UGC-India, Pune.

REFERENCE BOOKS:

1. Gilbert M. Masters and Ela Wendell P, Introduction to "Environmental Engineering & Science"- LPE Pearson educations.
2. Henry J.G. and Heinke G.W., "Environmental Science and Engineering", Prentice Hall of India, New Delhi.
3. Garg S.K. and Garg. R, "Ecological and Environmental Studies", Oscar Publications, Delhi.
4. Prof. Dr. N.S. Varandani, "Basics of Environmental Studies", LAP -Lambert Academic Publishing, Germany.

(ES107) COMPUTER PROGRAMMING

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Comprehend the computer as a system for computation.
2. Appreciate the program development & execution environment.
3. Learn a programming language through C.
4. Acquire the problem solving skills through computer programming.
5. Recognize the applications of C language.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Appreciate the stored program computing environment.
2. Analyze and implement software development tools like algorithm, pseudo codes and programming structure.
3. Acquire syntactic familiarity with C programming language.
4. Analyze the complexity of problems, Modularize the problems into small modules and then convert them into programs.
5. Apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
6. Apply and practice logical ability to solve the problems.
7. Apply C programming to solve problems related to scientific computing.
8. Develop efficient programs.

UNIT - I

Van-Neuman computer architecture and Concepts of stored program computing, Computer memory, Data Representation in computers: text, image, voice and numbers-integers and floating points. Role of Compilers in Computer System design, Different C compilers-turbo C, Ansi C, GCC and interpreters. Role of Operating Systems in computer system design. Architecture of UNIX operating system. Basic Shell Commands, Unix Editors-vi Editor. Programming Environment of C in UNIX.

UNIT - II

Introduction to problem solving: Flow charts, Algorithms, definitions & examples. Introduction to C Programming Language: Data types in C, primary and secondary data types, constants and variables. Operators: arithmetic, logical, bitwise. Expressions: Valid expressions, evaluation of expressions, type conversion, precedence and associativity. I/O functions: printf, scanf & their variations. Control structures in C: if , if-else ternary operator, looping statements, nesting of control structures, break and continue. The switch-case statement.

UNIT - III

Arrays: Single and multi-dimensional arrays. Basics of pointers, pointer to array, array of pointers, void pointer, pointer to pointer. Basics of structure in C, structure members, accessing structure members, nested structures, array of structures, pointers to structures. Unions- accessing union members. Programming examples using arrays, structures & unions.

UNIT –IV

Functions: User-defined functions, parameter passing in functions: call by value, call by reference, recursive functions. Passing arrays to functions, passing a structure to a function.
Strings: Declaration, storage and string manipulation. Built in functions: String functions and Character and Arithmetic functions. Memory Management in C: alloc , malloc and calloc-examples & discussion for each.

UNIT - V

File management: read, write, append and seek. Handling different types of data files: text, image and binary files.
Applications of C
Case study 1. Embedded software examples
Case study 2. Firmware examples
Case study 3. Verification software examples.

TEXT BOOKS:

1. B. A. Forouzan and R.F. Gilberg, “Computer Science: A Structured Programming Approach Using C”, Cengage Learning, Third Edition.
2. B.W.Kernighan Dennis M. Ritchie, “The C Programming Language”, PHI/Pearson Education.

REFERENCE BOOKS:

1. K.N. King, “C Programming: A Modern Approach”.
2. Yashwant Kanetkar, “Let us C”, BPB Publications.
3. Pradeep K.Sinha, Priti Sinha, “Computer science a structured programming approach using C”, Thomson publications.
4. David A. Curry, “Using C on the UNIX System,” O'Reilly.

(ES101) INTRODUCTION TO ENGINEERING

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	2	-	-	2	50	50	100

COURSE OBJECTIVES:

Students will be able to

1. Summarize different engineering disciplines and identify engineering challenges
2. Evaluating Opportunities and design process applicable to real world
3. Mention the methods for generating ideas to improve the design of existing product.
4. Build multi-disciplinary system perspective.
5. Design a physical model and recognizing the importance of technical report writing.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Define various disciplines technology and engineering challenges
2. Judge the Responsibilities as Professional Engineer in solving the societal problems.
3. Identify new opportunities to formulate and solve engineering problems.
4. Develop personal skills and attributes at critical thinking
5. Predict the importance of oral, written, and academic skills.
6. Develop social context of engineering practice
7. Apply engineering reasoning to problem solving.
8. Develop working with multi-disciplinary teams and build team work skills.

UNIT – I

Engineering process

A brief history of engineering and technology, engineering as a profession, science Vs engineering, engineering challenges, stages of design – from the world of imagination to world of objects

Assignment: *Report on an identified engineering challenge*

UNIT - II

Opportunity Identification: Opportunity Identification from inspiration – an act of creative awareness, how to find inspiration, Painstorming method for identifying opportunities. Methods of evaluating opportunities. Case studies.

Assignment: *Identify new potential opportunities based on the customer pain points and evaluate them to identify real opportunities. (example – Products for professional runners)*

UNIT – III

Conceptualization: Methods for generating ideas to solve the customer pain points including brainstorming, concept maps, and SCAMPER.

Assignment: *Application of idea generation methods to improve an existing product (example – New improved water bottle)*

UNIT – IV

Product design and development: Drawing basic geometric primitives including two-dimensional shapes (square, rectangle, ellipses, and circles etc.) and three-dimensional shapes (blocks, cylinders, and spheres etc.) using CAD tools. Interaction with peers, demonstration of projects developed by senior students and alumni, skill development workshop

UNIT - V

Project work: Physical model development and technical report writing on one of the product design and development issue.

TEXT BOOKS:

1. Karl Aspelund, "The Design Process –Fairchild books", Bloomsbury Publishing Inc.
2. ND Bhatt, "Engineering Drawing, Plane and Solid Geometry", Charotar Publishing House Pvt. Ltd., Publishers of Engineering Text Books.

REFERENCES:

1. Paul H Wright, "Introduction to Engineering", John Wiley and Sons, Inc.
2. Saeed Moaveni, "Engineering Fundamentals: an Introduction to Engineering", Cengage Learning, printed in USA.
3. Reymond B Landis, "Studying Engineering: A Road Map to rewarding career", Discovery press.

(BS107) ENGINEERING PHYSICS LAB

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	3	-	-	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Illustrate the phenomenon of light such as interference and diffraction.
2. Evaluate the numerical aperture and losses in optical fibers.
3. Recall the basic concepts of mechanics.
4. Calculate the energy gap and Planck's constant.
5. Examine the characteristics of RC circuit and solar cell.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Compare the intensity distribution of interference and diffraction patterns.
2. Estimate the frequency of tuning forks and AC supply with the help of stretched strings.
3. Analyze the importance of resistors and capacitors in electrical and electronic circuits.
4. Sketch the variation of magnetic field along the axis of a current carrying coil.
5. Identify the semiconductor based on the estimated value of energy gap.
6. Illustrate the conversion of light energy to electrical energy.
7. Discriminate the different modulii of elasticity.
8. Assess the conditions for signal propagation through an optical fiber.

LIST OF EXPERIMENTS:

Any Ten Experiments are to be performed:

1. Determination of radius of curvature of a plano-convex lens using Newton's rings setup.
2. Determination of wavelength of a source (sodium vapour lamp) using diffraction grating.
3. Determination of wavelength of a laser source using diffraction grating.
4. Evaluation of numerical aperture and bending losses of an optical fiber.
5. Determination of rigidity modulus of a wire using torsional pendulum.
6. Determination of frequency of electrically driven tunning fork using melde's apparatus.
7. Determination of frequency of an a.c. supply using sonometer.
8. Determination of time constant of an R-C circuit.
9. Determination of magnetic field along the axis of current carrying coil using Stewart and Gees apparatus.
10. Determination of energy gap of the material of a p-n junction diode.
11. Study of characteristics of a solar cell.
12. Determination of Planck's constant.

REFERENCE BOOKS:

1. C.V. Madhusudhana Rao and V. Vasanth Kumar, "Engineering Physics Lab Manual", SciTech Publications, India (P) Ltd.
2. Y. Aparna and K. Venkateswara Rao, "Laboratory Manual of Engineering Physics", VGS Publishers.

(ES106) PRODUCT DESIGN STUDIO

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recognize the functioning of various mechanical and electrical tools.
2. Realize the connections of electrical and electronic components by means of wiring and soldering practice.
3. Analyze the characteristics of various circuits by using different sensors.
4. Catagorize the functioning of various measurung instruments.
5. Evaluate the disassembling and assembling of program-specific product.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Develop new products by using carpentary tools.
2. Develop new products by using tinsmity tools.
3. Perform soldering with different circuit elements.
4. Evaluate the characteristics of components related to electrical and electronic systems.
5. Design circuit using various electronic components and sensors.
6. Compute various electrical parameters of various circuits using DMM.
7. Assess the characteristics of various signals using CRO.
8. Create a product using rapid prototyping technique.

I. Hand-held tools (3 sessions, 9hrs)

Familiarize and practice on using hand-held mechanical and electrically operated tools Identify parts and functions of each tool.

Assignment: *Students will make build small shapes using these tools.*

II. Soldering & tin-smithy (2 sessions, 6 hrs)

Familiarize and practice with trades - soldering & tin-smithy.

Assignment: *Students will make a comprehensive report on different trades by web-search*

III. Sensors, electrical & electronic circuit components (2 sessions, 6hrs)

Familiarize with a variety of sensors like pressure transducers, load cells, temperature sensors, sound, touch and distance sensors, used in different contexts. Learn how to connect, read and calibrate sourcing and sinking sensor outputs

Assignment: *Students will connect and read the digital output of at least two different types of sensors.*

IV. Measurement devices &Instruments (2 sessions, 6hrs)

Familiarize with digital measurement devices &instruments –multi-meter and oscilloscope.

Assignment: *Students will measure various parameters in a given circuit using multi-meter and oscilloscope*

V. Product Disassembly, Assembly & Development (3 sessions, 9 hrs)
Systematically disassemble a program-specific product, identify the parts and functions and carefully assemble the product. Use appropriate tools.
Design and develop a product using rapid prototyping technique

Assignment: *Students will prepare a comprehensive report of parts and functions by web-search. Include free-hand sketches where possible.*

TEXT BOOKS:

1. HS Kalsi, "Electronic Instrumentation", Tata McGraw-Hill Publishing Company Limited.
2. S K Hajra Choudhury & A K. Hajra Choudhury, "Elements of Workshop Technology: Vol I: Manufacturing Processes", Media Promoters & Publishers Pvt. Ltd.

REFERENCE BOOKS:

1. William D. Cooper, Albert D. Helfrick, "Electronic Instrumentation and Measurement Techniques", Prentice Hall.
2. A.K. Sawhney, Puneeth Sawhney, "Mechanical Measurements and Instrumentation and Control", Dhanpat Rai & Company.

(ES108) COMPUTER PROGRAMMING LAB

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	I	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Comprehend the computer as a system for computation.
2. Appreciate the program development & execution environment.
3. Learn a programming language through C.
4. Acquire the problem solving skills through computer programming.
5. Recognize the applications of C language.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Appreciate the stored program computing environment.
2. Analyze and implement software development tools like algorithm, pseudo codes and programming structure.
3. Acquire syntactic familiarity with C programming language.
4. Analyze the complexity of problems, Modularize the problems into small modules and then convert them into programs.
5. Apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
6. Apply and practice logical ability to solve the problems.
7. Apply C programming to solve problems related to scientific computing.
8. Develop efficient programs.

Recommended Systems/Software Requirements:

- 'gcc' Compiler for CSE

Week 1 (Content Focus) Basics

a) Basic Commands of Linux,
b) vi Editor Usage,
c) first C program.
d) Compiling and Executing a C Program.

Week 2. (Content Focus) Operators.

a) write a C program to demonstrate all arithmetic and bitwise operators .
b) Write a C program to find the Euclidean distance between two given points.
c) The total distance travelled by vehicle in 't' seconds is given by distance = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2).
Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'.

Week 3. (Content Focus) Conditional Statements and Logical Operators

a)Write a C program to check wheather the given triplet is a Pythagorean.

b)Write a C program to accept a coordinate point in a XY coordinate system and determine its quadrant
c) Accept Student Marks , calculate Total and find his Grade.

Week 4. (Content Focus) Iterative Statements
a) Write a C program to find the sum of individual digits of a positive integer.
b)Write a C Program to Find the biggest of n numbers.
c) Calculate the sum of upper triangle of a given matrix.
d)Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Week 5. (Content Focus) Iterative statements Continued.....
a)Factorial of a given number.
b) Febonacci series upto a given range.
c) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 6 (Content Focus) Iterative statements Continued.....
a) Write a C program to generate Pascal's triangle.
b) Write a C program to construct a pyramid of numbers.
c) Write a C program to find Birthday Probability.

Week 7. (Content Focus) Iterative statements Continued.....
a) Write a C program to read in two numbers, x and n, and then compute the series of sin, cos, tan check accuracy
b) Write C program to input real numbers and find the mean, variance and standard deviation

Week 8 (Content Focus) Array's
a) Search a given item in an array of integers and find the sum of array elements.
b) Maze Problem- Write a C program to check wheather there is a path form starting point to ending point .
c) Write a C program that uses functions to perform the following:
i) Addition & Multiplication of 2 matrices
ii) Determinant of matrix and inverse of a matrix

Week 9 (Content Focus) Structures
a) write a C program for defining a structure of bank customer details.(account number , acc holder name, acctype, balance)
b)Write a C program to Demonstrate Elecricity Bill of One Year.

Week 10 (Content Focus) Strings
a) Write a C program s to perform the following operations on strings
i) To insert a sub-string in to given main string from a given position.
ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not.
c) Write a C program to convert a floating point number to binary number.
d) Write a C program to check wheather the given numbers are anagrams or not.
e) Write a C program to check wheather the CREDIT card is valid or not.

Week 11 (Content Focus) Functions
a) Write a C program to find the sum of all elements of an array using pointers as arguments.
b) Write a C program to convert a Floating Point Number base(10) to binary number.
c) Write a C program which copies one file to another.
d) Write a C program computes statistics on a file of numbers

Week 12 (Content Focus) Hardware Interaction
a) Program for setting different display modes of output.
b) Write a C program that interacts with RAM data .

TEXT BOOKS:
1. B. A. Forouzan and R.F. Gilberg, "Computer Science: A Structured Programming Approach Using C", Cengage Learning, Third Edition.
2. B.W.Kernighan Dennis M. Ritchie, "The C Programming Language", PHI/Pearson Education.

REFERENCE BOOKS:
1. K.N. King, "C Programming: A Modern Approach".
2. Yashwant Kanetkar, "Let us C", BPB Publications.
3. Pradeep K.Sinha, Priti Sinha, "Computer science a structured programming approach using C", Thomson publications.
4. David A. Curry, "Using C on the UNIX System," O'Reilly.

Web links:
1. http://nptel.iitm.ac.in

(HS102) ENGLISH – II

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	2	-	-	2	50	50	100

COURSE OBJECTIVES:

Students will be able to

1. Recognize and modify their problems in pronunciation action to make themselves ready for native speaker.
2. Summarize a short passage on a familiar topic in their words.
3. Execute classroom discussion, encourage equal participation of all
4. Distinguish between the concepts of phrasing, blending and linking.
5. Construct sentences using past/ present / future tenses.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Reproduce the words using the given rules of pronunciation.
2. Paraphrase a short passage on given topic in their own words.
3. Produce basic grammatical structures and generate new sentences in a given paradigm.
4. Identify the main idea and supporting details in academic passages.
5. Develop telephone etiquette by using language for assent and dissent.
6. Draw information from various sources and develop writing.
7. Build professional writing skills to meet the future standards in technology.
8. Prioritize the requirements of industrial needs and communicate accordingly.

UNIT –I

Chapter entitled '**Health and Fitness***'* from Unlock Reading & Writing Skills – Cambridge University Press Unlock Listening and Speaking Skills - Cambridge University Press

L-Listening for Conversation from **Health and Fitness** from Unlock Listening and Speaking Skills

S-Telephone Etiquette

R- Reading for understanding from **Health and Fitness** from Unlock Reading & Writing Skills

W- Introduction to Essay writing

G-Types of Articles

V- Idioms

UNIT –II

Chapter entitled "**Discovery and Invention"** from Unlock Reading & Writing Skills– Cambridge University Press, Unlock Listening and Speaking Skills-Cambridge University Press

L – Listening for understanding stress from **Discovery and Invention** from Unlock Listening and Speaking Skills

S – Presenting ideas

R- Reading for note making, from **Discovery and Invention** from Unlock Reading & Writing Skills

W- Writing supporting sentences

G- Tenses

V- Words often confused

UNIT –III

Chapter entitled **Fashion,** from Unlock Reading & Writing Skills – Cambridge University Press, Unlock Listening and Speaking Skills - Cambridge University Press
L – Listening for main points and sub-points for note taking from **Fashion,** from Unlock Listening and Speaking Skills
S – Speaking using visual aids
R – Reading for contextualization- from **Fashion,** from Unlock Reading & Writing
W – Information transfer techniques
G – Direct and Indirect Speech
V – One word substitutions

UNIT –IV

Chapter entitled **Economics,** from Unlock Reading & Writing Skills – Cambridge University Press, Unlock Listening and Speaking Skills - Cambridge University Press
L -Listening for speaker's tone from **Economics,** from Unlock Listening and Speaking Skills
S- Analyzing graphs and pictorial expressions
R -Reading between lines- from chapter entitled **Economics,** from Unlock Reading & Writing Skills
W- Writing Cohesion, coherence in drafting essay
G- Active and Passive Voice
V- Vocabulary – usage of adverbs

UNIT –V

L- Critical Listening understanding intonation tone/ attitude from **The Brain** from Unlock Listening and Speaking Skills
S- Public Speaking - introduction
R- Critical reading from - Chapter entitled **The Brain,** from Unlock Reading & Writing Skills
W- Technical Report
G- Simple, Compound and Complex Sentences
V- Collocations and Technical vocabulary

Exercises from the texts not prescribed will also be used for classroom tasks.

TEXT BOOKS:

1. Carolyn Westbrook, "Unlock Reading & Writing Skills 3 – B1 English Profile", Cambridge University Press.
2. Sabina Ostrowska, "Unlock Listening and Speaking Skills 3 - B1 English Profile", Cambridge University Press.

REFERENCE BOOKS:

1. Raymond Murphy, "Murphy's Essential English Grammar" with CD, Cambridge University Press.
2. David Green, "Contemporary English Grammar Structures and Composition", MacMillan Publishers, New Delhi.
3. Edgar Thorpe & Showick Thorpe, "Basic Vocabulary", Pearson Education.
4. Meenakshi Raman, "Technical Communication", Oxford University.

(BS102) COMPUTATIONAL MATHEMATICS

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	3	1	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recall the linear System of equations, find the rank and inverse of any matrix.
2. Find the Eigen values, Vectors and Applies the Cayley-Hamilton Theorem to square matrix.
3. Calculate the Approximate numerical solution for any equation & to any set of points by using relevant formule.
4. Integrate any function, Explain about fitting of different curves by using method of Least Squares.
5. Solve the IVP Problems and Compare the numerical solution with analytical solution.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Define and calculate the rank, solution of n-linear equations, inverse of Matrices.
2. Apply the concept of Eigen values, vectors in communication Theory, Coding & Cryptography.
3. Apply the Cayley-Hamilton Theorem to calculate the Inverse & higher powers of any ordered square matrix.
4. Explain how to get the approximate root (solution) of any equation by using different numerical methods.
5. Formulate any given data points to get the numerical solution by different Interpolating formulas.
6. Estimate the numerical solution for any definite integral by using different Rules.
7. Interpret the given set of data points to best fit the linear curve by using method of Least Squares.
8. Compares the numerical solution of any IVP problem with analytical solution by using different single & multi step methods.

UNIT-I

Solution of Linear Systems: Matrices – basic definitions – real symmetric, skew-symmetric and orthogonal matrices – complex matrices – hermitian, skew-hermitian and unitary matrices – elementary row and column operations – echelon form – rank – normal form – inverse by elementary row operations(Gauss - Jordan method) – solutions of linear system of equations (homogeneous and non - homogeneous).

UNIT-II

Eigen Values and Eigen Vectors: Eigen values and eigen vectors – properties of eigen values and eigen vectors of real and complex matrices – Cayley-Hamilton theorem (without proof) – inverse and powers of a matrix by Cayley-Hamilton theorem.

UNIT-III

Numerical Solutions of Non-Linear Equations: Solution of algebraic and transcendental equations – Bisection method – Regula-falsi method –Newton Raphson method – iteration method.
Interpolation: Interpolation with unevenly spaced points – Newton's Divided Difference – Lagrange's Interpolation formula.

UNIT-IV
Numerical Integration and Curve Fitting: Numerical integration – Newton-cotes formula – Trapezoidal rule – Simpson's 1/3 and 3/8 rules. Curve fitting by method of least squares – fitting of straight line – parabola – exponential curve – power curve.

UNIT-V
Numerical solutions of initial value problems in ODE: Numerical solutions of initial value problems – introduction – Taylor series method, Picard's method, Euler's method, Modified Euler's method, Runge Kutta methods.

TEXT BOOKS:
1. K.A.Stroud with Dexter J.Booth, "Advanced Engineering Mathematics", Industrial Press, inc.
2. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2-B Nath Market, Nai Sarak, Delhi-110006.

REFERENCE BOOKS:
1. Peter V. O'Neil, "Advanced Engineering Mathematics", CL- Engineering.
2. Richard L. Burden, J. Douglas Faires, "Numerical Analysis", CENGAGE Learning.
3. S.S. Sastry, "Introductory Methods of Numerical Analysis",- PHI Learning Pvt. Ltd.
4. M.K.Jain, S.R.K.Iyengar, R.K.Jain, "Numerical Methods", Newage International (P), Ltd.

(BS104) ENGINEERING PHYSICS - II

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Identify the crystal systems and types of defects in solids.
2. Discuss the role of dielectric materials in various engineering applications.
3. Categorize the different magnetic materials and list their applications.
4. Evaluate the carrier concentration in semiconductors as well as understand the device physics.
5. Elaborate the types and properties of nanomaterials as well as their characterization.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Recognize the importance of defects in physical properties of crystalline solids.
2. Assess crystal structure and interplanar spacing of crystals using X-ray diffraction techniques.
3. Illustrate the variation of polarization with field, stress as well as temperature in dielectrics.
4. Select the magnetic materials for the desired engineering applications.
5. Estimate the carrier concentration and understand the types of currents in semiconductor.
6. Examine the construction and working of diodes in various applications.
7. Develop new methods to synthesize novel nanomaterials for various applications.
8. Apply the knowledge acquired from basic principles of materials science to design devices with higher performance and smaller in size**.**

UNIT - I: Crystallography

Introduction, Unit cell, Crystal systems and Bravais lattices, Crystal planes and Miller indices, Interplanar spacing of orthogonal crystal systems, Crystal defects – classification, Effect of crystal defects on physical properties, X-ray diffraction – Bragg's law, Bragg's spectrometer, Debye-Scherrer powder method, Applications of X-ray diffraction

UNIT - II: Dielectric Materials

Introduction, Polarization mechanisms - Electronic, Ionic, Orientation and Space charge polarizations (qualitative), Dielectric relaxation, Piezo-electricity - Production and detection of ultrasonics by piezo-electric effect, Applications of ultrasonics, Pyro-electricity, Ferro-electricity – hysteresis, Applications of dielectric materials

UNIT - III: Magnetic Materials and Superconductivity

Introduction, Origin of magnetic moment, Classification and characteristics of magnetic materials, Ferromagnetism - hysteresis, Soft and hard magnetic materials, Magnetostrictive effect, Applications of magnetic materials, Superconductivity - Meisner effect, Soft and hard superconductors, High T_c superconductors and applications of superconductors

Unit – IV: Semiconductors and Devices

Concept of Fermi energy, Intrinsic and Extrinsic semiconductors – Carrier concentration and Fermi level, Drift and diffusion currents, Einstein relation, Hall effect, Formation of PN junction diode, Energy band diagram (unbiased, biased), Volt-Ampere characteristics, PN junction diode as rectifier (qualitative), Principle, Construction and Applications of - light emitting diode (LED), photo diode and solar cell

UNIT - V: Nanomaterials

Historical development, Nanoscale, Surface area to volume ratio, Quantum confinement, Classification of nanomaterials (1D, 2D, 3D), Properties of nanomaterials, Types and properties of carbon nanotubes, Top-down fabrication - ball milling method, Bottom-up fabrication - Sol-gel method, Characterization of nanomaterials: X-ray diffractometer (XRD) – Determination of particle size, Transmission Electron Microscope (TEM) and Atomic Force Microscope (AFM), Applications of various nanomaterials

TEXT BOOKS:

1. S.O. Pillai, "Solid State Physics", New Age International (P) Ltd.
2. M.N. Avadhanulu & P.G. Kshirasagar, " A Text book of Engineering Physics" S. Chand & Company Ltd.

REFERENCE BOOKS:

1. A.J. Dekker, "Solid State Physics", Macmillan India Ltd.
2. P.K. Palanisamy, "Engineering Physics", SciTech Publications, India (P) Ltd.
3. M.R. Srinivasan, "Physics for Engineers", New Age International (P) Ltd.
4. B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath & James Murday, "Textbook of Nanoscience and Nanotechnology", Universities Press.

(BS105) ENGINEERING CHEMISTRY

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Outline the concept of electro chemistry, electrodes and cells.
2. Explain construction of batteries, fuel cells and mechanism, prevention of corrosion.
3. Apply reference electrodes and calculate the effect of corrosion.
4. Estimate drinking water quality parameters and properties of lubricants, refractories and fuels.
5. Formulate polymers, molecular interactions and spectroscopic methods.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Recall types of electrodes and potentials.
2. Illustrate chemically modified electrodes and corrosion control methods.
3. Show varying potentials using electrodes and corrosion inhibitors.
4. Analyze types of batteries and metallic coatings for prevention of corrosion.
5. Develop synthesis of conducting, liquid crystal and green polymers.
6. Prove alkalinity, content of dissolved oxygen and hardness of water.
7. Elaborate types of molecular interactions and electronic transitions.
8. Build refractories, glasses and ceramics.

UNIT-I: Electrochemistry

Introduction- Electrochemical cell, Review of the concept of electrode potentials, Nernst Equation, Standard Electrode potential, measurement of single electrode potential, EMF of cell, Spontaneity of cell, Electrochemical Series. Brief mention of types of electrodes with examples (Gas electrode, Metal- Metal ion electrode, Metal-Metal sparingly soluble salt electrode, oxidation-reduction electrode), Ion-selective electrode-Glass Electrode- Derivation of equation between electrode potential and pH, Determination of pH of a solution using a glass electrode, Determination of F^- ion using fluoride electrode (Numerical calculations), Potentiometer - Potentiometric titrations, Chemically modified electrodes (CMEs) Redox and Acid base electrodes - Concepts, CMEs as potentiometric sensors, Electrochemical energy systems - Electrochemistry of secondary cells e.g: Lead-acid cell, Rechargeable lithium batteries, Fuel Cells e.g: H_2-O_2, Methanol-O_2 Fuel Cell.

UNIT- II: Corrosion and its prevention

Introduction, Corrosion by chemical reaction (Dry corrosion), Pilling-Bedworth rule, Wet Corrosion in acidic, basic and Neutral environments with example, Galvanic Corrosion, Galvanic series, Differential aeration corrosion, Factors affecting corrosion rate (purity of metal, Position in galvanic series, relative areas of anode and cathode, effect of temperature, pH and dissolved oxygen). Prevention of corrosion–cathodic protection (Sacrificial Anode Protection and Impressed Current Cathode), application of corrosion inhibitors (cathodic and anodic), application of metal coatings (Electroplating, anodizing, cementation) with examples.

UNIT-III: Polymers

Polymer Chemistry – Introduction (definition of terms- monomer, polymer, tacticity with types, functionality). Classification based on - origin (natural & synthetic), composition (homo and co-polymers), structure (linear, branched chain and cross linked) and mechanism (addition, condensation and coordination polymerization with examples). Thermoplastic and Thermosetting polymers - differences and examples, conducting polymers: Mechanism of conduction in polymers - Example (Poly aniline) and applications. Some industrially important polymers-Nylon fibers-(Nylon: 6, Nylon 6:6 and Nylon 6:10), Synthetic Rubber-example (Thiokol Rubber), Silicones and Kevlar- properties and applications.

Green polymers: Introduction, synthesis and applications of Poly hydroxyl alkanoates (PHA), Poly lactic acid (PLA), Triglycerides and Polyesters.

UNIT-IV: Molecular Interactions and Introduction to Chemical Analysis

Molecular Interactions - Nature of ion-ion interactions, ion-dipole interactions, dipole-dipole interactions, charge transfer interactions, introduction of supramolecular interactions.

Spectroscopic Methods: Introduction to spectroscopy, Electromagnetic radiation concept of absorption, UV- visible spectra, types of electronic transitions, Lambert-Beer's law-derivation, verification and its applications.

Water Analysis: Drinking water Quality parameters-WHO Guidelines, BIS Guidelines Alkalinity, Dissolved Oxygen and Hardness of water- representation, types and units of Hardness, determination of hardness by EDTA method, problems. Boiler troubles- caustic embrittlement, Boiler corrosion, scale and sludge formation, Methods of softening of water-Zeolite process, Ion-exchange process, Brackish water - Electro dialysis and Reverse Osmosis.

UNIT-V: Engineering Materials

Lubricants: Introduction, classification with examples, criterion for good lubricants. Properties –Viscosity, Flash Point, Fire Point, Cloud Point and Pour Point .

Refractories: Characteristics of Refractories, classification – acidic, basic & neutral with examples, Concept of Refractoriness (RUL & Segar cone test).

Glasses and Ceramics: Introduction, classification with examples, properties and applications.

Fuels: Types and Characteristics of fuels (Liquid and gaseous fuels**),** Knocking-Octane number, anti-knocking agents and Cetane number. CNG, LPG, Calorific values (Units), Dulong's formulae for NCV, GCV-Numerical problems.

TEXT BOOKS:

1. Oleg Roussak & H. D. Gesser, "Applied Chemistry: A Textbook for Engineers and Technologists", Springer; Second Edition 2013.
2. P.C. Jain & Jain, "Engineering Chemistry"-Sixteenth Edition, Dhanpat Rai Publishing Company, New Delhi-2014.

REFERENCE BOOKS:

1. P. Atkins & Julio de Paula, "Atkins Physical Chemistry", Tenth Edition W. H. Freeman, NewYork-2014.
2. J. A. Parikh, "Applied Chemistry", First Edition, Tech Max Publications, Pune 2008.
3. S. Glassstone, "An Introduction to Electrochemistry", Bangalore 2007.
4. Shashi Chawla, "A Text Book of Engineering Chemistry", Tata McGraw Hill Education Private Limited, New Delhi-2012.

(ES110) DATA STRUCTURES

(Common to EEE, ECE, CSE Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recognize different data structure & their abstract data types (ADTs).
2. Implement STACK, QUEUE & LIST data structures.
3. Apply C in implementing the TREE ADTs & traverse the tree.
4. Understand different Hashing functions.
5. Familiarize with different sorting techniques.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
2. Outline common applications for arrays, records, linked structures, stacks, queues, trees and graphs.
3. Compare and contrast the benefits of dynamic and static data structures implementations.
4. Develop and Evaluate programs that use arrays, records, linked structures, stacks, queues, trees and graphs.
5. Demonstrate different methods for traversing trees.
6. Analyze alternative implementations of data structures with respect to performance.
7. Design and implement an appropriate hashing function for an application.
8. Discuss the computational efficiency of the principal algorithms for sorting, searching and hashing.

UNIT- I

Basic concepts - Data types, Abstract Data Types, Data structures, Algorithms.
Searching- Linear Search, Binary Search
Sorting- Bubble Sort, Insertion Sort, Selection Sort, Quick sort, Merge sort, Comparison of Sorting methods.

UNIT- II

Stack ADT - Definitions, operations, array and linked implementations, applications-infix to postfix conversion, recursion implementation,
Queue ADT - Definitions and operations, array and linked Implementations, Applications of Queue Circular queues and operations
Linear data structures - Linear Lists, Sequential and Linked allocation ,The list ADT, array and linked Implementations, Singly Linked Lists-Operations-Insertion, Deletion, Doubly Linked Lists-Operations - Insertion, Deletion

UNIT- III

Non Linear data structures: Trees – Basic Terminology, Binary tree ADT, array and linked representations, traversals, threaded binary trees, Disjoint Sets, Union and Find algorithms, Priority Queues-Definition, ADT, Realizing a Priority Queue using Heap.
Search Trees-Binary Search Trees, Definition, ADT, Implementation, Operations-Searching, Insertion and Deletion.

UNIT- IV
AVL Trees - Definition, Operations – Insertion and Searching,
B-Trees - Definition, B-Tree of order m, operations - insertion and deletion, Introduction to Red-Black and Splay Trees, Comparison of Search Trees.

UNIT -V
Graphs – Introduction, Basic Terminology, Graph Representations- Adjacency matrix, Adjacency lists, Adjacency multilists, Graph traversals- DFS and BFS, Spanning Trees – Kruskals, prims algorithms.

Hashing - hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

TEXT BOOKS:

1. Mark Allen Weiss, "Data structures and Algorithm Analysis", 3rd edition, Pearson Education. Ltd.,
2. S.Sahani, "Data structures, Algorithms and Applications", Universities Press.

REFERENCE BOOKS:

1. Michael T.Goodrich, R.Tamassia and D.Mount, "Data structures and Algorithms", Wiley student edition, seventh edition, John Wiley and Sons.
2. Adam Drozdek, "Data structures and algorithms", 3rd Edition, Cengage Learning.
3. Langsam, Augenstein and Tanenbaum, "Data structures using C", PHI.
4. G.L.Heileman, "Data structures, algorithms and OOP", TMH edition.

(ES105) ENGINEERING DRAWING WITH CAD

(Common to CE, ME, EEE Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	2	-	3	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Discuss the AUTOCAD tool.
2. Explain the types of planes and methods of projections.
3. Identify Projection of points, lines, planes &solids.
4. Distinguish the orthographic and Isometric views.
5. Create Free hand-sketches for 2-D and 3-D drawings.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Recognize AUTOCAD 2-D commands.
2. Identify the projections without confusion.
3. Solve projections problems with freehand.
4. Develop the skill of points, lines problems in different positions.
5. Develop the skill of planes and solids problems in different positions.
6. Draw the given Isometric views to ortho views.
7. Draw the given ortho views to Isometric views.
8. Compile and check all the drawings with software.

UNIT – I

Introduction to Computer Aided Drafting, AutoCAD Commands, Types of lines, Dimensioning, Theory of Projection – Elements of projection, planes of projection, methods of projection.

Projection of Points and Straight Lines – Projection of points, projections of straight lines, various positions of straight lines w.r.t. reference planes, traces of lines.

UNIT – II

Projection of Planes – Types of planes, projection of planes, various positions of planes w.r.t reference planes (Use First angle method of projection)

UNIT – III

Projection of Solids – Types of solids, projection of solids in simple position, projection of solids with axis inclined to one reference plane and parallel to other. (Use First angle method of projection)

UNIT – IV

Orthographic Projection –Introduction to Orthographic projections, types of surfaces, invisible lines, precedence of lines, steps to draw orthographic views, orthographic projection of different objects. (Use First angle method of projection)

UNIT – V

Isometric projection –Theory of isometric projection, isometric view, isometric views from orthographic views for simple objects. (Use First angle method of projection)

TEXT BOOKS:

1. N.D.Bhatt, "Engineering Drawing".
2. Dhananjay A Jolhe, "Engineering Drawing with an introduction to AutoCAD", Tata McGraw-Hill Publishing company limited.

REFERENCE BOOKS:

1. D.M. Kulkarni, A.P. Rastogi and A.K.Sarkar; "Engineering Graphics with AutoCAD", PHI Learning Private Limited, New Delhi.
2. P.S.Gill, "Engineering Drawing", S.K.Kataria & Sons, Delhi.

(HS103) ENGLISH LANGUAGE COMMUICATION SKILLS LAB

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recognize and clear the issues in oral communication.
2. Summarize and present thought and ideas in an understandable way.
3. Execute the writing and speaking skills learnt in class room as well as lab sessions.
4. Develop the language skills using proper grammar rules.
5. Compose sentences and develop them in to meaningful speaches.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Reproduce the sounds of language as per the rules of pronunciation.
2. Paraphrase the description of people, objects and place.
3. Produce meaningful sentences and giving them proper structure.
4. Identify the main idea and supporting details shown in the course videos.
5. Develop speaking abilities with proper body language.
6. Draw information from various sources of visualized images or hypothetical situations.
7. Build professional writing skills making use of the standards of grammar.
8. Prioritize and build employability skills and develop career competency.

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

Syllabus: English Language Communication Skills Lab shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Exercise – I

CALL Lab: Video Exercises- Chapters from **Animals, Customs and Traditions,** Sharks; Wild life conservation, Customs in Dagestan; Japan Customs and Traditions of Unlock Reading & Writing Skills, Unlock Listening and Speaking Skills– Cambridge University Press

ICS Lab: Ice-Breaking activity and JAM session

Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II

CALL Lab: Chapters from **History, Transport,** Egyptian Archaeology; The Desert Mummies of Peru

Indian transport; How to make a BMW of Unlock Reading & Writing Skills, Unlock Listening and Speaking Skills– Cambridge University Press

ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.
Concord (Subject in agreement with verb) and Words often misspelt- confused/misused

Exercise - III
CALL Lab: Chapters from **Environment, Health and Fitness,** Alaskan glaciers; Seeping giants: Russian volcanoes Cycling; Training for a triathlon: the ultimate event of Unlock Reading & Writing Skills, Unlock Listening and Speaking Skills– Cambridge University Press
ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.
Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV
CALL Lab: Chapters from **Discovery and Invention, Fashion,** Robots; Engineering a ski resort in the desert Missoni Italian fashion; From function to fashion of Unlock Reading & Writing Skills, Unlock Listening and Speaking Skills– Cambridge University Press
ICS Lab: Group Discussions
Official Letters

Exercise – V
CALL Lab: Chapters from **The Brain**The Russian Economy; Economic migration: the Chinese dreamThe Amazing Brain; The placebo effect of Unlock Reading & Writing Skills, Unlock Listening and Speaking Skills– Cambridge University Press
ICS Lab: Oral Presentation
Reading Comprehension and Job Application with Resume preparation.

TEXT BOOKS:
1. Carolyn Westbrook, "Unlock Reading & Writing Skills 3 – B1 English Profile", Cambridge University Press.
2. Sabina Ostrowska, "Unlock Listening and Speaking Skills 3 - B1 English Profile", Cambridge University Press.

SUGGESTED READING:
1. Chris Redston, Gillie Cunningham and Jan Bell, "Face to Face", Cambridge University Press.
2. Krishna Mohan and N.P.Singh, "Speaking English Effectively", Macmillan Publishers India Ltd. Delhi.
3. Soundararaj and Francis, "Basics of Communication in English", New Delhi: Macmillan.

SUGGESTED SOFTWARE:
- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 8th Edition.
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.

(BS108) ENGINEERING CHEMISTRY LAB

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recognize the nature of Electro chemical reactions and corrosion of metals.
2. Illustrate the fundamentals of water analysis like hardness, alkalinity and dissolved oxygen.
3. Show the instrumentation techniques like conductometry, potentiometry and colorimetry.
4. Assess the basic knowledge of volumetric analysis like permanganometric, complexometric titrations.
5. Create awareness regarding laboratory performance among engineering students.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Mention the types of various titration methods.
2. Explain about the determination of alkalinity and hardness of water methods.
3. Develop comprehensive knowledge of theory and practice of instrumental methods.
4. Examine the pH, electromotive force, conductance by using instrumental methods.
5. Test the amount of dissolved oxygen present in water sample.
6. Develop the knowledge of volumetric analysis.
7. Estimate the amount of copper in Brass by colorimetry.
8. Analyze the rate of corrosion by the use of corrosion inhibitors.

LIST OF EXPERIMENTS:

1. Determination of Alkalinity of the given Water Sample
2. Determination of Hardness of Water by Complexometric (EDTA) method
3. Estimation of Calcium in Limestone by Permanganometry
4. Determination of dissolved oxygen in the given sample of water
5. Titration of Strong Acid Vs Strong Base by Conductometric Method
6. Redox Titration by Potentiometric Method
7. Titration of Weak Acid Vs Strong Base by pH metry.
8. Determination of Copper in Brass by Colorimetry Method
9. Determination of Rate of Corrosion of oxide steel in acidic environment in the absence and presence of an inhibitor.
10. Preparation of a Polymer sample (Thiokol Rubber / Urea Formaldehyde)

TEXT BOOKS:

1) A. I. Vogel, “Text book of qualitative chemical analysis”, Prentice Hall of India.
2) S. Rattan, “Experiments in applied chemistry”, S. K. Kataria & Sons.

(ES111) DATA STRUCTURES LAB

(Common to EEE, ECE, CSE Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
I	II	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recognize and formulate the Abstract Data Types (ADT) for different data structures.
2. Make an appropriate choice of data structure depending on the context of application.
3. Implement different data structures using a programming language (C).
4. Develop applications involving data structures in general engineering problems.
5. Explore data structures in domain specific engineering problems, civil, mechanical, etc.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
2. Outline common applications for arrays, records, linked structures, stacks, queues, trees and graphs.
3. Compare and contrast the benefits of dynamic and static data structures implementations.
4. Develop and Evaluate programs that use arrays, records, linked structures, stacks, queues, trees and graphs.
5. Demonstrate different methods for traversing trees.
6. Analyse alternative implementations of data structures with respect to performance.
7. Design and implement an appropriate hashing function for an application.
8. Discuss the computational efficiency of the principal algorithms for sorting, searching and hashing

Week- 1:

Develop C programs on Arrays, Pointers and Structures.

Week-2:

Write a C program to sort the Given set of elements using

i)Bubble sort ii) Merge sort

Week -3:

Write a C program to sort the Given set of elements using

i)Insertion sort ii) Quick sort iii)Heap sort

Week-4:

Write a C program that implement stack and Queues (its operations) using Arrays

Week- 5:

a) Write a C program that uses functions to perform the following operations on singly linked list:

i) Creation ii) Insertion iii) Deletion iv) Traversal

b) Write a C program that uses functions to perform the following operations on Circular linked list:

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week- 6:

a) Write a C program that uses functions to perform the following operations on Doubly linked list:

i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways.

b) Write a C program that uses functions to perform the following operations on Circular Doubly linked list:

i) Creation ii) Insertion iii) Deletion iv) Traversal.

Week- 7:

Write a C program that implement stack and Queue (its operations) using Pointers

Week- 8:

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

i) Converting infix expression into postfix expression

ii) Evaluating the postfix expression

Week- 9:

Write a C program to perform the following operations on Binary Search Tree

i) Insertion. ii) Deletion iii) Traversal (Recursive)

Week- 10:

Write a C program to perform the following operations on AVL Tree

i) Insertion. ii) Deletion iii) Traversal (Recursive)

Week- 11:

Write a C program to perform the following operations on B Tree

i) Insertion iii) Search

Week- 12:

Write a C program to implement BFS and DFS algorithms for a given graph.

Week- 13:

a) Write a C program to implement Kruskal's and Prim's algorithms to generate a minimum cost spanning tree.

b) Write a C program to implement the given hash function and explore hash table for fast data lookup

Week- 14:

a) Write a C program to Apply a suitable data structure to represent the given polynomial, eg., **5x10 + 3x5 + 1**

b) Write a C program to Apply a suitable data structure to implement trie/dictionary such as one found on a mobile
telephone.

TEXT BOOKS:

1. M. A. Weiss “Data Structures and Algorithm Analysis in C”, Pearson Education Asia.
2. Yashvant Kanetkar “Understanding Pointers in C”, BPB Publications.

WEB LINKS:

1. www.nalanda.nitc.ac.in/libnew/book-13-05-05.html
2. http://nptel.iitm.ac.in
3. http://www.ebooks.com
4. http://www.suite101.com/reference/data_structure_tutorial

(HS104) ECONOMICS AND FINANCE FOR ENGINEERS

(Common to EEE, ME, ECE, CSE)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Explain importance of Economics and its application into business practice.
2. Develop least cost combination of inputs in production
3. Formulate suitable pricing policy pricing method
4. Apply the concepts of Accounting in calculating the profits of business
5. Identify relevant Capital budgeting techniques and appraise the projects.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Forecast the demand for product / service for a profitable Business administration.
2. Apply the demand forecasting techniques to estimate the demand
3. Minimize the cost incurred in Production and estimate the profit zone.
4. Recognize the time value in cash flows
5. Evaluate various investment opportunities and select best project
6. Develop least cost combination of inputs in production
7. Analyze Capital Budgeting techniques.
8. Build Financial Reports and evaluate financial status of the organization.

UNIT–I

Introduction to Economics

Definition, Nature and Scope – Demand Determinants, Law of Demand and its exceptions - Elasticity of Demand: Definition, Types, Measurement and Significance, Demand forecasting: factors and methods

UNIT–II

Theory of Production and Cost Analysis

Production Function - Least Cost Combination of Inputs. Break-Even Analysis (BEA) - Cost Concepts - Determination of Break-Even Point (Simple problems)

UNIT–III

Introduction to Markets and Pricing

Types of Market - Price-Output Determination in case of Perfect Competition, Monopoly and monopolistic – Pricing objectives and Methods

UNIT–IV

Financial Accounting and analysis

Double-Entry Book Keeping, Journal, Ledger, and Trial Balance – Final Accounts (Trading, Profit & Loss Account and Balance Sheet) with simple adjustments). Financial Analysis: Liquidity, Activity, Capital structure and Profitability ratios

UNIT–V

Capital Budgeting

Time Value of Money – Simple and Compound techniques - Nature and scope of Capital Budgeting, Payback Method, Accounting Rate of Return (ARR), Net Present Value and IRR Methods (simple problems).

TEXT BOOKS:

1. E.William, G. Sullivan, “Engineering Economy”, Pearson.
2. H. Craig Petersen, “Managerial Economics”, Pearson.

REFERENCE BOOKS:

1. Sasmita Mishra, “Engineering Economics and Costing”, PHI.
2. M.Kasi Reddy & S.Saraswathi, “Managerial Economics and Financial Accounting”, PHI.
3. V.S.Bagad, “Managerial Economics and Finanancial Analysis” Techcical Publications, Pune.

(BS109) MATHEMATICS-II

(Common to CE, EEE, ME, ECE Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Identify Laplace and inverse Laplace transforms with applications.
2. Illustrate Fourier series expansion.
3. Compute vector differentiation and integration.
4. Evaluate complex integration and applications.
5. Calculate residues and contour integration.

COURSE OUTCOMES:

At the end of the course, students will be develop an ability to

1. Explain Laplace transforms to solve differential equations.
2. Decide Laplace transform technique to engineering problems.
3. Recommend vector calculus to different engineering problems.
4. Discuss analytical functions apply to velocity potentials, stream functions, orthogonal trajectories.
5. Create complex integration to solve real improper integrals.
6. Apply Fourier series to engineering problems.
7. Analyze vector integral theorems.
8. Judge in evaluation of contour integration.

UNIT-I

Laplace Transforms

Definition - Existence - Laplace transforms of standard functions - First & Second Shifting theorems - Change of scale property - Laplace transform of Derivatives - Integrals- functions multiplied by t - divided by t - Laplace Transform of Periodic functions. Inverse Laplace transforms - Inverse Laplace transforms by partial fractions - Inverse Laplace transforms of Derivatives - Integrals - functions multiplied by s - divided by s - Convolution theorem - Applications of Laplace transforms to Ordinary Differential Equations.

UNIT-II

Fourier Series

Definition of Fourier series - Dirichlet conditions - Fourier series of functions defined in $[0,2\pi]$ - Fourier series of Even and Odd functions - Half range Fourier sine and cosine series - Fourier series in arbitrary intervals.

UNIT-III

Vector Calculus

Vector Differentiation: Introduction to vectors - Ordinary and Partial derivatives of a vector valued function - Gradient of a scalar function - Divergence and Curl of a vector function - vector Identities (without proofs).

Vector Integration: Integral of a vector valued function - Line integrals - Surface integrals -

Volume integrals - Vector Integral Theorems - Green's theorem - Stokes theorem - Gauss Divergence theorems (statements without proofs) - verification & Applications.

UNIT-IV

Complex Analysis - 1

Functions of Complex Variables: Analyticity – properties – Cauchy - Riemann conditions - hormonic and conjugate harmonic functions.

Complex Integration and Power Series: Line integral - evaluation - along a path and by indefinite integration - Cauchy's integral theorem - Cauchy's integral formula - Generalized integral formula - applications. Radius of convergence - Expansion in Taylor's series - Maclaurin's series - Laurent series - applications. Definitions - Singular point - Isolated singular point - pole of order m - essential singularity.

UNIT-V

Complex Analysis - 2

Contour Integration: Residues - Evaluation of residues by formulae - Residue theorem (without proof) - Evaluation of integrals of the type

a) $\int_{-\infty}^{\infty} f(x)dx$ b) $\int_{c}^{c+2\pi} f(\cos\theta,\sin\theta)d\theta$ c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

TEXTBOOKS:

1. Erwin kreyszig, "Advanced Engineering Mathematics", John wiley & sons, 605 Third Evenue, New York.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", Cl-Engineering, March 2006.

REFERENCE BOOKS:

1. R.K.Jain, S.R.K. Iyengar, “Advanced engineering Mathematics", Narosa publishing house, New Delhi.
2. B.S.Grewal, "Higher Engineering Mathematics", Khanna publishers, Delhi.

(ES112) FOUNDATIONS TO PRODUCT DESIGN

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	3	-	-	3	50	50	100

COURSE OBJECTIVES:

Students will learn

1. The overall design process and the various stages in the process
2. Methods to identify and frame the needs from ethnography to functional decomposition
3. Elements of value proposition from the point of view of different stakeholders.
4. Idea generation techniques, concept development methods based on appropriate experimentation, and Pugh's concept selection method.
5. Project planning, cost estimation, idea pitching, managing intellectual property issues, and report writing skills

COURSE OUTCOMES:

At the end of the course the students will develop an ability to

1. Describe and discriminate the design process and its stages.
2. Conduct an ethnographic study and frame a design need
3. Decompose the need in terms of independent functions
4. Formulate value proposition from the point of view of different stakeholders
5. Conceive ideas, develop them into viable concepts through appropriate investigation, and select viable concept.
6. Plan a project
7. Develop a working prototype, pitch the product concept, and create a design report
8. Plan the project and prepare cost estimates

UNIT – I

The Engineering Design Process

Overview of the engineering design process, Stages of design – Identification – conceptualization – Exploration and refinement – Modeling – Commercialization.

Assignment: Sketching Product Concepts Exercise

UNIT - II

Identification and Analysis of Need

Ethnography, Framing the Need, Functional Analysis (Functions, Constraints, Functional Decomposition and Development of Requirements), Kano Model, Value Proposition from the Point of View of Different Stakeholders.

Assignment: Perform ethnographic study, identify the new opportunity, frame the need, and decompose the need in terms of independent functions, and describe the value proposition from the stakeholders' points of view.

UNIT – III

Conceptualization:

Concept Generation – Six Hats method, Concept Development through Appropriate Investigation, Concept Selection.

***Assignment*:** Propose a variety of solutions to a given needs, develop them to product concepts and recommend one concept for further consideration.

UNIT – IV

Skill Development: Project Planning, Cost Estimation, Managing Intellectual Property Issues**,** Idea Pitching, Effective Report Writing

UNIT – V

Project work: An open-ended design project executed from opportunity to a working prototype culminating with an investor pitch, customer product unveiling, and report.

TEXT BOOKS:

1. Kevin Otto, Kristin Wood, "Product Design: Techniques in Reverse Engineering and New Product Development", Prentice Hall Edition, Jan 15 2013.
2. Jonathan Cagan, "Creating Breakthrough Products: Innovation from Product Planning to Program Approval", Publication FT Press ©2002,Edition-2.

REFERENCE BOOKS:

1. James H. Gilmore, B. Joseph Pine ,"Markets of One: Creating Customer-Unique Value through Mass Customization" Feb 1, 2000, ISBN 1578512387
2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Reis
3. The Art of Tinkering Hardcover use pre formatted date that complies with legal requirement from media matrix –by Karen Wilkinson

(EC101) ELECTRONIC DEVICES AND CIRCUITS

(Common to EEE & ECE Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Illustrate the characteristics and operation of various semiconductor devices.
2. Describe various diode rectifiers and filter circuits.
3. Explain the operation of transistors, their configurations and biasing techniques.
4. Analyze a transistor amplifier using h- parameter model.
5. Discuss construction, operation of JFET's and MOSFET's and solve various problems on FET's.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Demonstrate the basic semi conductor devices and their behavior.
2. Identify, formulate and solve electronic circuit problems.
3. Build simple electronic circuits to fulfill simple functions like amplifiers, filters etc.,
4. Discuss special semiconductor devices for power applications and communication engineering.
5. Explain the operations of tunnel diode, varactor diode and photo diode.
6. Design a voltage regulator circuit using Zener diode.
7. Explain the significance of DC and AC load lines.
8. Compare BJT, FET and MOSFET characteristics.

UNIT – I

Semi Conductor Devices: Review of semiconductors, PN junction diode, Volt-Ampere characteristics, Diode equation, Temperature dependence of V-I characteristics, Static& Dynamic Diode Resistances, Basic Concepts of Transition capacitance and Diffusion capacitance, Diode equivalent circuits, Breakdown mechanisms in diodes, Zener diode characteristics, Tunnel diode, varactor diode, SCR**.**

UNIT – II

Rectifiers: Half wave rectifier, Full wave rectifier, Bridge rectifier, Harmonic components in a rectifier circuit, Filters-L, C, LC & π filters, Zener diode as voltage regulator, Clipper and Clamper circuits.

UNIT – III

Bipolar Junction Transistor: Types of transistors, Principle of working, Transistor as switch, transistor as an amplifier, Transistor configurations-CE, CB, CC, BJT specifications, Operating point, DC & AC load lines, Need for biasing, bias stability, Fixed bias, Collector feedback bias, self bias, Bias compensation, Thermal runaway.

UNIT – IV

Small Signal Low Frequency BJT Models: BJT Hybrid model, Determination of h-parameters from Transistor characteristics, Analysis of transistor amplifier circuit using h-parameters, Comparison of CE, CB, CC amplifier Configurations

UNIT – V

Field Effect Transistor: JFET construction, Principle of operation, Volt-Ampere characteristics, small signal model, MOSFET construction, principle of working, MOSFET(Enhancement and Depletion mode) characteristics, Biasing FET, Common source amplifier, Common drain amplifier, FET as voltage variable resistor, UJT

TEXT BOOKS:

1. Jocob Millman & Christos C.Halkias, "Electronic Devices and Circuit", McGraw Hill.
2. Robert Boylestad & Lowis Nashelsky, "Electronic Devices and Circuit theory", Prentice Hall of India.

REFERENCE BOOKS :

1. J. Millman and Christos C.Halkias, "Integrated Electronics" –TMH.
2. Donald L Schilling & Charles Belove, "Electronic Circuits; discrete & Integrated", McGraw Hill International Edition.
3. Anil K.Maini &Varsha Agarwal, "Electronic Devices and Circuits", Wiley India Pvt. Ltd.
4. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, "Electronic Devices and Circuits", TMH, 2nd Edition.

(EE101) ELECTRICAL CIRCUITS - I

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	4	1	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Calculate the different network parameters.
2. Apply graph theory for different electrical circuits.
3. Describe various techniques to calculate voltage and current magnitudes.
4. Discuss properties of electrical circuits and magnetic circuits.
5. Solve networks by applying different network theorems.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Identify active and passive elements.
2. Draw voltage current characteristics of different passive elements.
3. Apply KVL & KCL for networks.
4. Sketch the response for different inputs (Square Step Ramp)
5. Calculate AC quantities and draw phasor diagrams.
6. Summarize the concepts of magnetic circuits and solve problems.
7. Apply theorems for AC and DC networks.
8. Develop Tie-set and Cut-set matrix for different networks.

UNIT – I

Introduction to Electrical Circuits: 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-to-delta & delta-to-star transformation. Nodal analysis, Supernode, Mesh analysis and Super mesh analysis for DC excitations.

UNIT – II

Single Phase A.C. Circuits: Single Phase A.C Circuits: R.M.S and Average values and form factor for different periodic wave forms, 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 – Phase and Phase difference – concept of power factor, Real and Reactive powers – J-notation, Complex and Polar forms of representation, Complex power.

UNIT – III

Locus Diagrams, Resonance and Magnetic Circuits: Locus diagrams – Series R-L, R-C, R-L-C and Parallel combination with variation of various parameters- Resonance – series, parallel circuits, concept of band width and Q factor. 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 – IV

Network Topology: Definitions – Graph – Tree, Basic cutset and Basic Tieset matrices for planar networks – Loop and Nodal methods of analysis of Networks with independent voltage and current sources - Duality & Dual networks.

UNIT – V

Network Theorems With DC and AC Excitations: Tellegen's, Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's and Compensation theorems for dc and ac excitations.

TEXT BOOKS:

1. W. Hayt and J. E. Kimmerly, Engineering Circuit Analysis, 8th ed., New Delhi: Tata Mcgraw Hill, 2011, pp. 1-880.
2. R. A. DeCarlo and Pen-Min-Lin, "Linear circuit analysis (time domain phasor, and Laplace transform approaches)", Oxford University Press. Second ed. 2004.

REFERENCE BOOKS:

1. Vanvalkenburg, "Network Analysis", PHI, 3rd ed., 2006.
2. N.C. Jagan & C. Lakshminarayana, "Network Theory", B.S Publications, 2nd edition, 2005, ISBN: 1904798047, 9781904798040.
3. S. Sudhakar, P.S.M. Satyanarayana, "Electrical Circuits", 3rd ed., TMH Publication, 2011.
4. Joseph Edminister, Mahmood Nahvi, "Electric Circuit Theory", 6th ed., Schaum's Outline Series, 2014.

(EE102) ELECTROMAGNETIC THEORY

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	3	1	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Apply the basic concepts of vectors and fields for static as well as time varying cases.
2. Analyse the concepts of Capacitance, Resistance and Electromotive force.
3 Discuss the Ampere's law and its applications for electrostatic and magnetic fields.
4 Explain the electric and magnetic potentials in the scalar and vector fields.
5 Formulate the laws of Maxwell's and Biot savart's law in electrostatic and magnetic fields.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Recall the dot product and cross product of vectors.
2. Develop the Coordinate system for Spherical and Cylindrical coordinate system.
3. Explain the use of Coulomb's law using vector analysis for an electric field.
4. Analyse the field intensities of a long conductor carrying current in a Transmission line.
5. Apply the Faraday's laws of Electromagnetic induction for Time variant and invariant fields.
6. Summarize the force and torque equation of a conductor in magnetic fields.
7. Discuss the Potential Energy and Kinetic Energy of group of charges.
8. Distinguish the Boundary conditions of conductor and Dielectric material for electric and magnetic fields.

UNIT – I

Electrostatics and Electric Dipole: Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law – Maxwell's first law, div (D)=ρv. Laplace's and Poison's equations – Solution of Laplace's equation in one variable. Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field.

UNIT – II

Dielectric and Capacitance: Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions, Capacitance – Capacitance of parallel plate and spherical and co-axial capacitors with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity.

UNIT – III

Magneto Statics and Ampere's Circuital Law and its Applications: Static magnetic fields – Biot-Savart's law – Oesterd's experiment - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, div(B)=0. Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation, Curl (H)=Jc, Field due to a circular loop, rectangular and square loops.

UNIT – IV

Force in Magnetic Fields and Magnetic Potential: Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field. Scalar Magnetic potential and its limitations – vector magnetic potential and its properties – vector magnetic potential due to simple configurations – vector Poisson's equations.

UNIT – V

Time Varying Fields: Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation, Curl (E)=-∂B/∂t – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current.

TEXT BOOKS:

1. William H. Hayt, John. A. Buck, "Engineering Electromagnetics", Mc. Graw-Hill Companies, 7th Editon.2006.
2. Sadiku, "Elements of electromagnetic Fields", Oxford Publications, 5th edition, 2010.

REFERENCE BOOKS:

1. D J Griffiths, "Introduction to Electro Dynamics", Prentice-Hall of India Pvt. Ltd, 2nd Editon.
2. J P Tewari "Electromagnetics", New Age International, 1st ed., 2003.
3. J. D Kraus, "Electromagnetics", Mc Graw-Hill Inc. 4th edition 1992.
4. S. Kamakshaiah, "Electromagnetic fields", 1st ed., Right Publishers, 2007.

(BS111) COMPUTATIONAL MATHEMATICS LAB

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	-	-	3	2	30	70	100

COURSE OBJECTIVES:

1. Explain the use of Excel for data analysis and reporting
2. Illustrate scientific documentation tools
3. Discuss Open Source modeling tools and create engineering models
4. Apply MATLAB for solving problems in numerical methods
5. Solve problems in curve fitting using MATLAB

COURSE OUTCOMES:

1. Analyze different databases using Excel
2. Assess proficiency in Excel
3. Design different charts for databases
4. Apply different modeling tools to generate suitable models
5. Construct scientific demonstration and reporting using Latex
6. Apply skills of modeling and generate engineering models
7. Solve problems in numerical methods by using MATLAB
8. Build plots for use in reports and presentations.

EXCEL

Week-1

1. Managing & Sharing work books
2. Applying Custom formats & layouts

Week-2

1. Creating advanced formulas
2. Creating Advanced charts & Objects
3. Prepare the student database with the following fields: S.No, name, Marks in subject1 to subject6, total, average

Case1: Find out the total marks and average of each student
Case2: Find out maximum and minimum marks of each subject
Case3: Find out whether the student is pass or fail (all subjects should be greater than 35 to pass)
Case 4: Find out the grades of the each student
Case 5: Find out the number of students in each grade
Case 6: Display the student list sorted on pass / fail field
Case 7: Highlight the fail cells in Pass/fail field
Case 8: Display the list of students who secured greater than 70 marks bin each subject.
Case 9: Display the list of students who secured greater than 70 marks bin each subject with Grade A .

Week-3

1. Explain pivot table with example
2. Explain about look-up and Vlook-up with an example.
3. Create an employee database with the following fields
4. S.No. empID, emp_namae, Joining-date, Experience, position, salary, bonus, net-salary

Week-4

1. Create a company sales database with the following fields
2. s.no, sales-person-ID, name, enter the sales details monthly wise, commission.
   Case1: Calculate total sales monthly , quarterly, half-yearly and yearly,
   Case2: Calculate the commission of slaes-person based on number of sales
3. Calculate electricity bill
4. Create the student data base with 4 internal mid marks

Give 25% waitage to each internal exam and calculate the total marks.
Case 1: Merge first name and last name in to name field
Case 2: split name field into first name and last name
Case 3: find out the duplicates
Case 4: Generate bar and pie chart for the above data base

Week-5

1. To determine the frequency of ac supply using sonometer.
2. To determine the wavelength of a given source of laser using a plane transmission grating by normal incident method
3. To determine the frequency of the electrically driven tunning fork.
4. To determine the numerical aperture of the optical fiber.
5. To determine the rigidity modules (n) of the material of the given wire using torsional pendulum.
6. To determine the forbidden energy gap of a given semiconductor.
7. To determine the radus of curvature of a given lens by forming newtons rings.
8. To study the variation of magnetic field along the axis of a circular coil carrying current.

NUMERICAL METHODS USING MATLAB

Week-6

Introduction to MatLab tools, working with MATLAB, writing functions & programs with logic flow, Analyzing Vectors and Matrices.

Week-7

Write a program to find the solution of given system of equations using
i) Gauss Jordan Method ii) Gauss Siedel Method

Week-8

Write a program to find the root of a given equation using
i) Bisection method ii) Regula Falsi Method iii) Newton-Raphson Method

Week-9

i) Write a program to determine y for a given x, if two arrays of x and y of same size are given (using Newton's Divided Difference formula and Lagranges Interpolation formula)

ii) Write a program to evaluate definite integral using

a) Trapezoidal rule, b) Simpson's $1/3^{rd}$ rule and c) Simpson's $3/8^{th}$ rule

Week-10

Write a program to find a curve of the form

i) $y = a + bx$ ii) $y = ae^{bx}$ and ii) $y = ax^2 + bx + c$

from the given two arrays of x and y of same size.

Week-11

Write a program to solve a given differential equation using

i) Euler's and modified Euler's method ii) Runge-Kutta method

DOCUMENTATION TOOLS

Week-12

Latex Basics and Prepare a publishable document using LaTeX IEEE conference template.

TEXT BOOKS:

1. Kelly Bennett, "MATLAB Applications for the Practical Engineer", InTech , 2014

REFERENCE BOOKS:

1. John Walkenbach, "Excel 2013 Bible", Mar 4, 2013.
2. Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, Chris Rowley, "The LaTeX Companion, 2nd edition (TTCT series)", ISBN 0-201-36299-6.

(EC102) ELECTRONIC DEVICES AND CIRCUITS LAB

(Common to ECE and EEE)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Sketch the V-I characteristics of PN junction diode & Zener diode and to calculate the static resistance and cut-in voltage & break-down voltage of Zener diode from the characteristics.
2. Calculate the ripple factor of rectifiers with and without filters and draw their output waveforms.
3. Draw the input & output characteristics of transistor in CE, CB configurations and calculate its input and output dynamic resistance.
4. Sketch the characteristics of FET and calculate its parameters.
5. Discuss the behavior of SCR.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Explain the unidirectional property of PN junction diode and discuss the regulation property of Zener diode.
2. Explain the behavior of semiconductor devices like BJT and FET.
3. Compute ripple factor & efficiency of Half-wave and Full-wave rectifiers.
4. Analyze the performance of various filter circuits.
5. Evaluate h-parameters of CB, CE & CC configuration.
6. Calculate the bandwidth of CE and CS amplifiers.
7. Sketch the characteristics of SCR.
8. Calculate intrinsic stand-off ratio of UJT by plotting its characteristics.

LIST OF EXPERIMENTS:

Any 10 experiments are to be performed:

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 rectifiers with and without filters
6. Full wave rectifiers with and without filters
7. FET characteristics
8. Measurement of h-parameters of transistor in CB,CE & CC configurations
9. Frequency response of CC amplifier
10. Frequency response of CE amplifier
11. Frequency response of common source FET amplifier
12. SCR characteristics
13. UJT characteristics

(MC101) BUSINESS COMMUNICATION AND PUBLIC SPEAKING

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	I	1	-	1	-	-	-	-

COURSE OBJECTIVES:

The student will be able to

1. Recall essentials of communication methods.
2. Paraphrase the business communication process.
3. Distinguish the various types of Public Speaking techniques.
4. Prioritize the importance of various speaking methods as per situations.
5. Construct professional communication as per the requirement.

COURSE OUTCOMES:

At the end of the course, the students will develop ability to

1. Recognize the importance of professional communication.
2. Paraphrase and construct a standard speech.
3. Distinguish the various structures of speech.
4. Develop techniques of drafting a document for effective speech.
5. Construct the documents according to the industrial needs.
6. Evaluate the significance of business communication.
7. Design speeches as per the requirement.
8. Design and deliver speeches for public utility.

UNIT- I

Human Resources

Getting the right job (Chapter 3)
Making Contact (Chapter 4)

UNIT- II

Marketing

Breaking into the market (Chapter 5)
Launching a product (Chapter 6)
A stand at trade fare (Chapter 7)
Communication with customers (Chapter 22)
Corresponding with customers (Chapter 23)

UNIT- III

Entrepreneurship

Starting a business (Chapter 9)
Financing a startup (Chapter 10)
Presenting your business idea (Chapter 12)

UNIT- IV

Introduction-Topic, Purpose, types

What Is Public Speaking and Why Do I Need to Do It?
Types of Speeches: Informative, Persuasive, and Special Occasion
Understanding Reasons for a Public Speaking Event
General Purpose vs. Specific Purpose of a Speech
Developing a Thesis Statement from Your Speech Topic
Informative Speaking: Purpose and Types
Helping Your Audience Learn During Informative Speeches: Strategies & Tips
Persuasive Speaking: Purpose and Types

UNIT-V

Organizing and Outlining, Preparing For an Impromptu Speech -Speech Delivery

Developing & Selecting the Main Ideas of a Speech
Supporting Ideas of a Speech: Development, Selection and Characteristics
Patterns of Organization for Informative Speeches, Persuasive Speech
Developing the Body of a Speech: Outline & Principles
Speech Conclusions: Role & Components
Preparing an Impromptu Speech: Topic Choice, Outline Preparation & Practice
Developing an Impromptu Persuasive Speech
Developing an Impromptu Informative Speech
Four Types of Speech Delivery: Impromptu, Extemporaneous, Manuscript & Memorized
The Role of Nonverbal Communication during Speech Delivery

TEXT BOOKS:

1. Guy Brook-Hart, "Business Benchmark", 2nd Edition, Cambridge University Press.
2. Stephen Lucas, "The Art of Public Speaking", 11th Edition, McGraw-Hill Higher Education.

REFERENCE BOOKS:

1. Dan O'Hair, Hannah Rubenstein and Rob Stewart**, "**A Pocket Guide to Public Speaking", 4th Edition, Bedford / St. Martin's Publisher.
2. Quentin J. Schultze, "An Essential Guide to Public Speaking: Serving Your Audience with Faith, Skill, and Virtue", 1st Edition, Baker Publishing Group.

SUGGESTED WEB SITES:

1. http://www.myspeechclass.com/fresh-public-speech-topics-ideas.html.
2. https://englishclassminds.wordpress.com/public-speaking-tips-speech-topics.
3. http://www.ljlseminars.com/monthtip.htm.

(HS105) ENGINEERING ETHICS

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	2	-	-	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Instill the moral values that ought to guide their profession.
2. Resolve the moral issues in the profession.
3. Infer moral judgment concerning the profession.
4. Correlate the concepts in addressing the ethical dilemmas.
5. Judge a global issue by presenting an optimum solution.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Distinguish between ethical and non ethical situations.
2. Practice moral judgment in conditions of dilemma.
3. Relate the code of ethics to social experimentation.
4. Develop concepts based on moral issues and enquiry.
5. Resolve moral responsibilities in complications.
6. Defend one's views in supporting the moral concerns.
7. Apply risk and safety measures in various engineering fields.
8. Develop cognitive skills in solving social problems.

UNIT – I

Introduction : Scope, Human Values: Morals, Values and Ethics – Integrity – Work Ethic-Honesty – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Courage -Empathy – Self-Confidence – Character – Spirituality, Engineering as social experimentation – Responsibilities to engineers - Code of ethics for engineers.

UNIT – II

Engineering Ethics, Moral Reasoning and Ethical Theories : Engineering Ethics - variety of moral issues – Deontology, Consequentialism, Utilitarian, Virtue Theory- Kohlberg's Theory - Gilligan's Theory - Consensus and Controversy – Models of Professional Roles - uses of ethical theories. Valuing Time – Co-operation – Commitment-Case study about above theories.

UNIT – III

The Engineer's Responsibility for Safety: Safety and Risk –Road, Rail, Electric, fire – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Case Studies on recent issues related to safety.

UNIT – IV

Responsibility to Employer's and Rights of Engineer's: Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupation Crime, Rights of Engineer's - Professional Rights – Employee Rights – Whistle blowing, Intellectual Property Rights (IPR) – Plagiarism.

UNIT – V

Global Issues and Responsibility as Engineer : Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Weapons Development, Role of Engineer as Manager – Expert Witnesses and Advisors - Case Studies .

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York, 2005. (Reprint 2013)
2. Ibo Van de Poel and Lamber Royakkers “Ethics, Technology, and Engineering - An Introduction”, John wiley publication, 2011.

REFERENCE BOOKS:

1. Edmund G. Seebauer and Robert L. Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2014.
2. Caraline whitbeck, “Ethics in Engineering practice and Research”, Cambridge University Press, 2012.

(ES113) MECHATRONICS

(Common to ECE, EEE, CSE and ME)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Define mechatronics and discuss basic building elements and network
2. Analyze various sensors, mechanisms and their applications to engineering
3. Discuss Microcontroller fundamentals and Arduino controller
4. Explain interfacing of devices with controllers.
5. Summarize signal conditioning circuits and Electrical actuating systems

COURSE OUTCOMES:

At the end of the course, students will be develop an ability to

1. Analyze electrical and mechanical systems and their interconnection
2. Develop the signal conditioning circuits
3. Discuss importance of mechanical, and electronics in the design of mechatronics system
4. Develop a mechatronic system for a set of specifications
5. Proficient in the programming of microcontrollers
6. Design circuits for interfacing various components used for power control
7. Construct a electrical actuating systems.
8. Differentiate AC and DC motor

UNIT – I

Introduction

Microcontroller fundamentals, Introduction to Arduino controller, Schematic & pin map, Procedural and embedded programming, Bit manipulation

UNIT – II

Sensors :

Characteristics of Sensors – Static and Dynamic, Classification – Analog Sensors: Displacement Force, Temperature, Strain Gauge, Digital Sensors : Proximity, Photo Sensors, LED’s.

UNIT – III

Actuators:

Mechanical Drives – Gears, Belt and Chain Drives, Bearings

Electrical Actuation systems

Relays, Solid State Switches – Diodes, Transistors, MOSFET, Thyristors and Triacs; Solenoids, fundaments of DC and AC Motors, Stepper motor.

UNIT – IV

Signal Processing and Conditioning

Rectifiers, Filters, Regulators, Amplifying signals using OP Amps, Comparator, fundamentals of ADC and DAC.

UNIT - V

Power and Speed Control

Power Control of DC and AC Motors using SCR, Triac, Speed Control of DC Motor using PWM technique, Stepper Motor control.

TEXT BOOKS:

1. Clarence W.de Silva " Sensors and Actuators" CRC Press, 2016.
2. W. Bolton, "Mechatronics: Electronic control system in Mechanical and Electrical Engineering," Pearson Education Asia.

REFERENCE BOOKS:

1. D. Patranabi, "Sensors and Transducers", PHI Learning pvt Ltd, 2003.
2. Muhammad H. Rashid , "Power Electronics Hand Book", Academic Press, 2011
3. Ramakanth A. Gayakwad, "Operational amplifiers and linear Intermitted Circuits", (PHI) 1987.
4. Mario Bohmer, "Beginning Android ADK with Arduino", A press (2012).
5. D.G. Alciatore and M.B. Histand, "Introduction to Mechatronics and Measurement System", Tata McGraw Hill. 4th ed. 2012.

(EC107) LINEAR IC APPLICATIONS

(Common to ECE and EEE)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	3	-	-	3	30	70	100

COURSE OBJECTIVES :

Students will be able to

1. Discuss ideal and practical characteristics of OP-AMP.
2. Analyze Linear and Non linear applications of OP-AMP.
3. Design OP-AMP circuits such as Filters, Oscillators.
4. Describe functional diagram of IC 555 Timer, IC 723 Regulator, IC 565 PLL and IC 566 VCO and applications.
5. Explain the operation of various ADC and DAC circuits and their specifications.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Discuss practical Characteristics OP-AMP.
2. Design arithmetic circuits using IC 741 OP-AMP such as adder, subtractor, multiplier.
3. Design wave shaping circuits such as integrator, differentiator using IC 741 OP-AMP. using IC 741 Op-Amp
4. Design filters, multi-vibrators, oscillators using 741 OP-AMP
5. Explain the functional diagram of 555 timer and its applications.
6. Develop applications of PLL, VCO.
7. Design low and high voltage regulator using IC 723
8. Differentiate various ADC and DAC circuits.

UNIT – I

Introduction: Integrated Circuits: Classification, Chip Size and Circuit Complexity, OP-Amp symbol, terminals, packages and specifications, block diagram of OP-Amp, Ideal and Practical Op-Amp, CMRR, Open Loop and Closed loop configurations, DC and AC Characteristics of OP-Amp, 741 Op-Amp and its Features, Slew rate, PSRR, Frequency Compensation Techniques- pole zero, dominant compensation.

UNIT – II

Linear applications of Op-Amp: Introduction, Inverting and Non Inverting amplifiers, Difference amplifier, voltage follower, sign changer, scale changer, summing, averaging amplifiers, adder-sub tractor, Integrator and Differentiator, Instrumentation amplifier, V to I and I to V Converters.

Non Linear Applications of Op-Amp: Sample & Hold Circuits, Comparators, Schmitt Trigger , Multivibrators- Astable, Monostable - Log and Anti Log amplifiers, Precision rectifiers, Clippers and Clampers.

UNIT – III

Active filters & Waveform generators: Introduction, comparison between passive and active filters, First Order and Second Order Active Low Pass, High Pass and Band Pass Filters- narrow band, wide band, Band Reject- narrow band and wide band and all pass

filters. waveform generators- Principle of operation and types of Oscillators- RC, Wien Bridge Triangular and Square wave Generators

UNIT- IV

Regulators: Basics of Voltage Regulators, series OP-Amp regulator - 723 general purpose regulator.

Timers and Phase Locked Loops: Introduction to 555 timer, functional diagram, Monostable and Astable operations and its applications, Schmitt trigger, PLL: operation of basic PLL, description of Individual blocks of 565, 566 VCO

UNIT – V

D-A and A-D converters: Introduction, Basic DAC Techniques – Weighted Resistor type, R-2R Ladder type, Inverted R-2R Type. Different types of ADCs-Parallel Comparator Type, Counter Type, Successive Approximation Register Type and Dual Slope Type. DAC and ADC Specifications.

TEXT BOOKS:

1. D. Roy Chowdhury, "Linear Integrated Circuits", 3rd Edition, New Age International (p) Ltd, 2008.
2. Floyd and Jain, "Digital Fundamentals", 8th Edition, Pearson Education, 2005.

REFERENCE BOOKS:

1. Ramakanth A. Gayakwad, "Op-Amp & Linear ICs", 4th Edition, PHI, 2015.
2. William D. Stanley, "Operational Amplifiers with linear Integrated Circuits", 4th Edition, Pearson Education India, 2009.
3. James M. Fiore, Cengage/ Jaico, "Op-Amps and Linear Integrated Circuits – Concepts and Application", 2nd Edition, Cengage Learning India Pvt Ltd, 2012.

(EE103) ELECTRICAL CIRCUITS - II

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Differentiate single phase and three phase systems.
2. Draw transient response for DC and AC excitation.
3. Calculate different network parameters.
4. Analyze system stability using pole zero plot.
5. Design filters based on desired parameters.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Differentiate balanced and unbalanced three phase systems.
2. Calculate active and reactive power for three phase systems.
3. Differentiate study state and transient response.
4. Draw current and voltage response curve for DC and AC exacted systems
5. Identify series, parallel, cascade Network properties.
6. summarize symmetry and reciprocity conditions for two port network
7. Develop Transfer function for circuit using pole zero plot.
8. Apply Fourier series for different signals.

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 3 phase circuits – Calculation and measurement of active and reactive power.

UNIT-II

DC and AC Transient Analysis: Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for DC excitation - Initial conditions - Solution method using differential equation approach and Laplace transforms. Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for AC excitation - Initial conditions - Solution method using differential equation approach and Laplace transforms.

UNIT-III

Network Parameters: Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations– Cascade networks - concept of transformed network – 2-port network parameters using transformed variables.

UNIT- IV

Network Functions: The concept of complex frequency, Physical Interpretation of Complex Frequency, Transform Impedance and Transform Circuits, Series and Parallel Combination of elements, Terminal pairs or ports, Network functions for the one-port and Two port, Poles and zeros of network functions, Significance of poles and zeros, Properties of driving point

functions, properties of transfer functions, Necessary conditions for driving point functions, Necessary conditions for transfer functions, Time domain response from pole-zero plot.

UNIT- V

Filters and Fourier Analysis of AC Circuits: Low pass, High pass, Band pass, Band elimination. Fourier series, consideration of symmetry, exponential form of Fourier series, line spectra and phase angle spectra, Fourier integrals and Fourier transforms, properties of Fourier transforms.

TEXT BOOKS:

1. Vanvalkenburg, "Network Analysis", 3rd ed., PHI publication, 2006.
2. William Hayt and Jack E. Kimmerly, "Engineering Circuit Analysis", 6th ed., Mc Graw Hill Company, 2012.

REFERENCE BOOKS:

1. David A. Bell, "Electric Circuits", 7th ed., Oxford University Press, 2009.
2. A. Chakrabarthy, "Electrical Circuits", 1st ed., Dhanpat Rai & Sons, 1999.
3. A. Sudhakar and Shyammohan S. Palli, "Circuits & Networks", 1st ed., 2002.
4. Joseph Edminister, and Mahmood Nahvi, "Electric Circuit Theory", 6th ed., Schaum's Outline Series, 2014.

(EE104) POWER SYSTEMS - I

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Outline the history of various power plants
2. Distinguish between ac and dc distribution system
3. Compare between GIS and AIS concepts
4. Demonstrate the methods of improving power factor
5. Explain different load curves and tariff methods

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Reproduce the history of various power plants
2. Describe about DC and Ac distribution systems
3. Apply the knowledge of ac and dc distribution systems for solving the problems
4. Compare the GIS and AIS
5. Develop the concept of layout of various substations
6. Evaluate the causes of low power factor
7. Explain different methods of voltage control
8. Summarize different load curves and tariff methods

UNIT-I

Thermal, Hydro, Nuclear and Gas Power Stations: Line 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. Lay-out of hydropower stations (HPS), types of hydropower stations, Types of turbines in hydropower stations and brief description of various components of hydropower stations. Nuclear Power Stations: 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. Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only)

UNIT-II

D.C. and A.C. Distribution Systems: General Aspects Of Distribution Systems, Classification of Distribution Systems - Comparison of DC Vs AC and Under-Ground Vs Over - Head Distribution Systems- Requirements and Design features of Distribution Systems-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

UNIT-III

Substations and Gas Insulated Substations (GIS): Classification of substations: Air insulated substations - Indoor and Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams. Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT-IV

Power Factor and Voltage Control: Causes of low p.f -Methods of Improving p.f -Phase advancing and generation of reactive KVAR using static Capacitors-Most economical p.f. for constant KW load and constant KVA type loads, Numerical Problems. Dependency of Voltage on Reactive Power flow.- Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers.

UNIT-V

Economic Aspects of Power Generation and Tariff Methods: 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. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods and Numerical Problems

TEXT BOOKS:

1. M.L. Soni, P.V. Gupta, U.S. Bhatnagar and A. Chakraborti, **"**A Text Book on Power System Engineering", 1st ed., Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. C.L.Wadhawa, "Electrical Power Systems", 7th Revised Ed., New age International (P) Limited, 2001.

REFERENCE BOOKS:

1. M.V. Deshpande, "Elements of Power Station Design and Practice", 1st Ed., Wheeler Publishing, 2001.
2. S.N.Singh, "Electrical Power Generation, Transmission and Distribution", 2nd Ed., PHI, 2003.
3. P.P. Wals, P. Fletcher, "Gas Turbine Performance", 2nd Ed., Blackwell Publisher, 2004.
4. V.K. Mehta and Rohit Mehta, "Principles of Power Systems"**,** S. Chand & Company Ltd., New Delhi, 2004.

(EE105) DC MACHINES AND TRANSFORMERS

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	3	1	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Draw the magnetization characteristic of a DC Shunt generator
2. Discuss different speed control methods of DC motors
3. predict the efficiency of dc machines
4. classify the transformers based on its construction
5. Evaluate the efficiency and regulation of transformers

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Identify the different features of DC machines.
2. Analyze the different types of DC Generators & DC Motors.
3. Calculate the efficiency of different types of DC Machines
4. Compare the characteristics of different types of DC Machines
5. Evaluate OC and SC tests on transformers
6. Estimate the regulation of transformers
7. Draw the phasor diagrams of transformer at different load conditions
8. Explain the operation of parallel operation of transformers

UNIT – I

DC Generators: DC Generators – Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – use of laminated armature – E.M.F Equation – Problems. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation.

Methods of Excitation – separately excited and self excited generators – build-up of E.M.F - critical field resistance and critical speed. Load characteristics of shunt, series and compound generators – parallel operation of DC series generators.

UNIT – II

DC Motors: DC Motors – Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors –Speed control of DC Motors: Armature voltage and field flux control methods. Ward- Leonard system. Principle of 3 -point and 4- point starters.

UNIT – III

Testing of D.C. Machines: Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency. Methods of Testing – direct, indirect and regenerative testing – brake test – Swinburne's test – Hopkinson's test, Problems.

UNIT – IV

Single Phase Transformers: Single phase transformers-types - constructional details-minimization of hysteresis and eddy current losses-EMF equation - operation on no load and

on load - phasor diagrams. Equivalent circuit - losses and efficiency-regulation. All day efficiency – separation of losses.

UNIT – V

Testing of Single Phase Transformer, Autotransformer and Polyphase 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. Polyphase transformers - Polyphase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Third harmonics in phase voltages-three winding transformers-tertiary windings-determination of Zp, Zs and Zt transients in switching - off load and on load tap changing; Scott connection.

TEXT BOOKS:

1. P. S. Bimbra, "Electrical Machines", Khanna Publishers, 6th Ed., 2003.
2. Clayton & Hancock, "Performance and Design of D.C Machines", 2nd Ed., BPB Publishers, 2004.

REFERENCE BOOKS:

1. I.J. Nagrath & D.P. Kothari, "Electric Machines", 4th Ed., Tata McGraw Hill Publishers, 2011.
2. A. E. Fritzgerald, C. Kingsley and S. Umans, "Electric Machinary", 6th ed., McGraw-Hill Companies, 2003.
3. S. Kamakshaiah, "Electromechanics – I (D.C. Machines)", 2nd Ed., Hi-Tech Publishers, 2012.
4. S.K. Bhattacharya, "Electrical Machines", TMH, 6th Ed., 2014.

(ES114) MECHATRONICS LAB

(Common to ECE, EEE, CSE and ME)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Study the Arduino and its Importance to Engineering
2. Study applications such as Interfacing RC components, DC and AC motor Control using Arduino
3. Study and Develop the Load Measurement of Strain Gage, Conveyer belt and Mechatronic System
4. Construct various circuits using OP Amp
5. Choose various methods of Stepper Motor Control using Arduino

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Demonstrate the importance of Arduino
2. Assess the controlling of Output & Input base circuits using Arduino
3. Develop an RC circuit and Interface with Arduino
4. Interpret the Bidirectional control of DC motor using Arduino
5. Examine the control of DC and AC Motors using Arduino
6. Develop a circuit with Stepper Motor drive using Arduino
7. Build various circuits using OP Amps an Interface with Arduino
8. Construct circuits for Load Measurement, Speed Control using Conveyer belt using Arduino and build a Mechatronic system

LIST OF EXPERIMENTS:

Any 10 experiments are to be performed.

1. Study of Arduino
2. Controlling output LEDs based on inputs (toggle switches) and light-controlled switch using Arduino.
3. Design and build circuits using RC components Interfacing them to Arduino.
4. Bi-directional control of DC motor using Arduino
5. Speed control of DC motor using Arduino
6. Position control of DC motor using PWM technique.
7. Speed control of Servo motor using Arduino.
8. Control of Unipolar, Bipolar, and Full-Step stepper motor drive using Arduino.
9. Study and calibration of load measurement using strain gauge.
10. Configure and test different types of Operational Amplifiers and Interface with Arduino.
11. Build a small conveyer belt with adjustable speed control.
12. Design a complete Mechatronic system incorporating sensors, Signal Conditioning, Amplification, Actuation and Drives.

(EE106) ELECTRICAL CIRCUITS AND SIMULATION LAB

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. To learn some of the frequently used instruments and equipment like digital multimeter and Regulated Power Supply.
2. To demonstrate various theorems using simulation and Hardware setup.
3. To familiarize the student in introducing and exploring software.
4. To measure inductance and coefficient of coupling of a mutually coupled coil.
5. To calculate network parameters using various theorems.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Conduct basic laboratory experiments involving electrical circuits using laboratory test equipment such as multi meters, power supplies, signal generators and oscilloscopes.
2. Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner.
3. Explain the concepts of Thevenin equivalent circuits and superposition theorem and apply them to laboratory measurements.
4. Predict and measure the transient and sinusoidal steady state responses of simple RC and RL circuits.
5. Relate physical observations and measurements involving electrical circuits to theoretical principles.
6. Evaluate the accuracy of physical measurements and the potential sources of error in the measurements.
7. Design winding of coupled coils for low leakage inductance.
8. Design electrical systems using programming techniques and tools.

LIST OF EXPERIMENTS:

Any 10 experiments are to be performed.

1. Verification of Thevenin's and Norton's Theorem.
2. Verification of Maximum Power Transfer Theorem.
3. Verification of Superposition Theorem and Reciprocity Theorem.
4. Verification of Compensation Theorem and Milliman's Theorem.
5. Locus Diagram of RL and RC Series Circuits.
6. Series and Parallel Resonance
7. Determination of self, mutual inductances and co-efficient of coupling.
8. Determination of 'Z' and 'Y' parameters.
9. Determination of Transmission and hybrid parameters.
10. Determination of Attenuation factor for Low pass and High pass Filters.
11. Simulation of Three- Phase circuits
12. Simulation of DC circuits using
    a)Mesh Analysis.
    b) Nodal Analysis

13. DC Transient Response.

(MC102) GENDER SENSITIZATION

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
II	II	-	-	2	-	-	-	-

COURSE OBJECTIVES:

Students will be able to

1. Act sensibility to issues of gender in contemporary India.
2. Develop a critical perspective on the socialization of men and women.
3. Emphasize about biological aspects of genders.
4. Judge and reflect on gender violence.
5. Expose themselves to more egalitarian interactions between men and women.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Developed a better understanding of issues related to gender in contemporary India.
2. Sensitize to multi dimensionalities like biological, social, psychological and legal aspects of gender.
3. Attain an insight of gender discrimination in society.
4. Acquire insight into the gendered division of labour and its relation to politics and economics.
5. Ensure and equip themselves for professional equivalence.
6. Respond to gender violence and empower themselves with moral values.
7. Expose themselves to debates on the politics and economics of work.
8. Equip themselves with morality and ethics.

UNIT- I

UNDERSTANDING GENDER

Gender: Why should we study it? (Towards a World of Equals: Unit – 1)

Socialization: Making Women, Making Men (Towards a World of Equals: Unit – 2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

Just Relationships: Being Together as Equals (Towards a World of Equals: Unit – 12)
Mary Kom and Onler. Love and Acid just do not Mix. Love letters. Mothers and Fathers. Further Reading: Rosa
Parks. The Brave Heart.

UNIT- II

GENDER BIOLOGY

Missing Women: Sex selection and its consequences (Towards a World of Equals: Unit – 4)
Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit – 10)
Two or Many? Struggles with Discrimination.

Additional Reading: Our Bodies, Our Health (Towards a World of Equals: Unit – 13)

UNIT –III
GENDER OF LABOUR
House Work: the Invisible Labour (Towards a World of Equals: Unit – 3)
"My Mother doesn't work." Share the Load."

Women's Work: Its Politics and Economics (Towards a World of Equals: Unit – 7)
Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

UNIT –IV
ISSUES OF VIOLENCE
Sexual Harassment: Say No! (Towards a World of Equals: Unit – 6)
Sexual Harassment, not Eve-teasing – Coping with Everyday Harassment –Further Reading, "Chupulu".

Domestic Violence: Speaking out (Towards a World of Equals: Unit – 8)
Is Home a Safe Place? When Women unite (Film). Rebuilding Lives. Further Reading New Forums for Justice.
Thinking about Sexual Violence (Towards a World of Equals: Unit – 11)
Blaming the Victim-"I Fought for my Life…" – Further Reading; The Caste Face of Violence.

UNIT –V
GENDER STUDIES
Knowledge: Through the lens of Gender (Towards a World of Equals: Unit-5)

TEXT BOOKS:
1. Sumeetha, Uma Bhrugubanda, Duggitala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, "Towards a World of Equals: A Bilingual Textbook on Gender".
2. Jayaprabha, A, "Chupulu (Stares)". Women Writing in India: 600BC to the Present. Volume it. The 20th Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.

REFERENCE BOOKS:
1. Sen, Amartya, "More than One Million Women are Missing", New York review of Books 37.20(20th December 1990). Print. 'We Were Making History….' Life stories of Women in the Telangana People's struggle. New Delhi: Kali for Women, 1989.
2. K. Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing Form South India, Dossier 2: Telugu And Kannada. http://harpercollins.co.in/BookDetail.asp?Book_Code=3732

(HS106) TECHNICAL WRITING

(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	I	2	-	-	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recall basics of communication and correspondence methods.
2. Paraphrase the technical writing process.
3. Distinguish and the various types of correspondence techniques.
4. Prioritize the importance of various presentation techniques.
5. Construct professional documents as per the requirement of forthcoming technology.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Recognize the importance of professional documents.
2. Paraphrase an idea and construct a standard document.
3. Distinguish the various structures of drafting professional documents.
4. Develop techniques of drafting various documents as per the needs of industry.
5. Construct the documents according to the industrial needs.
6. Evaluate the significance of inter personal and intrapersonal communication.
7. Design various reports as per the requirement.
8. Design professional documents according to the situation.

UNIT- I

Introduction to Communication and Correspondence

Basics of Communication-Types-Barriers to communication
Overview of Technical Writing Process-Stages of Technical Writing
Effective Writing-Paraphrasing-Note Making-Note Taking

UNIT- II

Drafting Professional Documents-I

Basics of Professional Documents
Office Correspondence-Letters-Types & Styles Drafting Official & Business Letters

UNIT -III

Drafting Professional Documents-II

Drafting Notice-Circular-Agenda-Minutes of Meeting-Memo-Emails-Proposals
Building Resume-Contrast between Resume and Curriculum Vitae

UNIT –IV

Report writing & Research Papers

Types-Drafting Technical Reports-Business Reports-Project Reports
Overview of Research Papers-Dissertations-Drafting Techniques

UNIT –V

Business Presentation & Interpersonal Communication

Defining situation-Designing Presentation-Opening and closing thoughts
Use of Visual Aids

Introduction and Importance of Techniques in Interpersonal Communication
Communication techniques in Professional life
Public Speaking Techniques

TEXT BOOKS:

1. Gerald J. Alred (Author), "The Business Writer's Companion", Seventh Edition, Bedford/ St. Martin's, 2005.
2. Philip C. Kolin, "Successful Writing at Work", Concise Edition (Paperback), University of Southern Mississippi, Cengage learning.
3. M. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw Hill Education Pvt. Ltd. New Delhi.
4. RC Sharma Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill Education Pvt. Ltd. New Delhi.

(EC106) DIGITAL ELECTRONICS
(Common to EEE and ECE)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:
Students will be able to
1. Define Number Systems, Binary arithmetic & codes.
2. Solve logical expressions using K-Map and Quine-McCluckey method.
3. Design and analyse Combinational Circuits
4. Design and analyse Sequential Circuits.
5. Introduce the concept of Programmable Logic Devices.

COURSE OUTCOMES:
At the end of the course, students will develop an ability to
1. Explain the fundamentals of number system, binary arithmetic and codes.
2. Apply the Boolean laws to reduce the Boolean function and realize using Basic Gates.
3. Apply K-Map and Quine Mc Clusky Method for simplification of Boolean function and realize using Basic gates.
4. Analyze the combinational logic circuits and realize them.
5. Discuss the basic of flip flops and realize one flip-flop to another flip-flop.
6. Analyze the Asynchronous Sequential circuits and design them.
7. Analyze clocked Sequential circuits and realize them.
8. Describe the operation of PLD's and implement combinational logic using PLD's.

UNIT – I
Number Systems and Codes: Review of Binary, Octal and Hexadecimal Number Systems – Conversion methods- complements- signed and unsigned Binary numbers. Binary codes: Weighted and non Weighted codes – ASCII – Error detecting and Error correcting codes- hamming codes.

UNIT – II
Boolean Algebra, Switching Functions And Minimization of Switching Functions :
Boolean postulates and laws –De-Morgan's Theorem- Boolean function- Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)-Canonical forms – Karnaugh map Minimization – Don't care conditions – Quine Mc'Clusky method of minimization, simplification rules.
LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR, Implementations of Logic Functions using basic gates, NAND –NOR implementations.

UNIT – III
Combinational Logic Design:
Definition, Design procedure – Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor- Carry look ahead adder, BCD adder- Magnitude Comparator- Multiplexer/ Demultiplexer- encoder / decoder – parity checker – code converters: Binary to Gray, Gray to Binary , BCD to excess 3 code. Implementation of combinational logic using MUX, Decoder.

UNIT – IV

Sequential Circuits:

Definition, Flip-Flops- SR Flip flop, JK Flip flop, T Flip flop, D Flip flop and Master slave Flip flops – Characteristic table and equation – Application table– Edge triggering –Level Triggering –Realization of one flip flop using other flip flops –Asynchronous / Ripple counters – Synchronous counters – Modulo – n counter – Classification of sequential circuits –Analysis of clocked sequential circuits: State equation- State table- State diagram – State reduction and State assignment- Register – shift registers- Universal shift register – Shift counters.

UNIT – V

Programmable Logic Devices: Basic PLD's –ROM, PROM, PLA, PAL. Realization of Switching function using PLD's – Introduction to FPGA, CPLD.

TEXT BOOKS:

1. M. Moris Mano, Michael D. Ciletti, "Digital Design", 5th Edition, Pearson Education, New Delhi, 2012.
2. Zvi. Kohavi, "Switching and Finite Automata Theory", Tata McGraw-Hill, New Delhi ISBN: 0070993874.

REFERENCE BOOKS:

1. Anand Kumar, "Fundamentals of Digital Circuits", 3rd Edition, Prentice Hall, 2014.
2. John F. Wakerly, "Digital Design: principles and practices", 4th Edition, Pearson Education, 2008.
3. R.P. Jain, "Modern Digital Electronics", Prentice Hall of India, New Delhi, ISBN 9780132543033.

(EE107) POWER SYSTEMS - II

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	I	3	1	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Define a transmission line
2. List out the types of transmission lines
3. Explain about various types of performance parameters of transmission lines
4. Classify the various overhead transmission line insulators.
5. Illustrate the types of cables.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Identify the types of transmission lines.
2. Calculate the performance parameters of transmission lines.
3. Calculate the transmission parameters of transmission lines.
4. Compare the overhead transmission system and underground transmission system.
5. Categorize the cables
6. Calculate sag and tension of transmission lines.
7. Apply the sag templates to determine sag and tension of transmission lines.
8. Analyze the various types of cables.

UNIT-I

Transmission Line Parameters: Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems.

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical 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 for symmetrical & Asymmetrical Networks, Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems. Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Incident, Reflected and

Refracted Waves -Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent Pie network models (numerical problems).

UNIT-III

Power System Transients: Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

UNIT – IV

Overhead Line Insulators, Sag and Tension Calculations: Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding. Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

UNIT-V

Factors Governing The Performance of Transmission Lines and Underground Cables: Skin and Proximity effects - Description and effect on Resistance of Solid Conductors. Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Shunt Compensation. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems. Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.

TEXT BOOKS:

1. John J Grainger, William D Stevenson, "Power system Analysis", 4th ed., TMC Companies, 2008.
2. C.L. Wadhwa, "Electrical power systems", 6th ed., New Age International (P) Limited, Publishers, 2009, ISBN: 81-224-0613-0.

REFERENCE BOOKS:

1. M.L. Soni, P.V. Gupta, U.S. Bhatnagar and A. Chakraborti, **"**A Text Book on Power System Engineering", 1st ed., Dhanpat Rai & Co. Pvt. Ltd., 1999, ISBN:0070647917.
2. Hadi Saadat, "Power System Analysis", 2nd ed., TMH Edition, 2002.
3. I.J. Nagaraj and D.P. Kothari, "Modern Power System Analysis", Tata McGraw Hill, 5th Edition, 2011, ISBN: 978-0-07-049489-3
4. B.R. Gupta, "Power System Analysis and Design", 6th ed., Wheeler Publishing, 2009, ISBN: 9788121922388.

(EE108) INDUCTION MOTORS AND SYNCHRONOUS MACHINES

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	I	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. List out various parts of the induction motor and synchronous machines
2. Sketch the characteristics of an induction motor
3. Examine the speed control methods of induction motor
4. Evaluate the regulation of synchronous generator
5. Assess the load sharing of generators by parallel operation

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Draw the equivalent circuit of an induction motor
2. Summarize the advantages of induction motors
3. Calculate the efficiency of an induction motor
4. Judge the performance of an induction motor
5. Compare the regulation of synchronous generators by different methods
6. Sketch the phasor diagram of a synchronous motor
7. Classify synchronous machines based on construction
8. Assess the effect of variation of current and pf with excitation

UNIT-I

Poly-phase Induction Motors: Poly-phase induction motors-constructional 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. Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation expressions for maximum torque and starting torque - torque slip characteristic - double cage and deep bar rotors - equivalent circuit - phasor diagram - crawling and cogging.

UNIT-II

Circle Diagram of Induction Motors and Speed Control Methods: Circle diagram-no load and blocked rotor tests-predetermination of performance-methods of starting and starting current and torque calculations. Speed control-change of frequency; change of poles and methods of consequent poles; cascade connection. Injection of an emf into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

UNIT-III

Single Phase Motors and Special Motors: Single phase Motors: Single phase induction motor – Constructional features-Double field revolving theory – Elementary idea of cross-field theory – split-phase motors – shaded pole motor. Principle & performance of A.C. Series motor- Universal motor – Principle of permanent magnet and reluctance motors.

UNIT – IV

Construction, Principle of Operation and Regulation of Synchronous Generator: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings –

distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics. Regulation of Synchronous Generator: Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of Xd and Xq (Slip test) Phasor diagrams – Regulation of salient pole alternators.

UNIT – V

Parallel Operation of Synchronous Generator: Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input.

Synchronous Motors – Principle of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed. Hunting and its suppression – Methods of starting – synchronous induction motor.

TEXT BOOKS:

1. A. E. Fritzgerald, C. Kingsley and S. Umans, “Electric Machinary”, 6th ed., McGraw-Hill Companies, 2003, ISBN: 9780073660097.
2. P. S. Bimbra, “Electrical Machines”, 6th ed., Khanna Publishers, 2003, ISBN: 8174091734, 9788174091734.

REFERENCE BOOKS:

1. Langsdorf, “Theory of Alternating Current Machinery”, 2nd ed., Tata McGraw-Hill Companies, 1999.
2. I.J. Nagrath & D.P. Kothari, “Electric Machines”, 3rd ed., Tata McGraw Hill Publishers, 2004.
3. S. Kamakshaiah, “Electromechanics – II (transformers and induction motors)”, 3rd ed., Hi-Tech Publishers, 2004.
4. M.G. Say “Performance and Design of AC Machines”, 2nd ed., BPB Publishers, 2005.

(EE109) CONTROL SYSTEMS

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Apply various mathematical principles (from calculus and linear algebra) to solve control system problems.
2. Obtain mathematical models and derive transfer functions for mechanical, electrical and electromechanical systems.
3. Perform system's time and frequency-domain analysis with response to test inputs for a given system.
4. Design controllers and compensators for the suitable applications.
5. Analyze the system's stability using state space model

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Develop concepts and compare different types of control systems
2. Derive the transfer functions of AC and DC servo meters.
3. Draw the root locus plots and analyze the effect of adding zeros and poles
4. Perform the frequency response analysis and derive the specifications of control systems with transfer function.
5. Perform stability analysis in time and frequency domains
6. Design PID controllers and Lag-Lead compensators
7. Solve the time invariant state equations using State space approach
8. Calculate state variables and obtain controllability and observability of system

UNIT – I

Introduction and Transfer Function Representation: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems. Transfer Function of DC Servo motor - AC Servo motor- Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT II

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems (P, PI, PID controllers).

UNIT-III

Stability Analysis in S-Domain and Frequency Domain: The concept of stability – Routh's stability criterion –qualitative stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.
Introduction to frequency domain analysis, Frequency domain specifications-Bode diagrams-Determination of frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Plots.

UNIT – IV
Classical Control Design Techniques: Compensation techniques – Lag, Lead, Lead-Lag Controllers design with bode plot.

UNIT – V
State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

TEXT BOOKS:
1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", 5th ed., New Age International (P) Limited, Publishers, 2009,
2. Katsuhiko Ogata, "Modern Control Engineering", 3rd ed., Prentice Hall of India Pvt. Ltd., 1998.

REFERENCE BOOKS:
1. Norman S Nise, "Control Systems Engg.", 4th ed., John wiley Publishers, 2007.
2. B. C. Kuo, "Automatic Control Systems", 9th edition, John wiley and son's, 2014.
3. Narciso F. Macia George J. Thaler, "Modelling & Control of Dynamic Systems", Thomson Publishers.
4. N.K.Sinha, "Control Systems", 3rd ed., New Age International (P) Limited Publishers, 1998, ISBN: 81-224-1168-1.

(EE115) DC MACHINES AND TRANSFORMERS LAB

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	I	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Draw the magnetization characteristics of a DC shunt generator
2. Calculate the efficiency of a DC machine
3. Analyze the losses present in a DC machine
4. Evaluate the losses of a transformer
5. Estimate the efficiency of a transformer

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Select the suitable DC machine for a specific application
2. Summarize the various losses present in a DC machine
3. Sketch the characteristics of DC machines
4. Compare different speed control methods of DC motors
5. Test the performance of a transformer
6. Estimate the efficiency of a transformer
7. Classify the transformers based on construction
8. Categorize various losses of a transformer

LIST OF EXPERIMENTS:

Any 10 experiments are to be performed:

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Swinburne's test on constant flux machines. Predetermination of efficiency.
3. Speed control of DC shunt motor.
4. Load test on DC shunt generator. Determination of characteristics.
5. Load test on DC series generator. Determination of characteristics.
6. Brake test on DC shunt motor. Determination of performance curves.
7. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
8. O.C. & S.C. Tests on Single phase Transformer
9. Sumpner's test on a pair of single phase transformers
10. Scott connection of transformers
11. Parallel operation of Single phase Transformers

(EE116) CONTROL SYSTEMS AND SIMULATION LAB

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	I	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recognize the time response of second order system.
2. Draw the time response of second order system.
3. Calculate the error of a given system.
4. Obtain the transfer function of a given system.
5. Compare the characteristics of various systems.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Identify the time response of second order system.
2. Calculate the time response of second order system.
3. Identify the suitable controller of a given system.
4. Estimate the system response.
5. Execute the given truth table.
6. Analyze the stability of a given system.
7. Design a given second order system with a damping factor.
8. Estimate the compensation of a given system.

LIST OF EXPERIMENTS:

Any 10 of the following experiments are to be Performed:

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 motor
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation – Magnitude and phase plot
8. Transfer function of DC generator
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Linear system analysis (Time domain analysis, Error analysis).
13. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system
14. State space model for classical transfer function.

(EC151) MICROPROCESSORS AND INTERFACING

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to.

1. Outline the history of computing devices.
2. Describe the architecture of 8086 Microprocessors.
3. Develop Programs for Microprocessor and Microcontrollers
4. Compare Microprocessors and Microcontrollers
5. Understand 8051 Microcontroller concepts, architecture and Programming

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Define the History of Microprocessors
2. Describe the architectures of 8085 and 8086 Microprocessors.
3. Draw timing diagram
4. Write Programs using 8086 and 8051
5. Distinguish Between the different modules of operation of Microprocessors.
6. Interface peripherals to 8086 and 8051
7. Evaluate the appropriateness of a memory expansion interface based on the address reference with particular application.
8. Apply the above concepts to real world electrical and electronics problems and applications.

UNIT- I

Evaluation of Microprocessors, over view of 8085

8086 ARCHITECTURE: Functional Diagram, Register Organization, Addressing modes, Instructions, Functional schematic, Minimum and Maximum mode operations of 8086, 8086 Control signal interfacing, Timing Diagrams.

ASSEMBLY LANGUAGE PROGRAMMMING OF 8086: Assembly Directives, Macro's, Simple Programs using Assembler, Implementation of FOR Loop, WHILE, REPEAT and IF-THEN-ELSE Features.

UNIT-II

I/O and Memory INTERFACE: 8086 System bus structure, Memory and I/O Interfacing with 8086, 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing, need for DMA, 8057 DMA controller.

UNIT-III

Interrupts: Interrupts in 8086,Interrupt vector table, dedicated interrupts**,** Interfacing 8259 (Interrupt Priority Control).

COMMUNICATION INTERFACE: Serial Communication Standards, USART Interfacing RS-232, IEEE-488.

UNIT-IV

INTRODUCTION TO MICRO CONTROLLERS: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, Addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming of 8051

UNIT- V

INTERRUPT COMMUNICATION: Interrupts - Timer/Counter and Serial Communication, Programming Timer Interrupts, Programming External H/W interrupts, Programming the serial communication interrupts, Interrupt Priority in the 8051, Programming 8051 Timers, Counters and **Programming.**

TEXT BOOKS:

1. D.V. Hall, "Micro Processor and Interfacing ", Tata McGraw-Hill.
2. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education.

REFERENCE BOOKS:

1. Ray and BurChandi, "Advanced Micro Processors", Tata McGraw Hill.
2. Liu & Gibson, "Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design", 2nd edition.

(EE110) POWER ELECTRONICS

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	4	-	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Study the characteristics of SCR,MOSFET & IGBT
2. Control AC to DC voltage using converters
3. Determine design parameters of Chopper circuits
4. Analyze AC-AC Converters for speed control of Machines
5. Apply PWM techniques for Inverters

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Suggest appropriate switches for specific applications
2. Design protection circuits for SCR
3. Evaluate performance indices of converters
4. Operate ac-dc three phase converters
5. Design the chopper circuits
6. Perform step up/step down frequency operation using cyclo converters
7. Apply inverters for speed control of induction motors
8. Do the harmonic analysis of Inverters

UNIT – I

Power Semiconductor Devices & Commutation Circuits: 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 - Turn on and Turn off times -
Two transistor analogy – SCR - 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 and Three Phase Line Commutated Converters: Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode –Numerical problems.
Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load– Derivation of average load voltage and current – Line commutated Rectifiers - Active and Reactive power inputs to the converters without and with Freewheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numerical problems.
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 –Numerical Problems.

UNIT – III

AC Voltage Controllers & Cyclo Converters: 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 -Numerical problems - Cyclo converters – Single phase midpoint cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms

UNIT – IV

Choppers: Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression

Morgan's chopper – DC Jones chopper (Principle of operation only) Waveforms — AC Chopper – Problems.

UNIT – V

Inverters: Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter bridge inverter – Waveforms – Simple forced commutation circuits for bridge inverters – Mc Murray and Mc Murray Bedford inverters - Voltage control techniques for inverters Pulse width modulation techniques – Numerical problems.

TEXT BOOKS:

1. P.S Bimbra "Power Electronics" Khanna Pubishers
2. M. D. Singh, K. B. Kanchandhani, "Power Electronics", 2nd ed., Tata McGraw – Hill Publishing company, 2004, ISBN: 0-07-463369-4.

REFERENCE BOOKS:

1. M. H. Rashid, "Power Electronics: Circuits, Devices and Applications", 2nd ed., Prentice Hall of India, 1998, ISBN: 81-203-0869-7, 788120308695.
2. Vedam Subramanyam, "Power Electronics", 2nd ed., New Age International (P) Limited, Publishers, 2008, ISBN: 81-224-0878-8
3. P.C. Sen, "Power Electronics", 4th ed., Tata McGraw-Hill Publishing, 1999, ISBN: 0-07-462400-8.
4. V.R. Murthy, "Power Electronics", 1st ed., OXFORD University Press, 2005.

(EE111) POWER SYSTEM OPERATION AND CONTROL

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	4	1	-	4	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Draw the characteristics of thermal generators.
2. Develop mathematical model of a speed governing system.
3. Explain the necessity of constant frequency.
4. Analyze load frequency control and economic dispatch control.
5. Elaborate various sources of reactive power.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Mention the role of the characteristics of thermal generators in economic dispatch problem.
2. Calculate optimal loading of thermal generators to meet the power demand.
3. Draw the block diagram model of a speed governing system.
4. Analyze IEEE type –I excitation system.
5. Assess the change in frequency of the system for different load changes.
6. Distinguish controlled and uncontrolled cases of a two area system.
7. Design a compensation scheme for a transmission line.
8. Justify the need of reactive power control.

UNIT – I

Economic Operation of Power Systems and Hydrothermal Scheduling: 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.

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

UNIT – II

Modelling of Turbine, Generator and Automatic Controllers: Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam.

Modelling of Generator (Steady State and Transient Models): Description of Simplified Network Model of a Synchronous Machine (Classical Model).

Modelling of Governor: Mathematical Modelling of Speed Governing System – Derivation of small signal transfer function. Modelling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model.

UNIT – III

Single Area and Two-Area 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 two-area system – uncontrolled case and controlled case, tie-line bias control.

UNIT – IV

Load Frequency Controllers: 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: 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.

TEXT BOOKS:

1. I.J. Nagrath & D.P.Kothari "Modern Power System Analysis", Tata Mc. Graw – Hill Publishing Company Ltd, 2nd edition, ISBN: 978-0-07-049489-3.
2. Wood and Woollenberg, "Power System Operation and Control", 2nd ed., NewYork: John Wiley and Sons, 1996.

REFERENCE BOOKS:

1. C.L.Wadhwa, "Electrical Power Systems", Newage International-3rd Edition, 2005, ISBN: 81-224—613-0.
2. N V Ramana, "Power System Operation and Control", Pearson Education India Ltd, 2010.
3. Dr. K. Uma Rao, "Power System: Operation and Control", Willey India publications, 1st edition, 2012, ISBN: 9788126534418.
4. Chandrasekar reddy,g.r Power System: Operation and Control

(EC122) PLC AND ROBOTICS
(Common to ECE, EEE, CSE and ME)
(**Professional Elective-1**)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:
Students will be able to
1. Recall the factory automation
2. State programmable logic controls
3. Discuss PLC program
4. Explain about Robotic Programming
5. List the applications of robotics

COURSE OUTCOMES:
At the end of the course, students will develop an ability to
1. Explain programmable logic controls
2. Develop the PLC, interface with sensors
3. Illustrate various types of robots and their applications
4. Identify the importance of robot dynamics
5. Develop the robotic programming.
6. Identify the suitable sensor and actuator for a control system
7. Design complex robotics engineering projects
8. Select a suitable robot for a specific application

UNIT – I
Programmable Logic Controllers: Basic Structure, Input / Output Processing, Ladder Logic Programming (Examine If Closed, Examine If Open, Output Energize, Output Latch, Output Unlatch), Data Handling, Selection of a PLC, Interfacing sourcing and sinking sensors , Interfacing actuators

UNIT – II
Ladder Logic Programming for Real-World Applications: Timers (Timer On Delay, Timer Off Delay) and counters (Count Up, Count Down) with applications, Bit Shift with Applications (Bit shift left and right), Analog I/O, PID Servo Motor Control, Stepper Motor Control

UNIT – III
Introduction to Robotics: Robotics, Classification of Robots, Fundamentals about Robot Technology, Factors related to use Robot Performance, Robot programming – teaching positions, different types of move command, different types of pick and place tasks, stacking and palletizing using the robot, using I/O operations to interface PLC to Robot Controller

UNIT – IV
Machine Vision: Machine Vision System, Description, Sensing, Digitizing, Image Processing and Analysis and Application of Machine Vision System, Edge detection, shape, feature and color recognition

UNIT - V

Design of mechatronics systems: Steps in designing Mechatronics Systems. Integrating PLCs, Robotics and Vision Systems in factory automation.

TEXT BOOKS:

1 John J. Craig , "Introduction to Robotics", Pearson, 2009

2 Gary Anderson, "PLC Programming using RSLogix 500: Basic Concepts of Ladder Logic Programming", Create space independent publishing, 2015.

REFERENCE BOOKS:

1. Deb S. R. and DebS., "Robotics Technology and Flexible Automation", Tata McGraw Hill Education Pvt. Ltd, 2010.
2. Maxrabiee, "Programmable logic controllers", 3rd ed. Oxford university press 2013.
3. Fu K S, Gonzalez R C, Lee C.S.G, "Robotics : Control, Sensing, Vision and Intelligence", McGraw Hill, 1987.
4. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering–An Integrated Approach", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., 2006.

(EE112) SOLAR THERMAL PV SYSTEMS
(Professional Elective-1)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Explain the concepts of solar radiation.
2. Explain the measurement of solar radiation.
3. Discuss the PV power generation.
4. Explain the operation of solar cell and its simulation model.
5. Discuss the various types of solar radiation systems.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Sketch the solar radiation measuring instruments.
2. Evaluate the performance of PV system.
3. Construct the solar thermal radiation system.
4. Analyse the PV system based on F-chart.
5. Estimate the solar energy.
6. Analyse the life cycle analysis of solar system.
7. Economic analysis of solar energy conversion system.
8. Evaluate the carbon credit of solar energy system.

UNIT – I

SOLAR RADIATION

Nature of Solar Radiation, Global, Beam and Diffuse Radiation, Hourly, Daily and Seasonal variation of solar Radiation, Estimation of Solar Radiation, Measurement of Solar Radiation.

UNIT – II

PHOTO THERMAL SYSTEMS

Flat Plate Collector, Hot Air Collector, Evacuated Tube Collector, Parabolic , Compound Parabolic and Fresnel Solar Concentrators, Central Receiver System, Thermal Analysis of Solar Collectors Performance of Solar Collectors, Solar Water Heating Systems(Active & Passive), Solar Space Heating & Cooling Systems, Solar Industrial Process Heating Systems, Solar Dryers & Desalination Systems, Solar Thermal Power Systems.

UNIT – III

PHOTOVOLTAIC SYSTEMS

Solar cells & panels, performance of solar cell, estimation of power obtain from solar power, solar panels PV systems, components of PV systems, performance of PV systems, design of PV systems, applications of PV systems, concentrating PV systems, PV power plants, power plant with fuel cells.

UNIT – IV

DESIGN & MODELING OF SOLAR ENERGY SYSTEMS

F Chart method, φ– F Chart method, Utilizability modelling & simulation of Solar Energy Systems.

UNIT – V

ECONOMIC ANALYSIS OF SOLAR ENERGY SYSTEMS

Life cycle analysis of Solar Energy Systems, Time Value of Money, Evaluation of Carbon Credit of Solar Energy Systems.

TEXT BOOKS:

1. J.A. Duffie and W.A. Beckman, "Solar Engineering of Thermal Process", 4th ed., John Wiley & Sons, 2013.
2. S.A. Kalogirou, "Solar Energy Engineering", 2nd ed., Academic Press, 2014.

REFERENCE BOOKS:

1. Mukherjee and Thakur, "Photo Voltaic Systems Analysis and Design", Economy ed., PHI, Eastern 2012.
2. C. S Solanki, "Solar Photovoltaics – Fundamentals, Technologies and Applications", Eastern Economy Edition, PHI, 2012.

(EE113) NEURAL AND FUZZY SYSTEMS
(Professional Elective-1)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:
Students will be able to
1. Discuss basic properties & compositions of neural networks and learning process
2. Summarize and describe various methods of minimization like LMS algorithm, Back propagation algorithms, single &multi layer perceptrons, self organized maps
3. Develop the concept of Fuzzy logics and fuzzy system implementations
4. Analyse the concept of Associate Memories.
5. Design and implement the applications of ANN in Electrical Engineering.

COURSE OUTCOMES:
At the end of the course, students will develop an ability to
1. Identify the various machine learning problems.
2. Recognize the suitable network parameters to solve practical problems.
3. Illustrate the different types of ANN.
4. Distinguish between various training algorithms.
5. Analyze fuzzy logic and fuzzy system implementations
6. Classification of associative memories, training algorithms and BAM concepts.
7. Discuss concepts about fuzzy sets and fuzzy logic rules.
8. Apply and design the networks, solve problems using fuzzy logic techniques.

UNIT – I
Introduction to Neural Networks and Essentials of Artificial Neural Networks: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.
Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

UNIT–II
Single Layer Feed Forward Neural Networks: Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

UNIT- III
Multilayer Feed Forward Neural Networks: Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Learning Difficulties and Improvements.
UNIT IV

Associative Memories, Bidirectional Associative Memory: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem.
Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network. Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

UNIT – V

Classical and Fuzzy Sets and Fuzzy Logic System Components: Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. Process identification, control, fault diagnosis and load forecasting. Fuzzy logic control and Fuzzy classification.

TEXT BOOKS:

1. Rajasekharan and Pai, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications”, Kindle Edition, PHI Publication, 2009, ISBN: 978-81-203-2186-1
2. Simon Hakins, “Neural Networks”, 2nd ed., Pearson Education, 2005, ISBN:81-7808-300-0.

REFERENCE BOOKS:

1. Bart Kosko, “Neural Networks and Fuzzy Logic System”, illustrated ed., PHI Publications, 1992, ISBN: 81-203-0868-9.
2. S.N. Sivanandam, S. Sumathi, S.N. Deepa, “Introduction to Neural Networks using MATLAB6.0”, 1st ed., TMH, 2005, ISBN: 0-07-059112-1.
3. James A Freeman and Davis Skapura, “Neural Networks”, 1st ed., Pearson Education, 2002.
4. C. Eliasmith and C.H. Anderson, “Neural Engineering - Computation, Representation & Dynamics in Neurobiological Systems”, 1st ed., MIT Press, 2003.

(EE114) SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)
(Professional Elective-1)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Understand the need of SCADA
2. Apply the SCADA in power systems
3. Analyze the concept of energy management
4. Create and design substation automation
5. Apply automatic mapping and facility management

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Understand the programming language standards
2. Design to plan, operate and account tasks of National Control Centre
3. Compute load forecasting
4. Calculate the power system operation states
5. Formulate automatic mapping and facility management
6. Evaluate the equipment condition monitoring
7. Illustrate the energy auditing
8. Draw the RTU block diagram

UNIT-I

SCADA: Need of Supervisory Control and Data Acquisition (SCADA) system, Distributed control Systems (DCS), General definition and SCADA components. Hardware Architecture, Software architecture, Protocol detail, Discrete control and Analog control, application & benefits, PLCs Vs RTUs, RTU Block diagram, , MTU communication interface, Future trends, Internet based SCADA display system, Components of control systems in SCADA.

PLC programming language standards: ladder logic, functional block, structural text, instruction, ladder diagrams, trouble shooting, features.

UNIT-II

SCADA in Power Systems: Main task in power systems- Planning, operation, accounting, tasks of national control centre, regional control centre, Generating station control room, AGC-SCADA, SCADA in generation, SCADA in Power Distribution, SCADA in Power Grid.

UNIT-III

Supervisory Power Management: Energy Management System, power system operation states, security analysis, computer programmes-generating planning, transmission planning, system studies, energy audit, state estimation, load forecasting.

UNIT-IV

Utility distribution system design, regulation, distribution automation, DMS, design, layout and construction and commissioning of substations, Substation Automation and Equipment condition monitoring.

UNIT-V

Automatic mapping and facility management, Distribution system design, Facility mapping, tracking, facility inventory, system and equipment maintenance, trouble call management, Customer level intelligent automation system, computer level monitoring and control of distribution transformers, Substation and feeder level automation.

TEXT BOOKS:

1. Stuart A. Boyer, "SCADA: Supervisory Control and Data Acquisition", 4th Revised edition, ISA, 2009.
2. David A Bailey and Edwin Wright, "Practical SCADA for Industry", 1st ed., Newnes, 2003.

REFERENCE BOOKS:

1. Frank D. Petruzella, "Programmable Logic Controllers", 4th ed., McGraw-Hill Education, 2010, ISBN-10: 0073510882, ISBN-13: 978-0073510880.
2. J. Parikh, B. Reddy, R. Benerjee, "Planning for Demand Side Management in the Electric Sector", Indira Gandhi Institute of Development Research, 1994.
3. Gary Dunning, Thomson Delmar, "Introduction to Programmable Logic Controllers", 3rd ed., CENGAGE LEARNING 2007.
4. Torsten Cegrell, "Power System Control Technology", Illustrated Ed., Prentice Hall New Delhi, 1986.

(EC152) MICROPROCESSORS AND INTERFACING LAB

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. List the features of 8086 microprocessor and 8051 microcontroller.
2. Describe accessing of data using different addressing modes
3. Develop assembly language programs for 8086 microprocessor and 8051 microcontroller.
4. Analyze interfacing of peripheral devices with 8086.(analyze)
5. Test operation of timers/counters, serial/parallel ports, interrupts using 8051.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Write assembly level programs on arithmetic operations using various addressing modes.
2. Familiarize with the assembly level programming on strings
3. Apply the concepts of assembly level programming on sorting and code conversions.
4. Design interfacing of various I/O devices to microprocessor.
5. Develop assembly language programs on 8051 microcontroller.
6. Apply the concept of serial communication for transmission of serial data.
7. Verify the ports, timers, and interrupts operation in 8051 microcontroller
8. Design and implement microcontroller-based embedded system

LIST OF EXPERIMENTS:

I. MICROPROCESSOR 8086

1.Introduction to Assembler.

2.Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.

3.Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.

4.By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.

II. INTERFACING

1. ADC/DAC
2. Stepper Motor
3. Traffic Light
4. Keyboard

III. MICROCONTROLLER 8051

1.Programming on arithmetic operations

2.Reading and Writing on a parallel port.

3.Timer in different modes

4.Serial communication implementation.

5.Interfacing: switches, LEDs, LCD.

(EE117) INDUCTION MOTORS AND SYNCHRONOUS MACHINES LAB

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Identify various parts of an induction motor
2. Explain starting methods of an induction motor
3. Develop circle diagram of an induction motor to determine the performance
4. Calculate the regulation of an alternator
5. Estimate X_d and X_q of a salient pole synchronous machine

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Draw the equivalent Circuit of a single phase induction motor
2. Explain testing of an induction motor
3. Execute brake test on three phase Induction Motor
4. Analyze No-load & Blocked rotor tests of a three phase Induction motor
5. Evaluate regulation of a three –phase alternator
6. Construct V and Inverted V curves of a three—phase synchronous motor
7. Predict efficiency of a three-phase alternator
8. Select the optimistic method to find the regulation of an alternator

LIST OF EXPERIMENTS:

Any 10 experiments are to be performed:

1. Brake test on three phase Induction Motor
2. No-load & Blocked rotor tests on three phase Induction motor
3. Draw the equivalent circuit diagram of a 3-phase I.M (Draw the circle diagram and obtain the machine performance parameters).
4. Equivalent Circuit of a single phase induction motor
5. Load test on single phase induction motor.
6. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods
7. V and Inverted V curves of a three—phase synchronous motor.
8. Determination of X_d and Xq of a salient pole synchronous machine.
9. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
10. Efficiency of a three-phase alternator
11. Measurement of sequence impedance of a three-phase alternator

(EE118) POWER ELECTRONICS AND SIMULATION LAB

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
III	II	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Identify the switches with their specifications and ratings.
2. Select appropriate firing circuits for the converters.
3. Classify different commutation circuits.
4. Write the simulation program power electronics circuits.
5. Apply different converters for different applications.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Recognize the appropriate switch for the selective application.
2. Use different firing circuits for different converters.
3. Sketch voltage and current waveforms for various loads.
4. Demonstrate and compute the readings of the various controller circuits.
5. Differentiate series and parallel inverter operations.
6. Categorize the quadrant operations.
7. Simulate and estimate the converter circuits.
8. Justify the appropriate converter for drive applications.

LIST OF EXPERIMENTS:

Any 10 Experiments are to be performed:

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, Class D & Class E)
6. DC Jones chopper with R and RL Loads
7. Single Phase parallel inverter with R and RL loads
8. Single Phase cyclo-converter with R and RL loads
9. Single Phase half controlled converter with R load
10. Three Phase half controlled bridge converter with R-load
11. Single Phase series inverter with R and RL loads
12. Single Phase bridge inverter with R and RL loads
13. Single Phase dual converter with RL loads
14. Simulation of single-phase full converter using RLE load and single-phase AC Voltage controller using RLE load.
15. Simulation of resonant pulse commutation circuit and Buck chopper.
16. Simulation of single phase inverter with PWM control

(HS107) PROJECT MANAGEMENT

(Common to ME, EEE, ECE, CSE Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Identify the elements of the Project Management life cycle, including plan, control, and organize and allocate resources.
2. Comprehend and become familiar with the use of basic tools and techniques to plan, organize, and manage a project.
3. Optimize results while managing the triple constraints.
4. Manage stakeholder communications and demonstrate the principles and practice of team leadership.
5. Describe the career paths in the Project Management profession.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Describe the importance of Project Management in the context of various organizational cultures and strategies, and summarize the typical components of the Project Management system and the processes that are considered essential to any project.
2. Evaluate factors important to project selection and prioritization as evidenced by organizational capability and available resource capacity.
3. Select and describe an appropriate project management strategy for a new project that can meet stakeholder expectations in a given organizational context.
4. List and describe the project phases that make up a typical project, and summarize the PM processes that occur within each. Explain the relationships between subject areas, process groups, and processes.
5. Describe the typical Project Management process documentation and the Project Management deliverables that are produced by project managers in each project phase.
6. Develop a sequence of categorized Project Management processes and activities that will meet stakeholder expectations. Develop a Project Management plan that documents the actions necessary to define and coordinate activities, assess project deliverables, and ensure control and management of costs, schedule, and changes to the project.
7. Compose a life cycle for a specific project in a specific industry and Develop a project charter and a preliminary scope that document high-level project strategy, milestones, deliverables, and estimates for stakeholder, customer, and sponsor approval.
8. Describe the interaction of the various components of the Project Management system, and give examples of how changes impact projects and how project managers adjust activities, coordinate responses, and communicate the results to stakeholders.

UNIT-I

Project Management Foundations: Define a project, project management, and the role of the project manager - Program management and portfolio management - Project sponsorship and the project office - Project organizational structures

UNIT–II

Understanding the PM context - Project lifecycle: sample life cycles, along with traditional vs. agile - Project management processes - Project initiation: creating a charter and identifying stakeholders

UNIT–III

Project planning: creating a scope statement; building a WBS; identifying resources, and building a project budget; basic scheduling, networks, and critical path; and creating a PM plan along with key subsidiary plans – Project execution: problem solving and decision making

UNIT–IV

Project monitoring and controlling: managing changes to scope, cost, and schedule; understanding team dynamics and managing resources effectively – Project closing: gaining customer acceptance and documenting lessons learned

UNIT–V

Global issues in PM - Introduction to the importance of people-oriented skills, such as communications management, human resources, and leadership - Product-based planning: PM documents that need to be produced at each stage in the process (artifacts of project control)

TEXT BOOKS:

1. Harold R.Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", Wiley Publications, 11th Edition.
2. Garold (Gary) Oberlender**, "**Project Management for Engineering and Construction", McGrawHill Education, 3rd Edition.

REFERENCE BOOKS:

1. Prasanna Chandra, "Projects: Planning, Analysis, Selection, Financing, Implementation, and Review", Mc Graw Hill Education; Eighth edition.
2. Erik Larson and Clifford Gray, "Project Management: The Managerial Process", McGraw Hill Higher Education; 5th Revised edition.

(CS104) OBJECT ORIENTED PROGRAMMING CONCEPTS THROUGH JAVA
(Common to all Branches)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recall the various features of object oriented programming.
2. Identify the features of OOP specific to Java programming.
3. Apply exception handling mechanism to solve run time errors.
4. Discuss different inheritance techniques and multithreading.
5. Built user interfaces using swings and AWT controls.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. List all OOP features to design object oriented applications.
2. Explain design, compile, test and execute straightforward programs using a high level language.
3. Discuss the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements.
4. Analyze implementation, compilation, testing and run java programs comprising more than one class, to address a particular software problem.
5. Illustrate synchronization using multithreading.
6. Classify effective user interface applications through AWT controls and swings.
7. Examine use of members of classes in the Java API.
8. Summarize the framework and architecture for MVC's.

UNIT – I

Object Oriented Thinking: Need for OOP paradigm, OOP Principles, **Java Basics** History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects – concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.

UNIT - II

Inheritance: Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes.

Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. **I/O Streams.**

UNIT – III

Exception Handling and Multithreading: Concepts of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

UNIT - IV

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menubar, graphics, layout manager – layout manager types – boarder, grid, flow, card and grib bag.

UNIT – V

Swings: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java 7 Programming - Black Book, By Kogent Learning Solutions Inc., Freamtech Publications.
2. Head First Java 2nd Edition by Kathy Sierra, Oreilly Publication.

REFERENCE BOOKS:

1. Y. Daniel Liang, "Introduction to Java programming", 6th Edition, pearson education, ISBN:10:0132221586.
2. R.A. Johnson, "An introduction to Java programming and object oriented application development", Thomson, ISBN:-10:0619217464.
3. T.Budd "Understanding OOP with Java" updated Edition, pearson eduction, ISBN:10:0201612739.
4. Herbert schildt, "Java the complete reference", 7th Edition, TMH,ISBN:0072263857.

WEB LINKS:

1. www.tatamcgrawhill.com/html/9780070636774.html
2. http://nptel.iitm.ac.in
3. https://www.cl.cam.ac.uk/teaching/0910/OOProg/OOP.pdf
4. www.java2s.com

(EE120) COMPUTER METHODS IN POWER SYSTEMS

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	1	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recall the formation of incidence matrices.
2. Explain the formation of Z_{Bus} and Y_{Bus} matrices.
3. Discuss the necessity of load flow studies.
4. Classify the buses based on known parameters.
5. Classify the various types of stabilities.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Calculate the incidence matrix elements.
2. Construct Z_{Bus} and Y_{Bus} matrices.
3. Identify the various types of buses based on known parameters.
4. Estimate the power flow through the various elements of power system network.
5. Identify the load flow method to solve a power system network with in minimum number of iterations.
6. Compute the fault current at various faults.
7. Calculate the per unit quantities.
8. Analyse the steady state and transient stabilities.

UNIT – I

Power System Network Matrices: Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} formation by Direct and Singular Transformation Methods, Numerical Problems. Formation of Z_{Bus}: Partial network, Algorithm for the Modification of Z_{Bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old buses (Derivations and Numerical Problems) - Modification of Z_{Bus} for the changes in network (Problems).

UNIT – II

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 (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) 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 Different Methods.

UNIT – III

Short Circuit Analysis: Per-Unit System of Representation. Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Symmetrical fault Analysis:

Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical 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, Numerical Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

UNIT – IV

Power System 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.

UNIT –V

Power System 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: Point-by-Point Method. Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXT BOOKS:

1. G.W. Stagg, Ahmed H. El-Abiad, "Computer Methods in Power System Analysis", 1st ed., McGraw-Hill Book Company, 1964.
2. John J Grainger, William D Stevenson, "Power system Analysis", 4th ed., TMC Companies, 2008.

REFERENCE BOOKS:

1. J. Duncan Glover, M.S. Sarma, T.J. Overbye, "Power System Analysis and Design", 5th ed., Cengage Learning India Pvt. Ltd, 2011, ISBN: 978-81-315-1635-5.
2. M.A. Pai, "Computer Techniques in Power System Analysis", 3rd ed., TMH Publications, 2005, ISBN:0070593639, 9780070593633.
3. I.J. Nagrath& D.P. Kothari ,"Electric Machines", 4th ed., Tata McGraw Hill Publishers, 2011, ISBN: 0-07-069967-4, 9780070699670.
4. Hadi Saadat, "Power System Analysis", 2nd ed., TMH Edition, 2002.

(EE121) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
(Professional Elective-2)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Analyze the operating principle of PMMC and MI instruments.
2. Evaluate the constructional and operational details of instrument transformer and energy meter.
3. Apply the concepts of bridges in measuring R, L and C components.
4. Understand the usage of oscilloscope.
5. Analyze different types of digital voltmeter.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Select a suitable measuring instrument for measurement of ac/dc electrical quantity.
2. Differentiate between MI and MC for proper measurement
3. Choose a suitable Instrument transformer to assess the voltage and current in a power system.
4. Analyze the principle and working of energy meter.
5. Design and calculate the resistance, inductance and capacitance using bridges circuits, draw the phasor diagrams for a given ac bridge network.
6. Analyze lissajous patterns and able to measure phase and frequency of different signals using CRO.
7. Summarize CRO applications.
8. Identify different types of digital voltmeters and make proper selection for application.

UNIT – I

Measurement of Current and Voltage:

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance.

Characteristics of Signals and Their Representation: Measuring Systems, Performance Characteristics, - Static characteristics, Dynamic Characteristics

UNIT – II

Instrument transformers & Measurement of Energy:

CT and PT – Ratio and phase angle errors – design considerations. Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter.

UNIT - III

Measurement of Resistance, Inductance & Capacitance:

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method. Introduction to AC bridges - Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's

bridge. Measurement of capacitance and loss angle - Desauty bridge. Wien's bridge – Schering Bridge.

UNIT – IV

Oscilloscope: Cathode ray oscilloscope-Cathode ray tube-time base generator-horizantal and vertical amplifiers-CRO probes-applications of CRO-Measurement of phase and frequency-lissajous patterns-Sampling oscilloscope-analog and digital type.

UNIT – V

Digital Voltmeters: Digital Voltmeters- Successive Approximation, Ramp, Dual-Slope Integration Continuous Balance Type-Micro Processor Based Ramp Type DVM Digital Frequency Meter-Digital Phase Angle Meter

TEXT BOOKS:

1. E.W. Golding and F.C. Widdis, "Electrical Measurements and measuring Instruments", 5th ed., Wheeler Publishing, 2011.
2. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", 2nd ed., Dhanpat Rai & Co. Publications, 2011.

REFERENCE BOOKS:

1. Buckingham and Price "Electrical Measurements", 2nd ed., Prentice – Hall, 1966.
2. D.V.S Murthy, "Transducers and Instrumentation", 2nd ed., Prentice Hall of India, 2008.
3. D.O. Doeblin, "Measurements Systems, Applications and Design", 2nd ed., McGraw-Hill Education, 1990.
4. H.S. Kalsi, "Electronic Instrumentation", 3rd ed., Tata McGraw-Hill Edition, 2010.

(EE122) DIGITAL CONTROL SYSTEMS
(Professional Elective-2)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Learn principles and techniques of A/D and D/A conversions and basics of Z-transform
2. Perform stability analysis of digital control systems
3. Design of digital control systems for different engineering model
4. Analyze the functions in both time domain and Z domain
5. Design the discrete-data control systems

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Develop the basic sampling theory and converter
2. Obtain Z-transform and its properties
3. Analyze signals in both time domain and Z domain
4. Develop transfer function, block diagram, and signal flow graphs
5. Perform analysis using the state variable technique
6. Understand the basic knowledge necessary for system stability
7. Learn the theory of digital PID controller
8. Design the discrete-data control systems

UNIT – I

Sampling and Reconstruction: Introduction, sample and hold operations, Sampling theorem, Reconstruction of original sampled signal to continuous-time signal.

The Z – Transforms: Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z-Transforms.

Z-Plane Analysis of Discrete-Time Control System Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane: Primary strips and Complementary Strips.

UNIT – II

State Space Analysis: State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations

Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

UNIT – III

Stability Analysis: Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion. Stability analysis using Liapunov theorems.

UNIT – IV

Design of Discrete Time Control System by Conventional Methods: Design of digital control based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers. Design digital control through deadbeat response method.

UNIT – V

State Feedback Controllers and Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula.
State Observers – Full order and Reduced order observers.
Linear Quadratic Regulators: Min/Max principle, Linear Quadratic Regulators, Kalman filters, State estimation through Kalman filters, introduction to adaptive controls.

TEXT BOOKS:

1. M. Gopal, "Digital Control and State Variable Methods", 3rd Edition, TMH, Sep-2008.
2. K. Ogata , "Discrete-Time Control systems" , Pearson Education/PHI, 2nd Edition.

REFERENCE BOOKS:

1. B.C. Kuo, "Digital Control Systems", 2nd Edition, Oxford University Press, 2003.
2. M. Gopal, "Digital Control Engineering", New Age International Publications, 2003.

(EE123) WIND ENERGY SYSTEMS
(Professional Elective-2)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Remember the concept of wind energy basics, energy storage.
2. Understand the wind energy measurement and data analysis and its applications.
3. Understand the aero dynamic theory, turbine types
4. Apply the wind turbine technology, component of WTG system to various fields
5. Evaluate the modern wind turbine control and monitoring system

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Know the wind atmospheric boundary layers and data analysis
2. Analyze the design aspects of the various wind turbines and its components
3. Evaluate efficiencies, and economics limitations of modern wind turbine
4. Model the wind farms based on control and monitoring system
5. Apply the wind turbine power plants for various application
6. Analyze the Wind turbine Economics
7. Evaluate the grid connected wind turbine with power electronics devices
8. Create new applications with advanced wind turbine in grid technology with improved performance

UNIT – I

WIND ENERGY FUNDAMENTALS: Wind Energy Basics, Wind Speeds and scales, Terrain, Roughness, Wind Mechanics, Power Content, Class of wind turbines, Atmospheric Boundary Layers, Turbulence. Wind Measurements, Analysis and Energy Estimates: Instrumentation for wind measurements, Wind data analysis, tabulation, Wind resource estimation, Betz's Limit, Turbulence Analysis.

UNIT – II

AERODYNAMICS THEORY & WIND TURBINE TYPES: Airfoil terminology, Blade element theory, Blade design, Rotor performance and dynamics, Balancing technique (Rotor & Blade), Types of loads; Sources of loads. Wind turbines types: Vertical Axis Type, Horizontal Axis, Constant Speed Constant Frequency, Variable speed Variable Frequency, Up Wind, Down Wind, Stall Control , Pitch Control, Gear Coupled Generator type, Direct Generator Drive /PMG/Rotor Excited Sync Generator.

UNIT – III

WIND TURBINE TECHNOLOGY & COMPONENTS OF WTG: Gear Coupled Generator Wind Turbine Components and their construction Electronics Sensors /Encoder /Resolvers, Wind Measurement : Anemometer & Wind Vane, Grid Synchronization System, Soft Starter, Switchgear [ACB/VCB], Transformer, Cables and assembly, Compensation Panel, Programmable Logic Control, UPS, Yaw & Pitch System : AC Drives, Safety Chain Circuits, Generator Rotor Resistor controller (Flexi Slip), Differential Protection Relay for

Generator, Battery/Super Capacitor Charger & Batteries/ Super Capacitor for Pitch System, Transient Suppressor /Lightning Arrestors, Oscillation & Vibration sensing.
Direct Rotor Coupled Generator (Multiple), Variable Speed ,Variable Freq. Excited Rotor Synch. Generator / PMG Generator, Control Rectifier, Capacitor Banks, Step Up / Boost Converter (DC-DC Step Up), Grid Tied Inverter, Power Management, Grid Monitoring Unit (Voltage and Current), Transformer, Safety Chain Circuits Doubly Fed Induction Generator and Power Control.

UNIT – IV

MODERN WIND TURBINE CONTROL & MONITORING SYSTEM: Details of Pitch System & Control Algorithms, Protections used & Safety Consideration in Wind turbines, Wind Turbine Monitoring with Error codes, SCADA & Databases: Remote Monitoring and Generation Reports, Operation & Maintenance for Product Life. Cycle, Balancing technique (Rotor & Blade), FACTS control & LVRT & New trends for new Grid Codes. Concept of Wind Farms and project cycle: Project planning, Site selection, Project execution, Operation and maintenance

UNIT – V

COST ECONOMICS: Wind resource assessment and R&D costs, Fixed and variable costs, Value of wind energy, Life cycle costing and cash flow of wind power projects, Wind project owners / developers, Wind energy market.

TEXT BOOKS:

1. Gary L. Johson, “Wind Energy Systems”, 1st ed., Prentice Hall .Inc. Publications, 1985.
2. Mathew Sathyajith, “Wind Energy Fundamentals Resource Analysis and Economics”, 1st ed., Springer Publications, 2011.

REFERENCE BOOKS:

1. Anna Mani, “Wind Energy Data for India”, 1st ed., Allin Publisher, 1992.
2. E. Sreevalsam, R Sasi Kumar, G. Arivukkodi, “Wind Energy Resources Survey in India VIII”, C-WET, Chennai, 2012.
3. S. Rangarajan, “Wind Energy Resources Survey in India”, Volume 2.

(EE124) OPTIMIZATION TECHNIQUES
(Professional Elective-2)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Assess the theory of optimization methods and algorithms developed for solving various types of optimization problems
2. Build the fundamental concepts of Optimization Techniques
3. Recognize the importance of optimizations in real scenarios;
4. Illustrate the concepts of various classical and modern methods of for constrained problem in both single and multivariable.
5. Illustrate the concepts of various classical and modern methods of for un-constrained problem in both single and multivariable.

COURSE OUTCOMES:

At the end of the course, students will develop the ability to

1. Formulate the electrical and electronics engineering problems through classical optimization techniques.
2. Evaluate the feasible region.
3. Solve the LPP with two variables using graphical method.
4. Solve the LPP using simplex method.
5. Formulate the dual problem from primal.
6. Formulate engineering design problems as mathematical optimization problems.
7. Analyze the sensitivity of a decision variable.
8. Solve various multivariable optimization problems.

UNIT-I

Introduction & Classical Optimization Techniques: Statement of an Optimization problem — design vector — design constraints — constraint surface — objective function — objective function surfaces — classification of Optimization problems Single variable Optimization — multi variable Optimization without constraints — necessary and sufficient conditions for minimum/maximum multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers — multivariable Optimization with inequality constraints — Kuhn — Tucker conditions.

UNIT — II

Linear Programming: Standard form of a linear programming problem — geometry of linear programming problems — definitions and theorems — solution of a system of linear simultaneous equations — pivotal reduction of a general system of equations — motivation to the simplex method — simplex algorithm.

UNIT – III

Constrained and Unconstrained Optimization: Characteristics of a constrained problem, Classification, Basic approach of Penalty function method; Basic approaches of Interior and Exterior penalty function methods, Introduction to convex Programming Problem. One dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method. Univariate method, Powell's method and steepest descent method.

UNIT—IV

Dynamic Programming: Dynamic programming multistage decision processes — types — concept of sub optimization and the principle of optimality — computational procedure in dynamic programming — examples illustrating the calculus method of solution – examples illustrating the tabular method of solution.

UNIT-V

Introduction to non-traditional methods: Genetic Algorithm: Introduction, Representation of design variables, objective function and constraints, Genetic operators and numerical results. Solving Economic load dispatch by considering with and without losses using genetic algorithms.

TEXT BOOKS:

1. S. S. Rao, "Engineering optimization. Theory and practice", New Age International (P) Limited.
2. K.V. Mittal and C. Mohan, "Optimization Methods in Operations Research and systems Analysis", New Age International (P) Limited.

REFERENCE BOOKS:

1. S.D. Shama, H. Sharma, "Operations Research: Theory, Methods and Applications", Kedar Nath Ram Nath Publishers, 15 Reprint.
2. H.S. Kasana & K.D. Kumar, "Introductory Operations Research: Theory and Applications", Springer (India), Pvt. Ltd.
3. H.A.Taha "Operations Research: An Introduction", , Pearson Pvt. Ltd.
4. R k, Hard Bronson, Govindasami Naadimuthu, "Operations Research", Tata McGraw Hill Company Limited.

(EC125) VLSI DESIGN
(Professional Elective-3)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES :

Students will be able to

1. Comprehend the basic IC technologies viz. PMOS, NMOS, CMOS and BiCMOS.
2. Interpret MOS device concepts and draw stick diagrams and layouts using design rules.
3. Impart design skills of various logic styles and evaluation of delays etc.
4. Interpret subsystems design concepts and semi-custom IC design options.
5. Explain the various CAD tools and testing of VLSI circuits.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Describe fabrication steps of IC
2. Explains Ids Vs Vds relation for a MOS Transistor
3. Distinguish NMOS Inverter And CMOS Inverter
4. Comprehend MOS device concepts , draw stick diagrams and layouts using design rules
5. Comprehend gate level design
6. Design digital systems and components
7. Describe semiconductor integrated circuits design
8. Explain test Principles and different testing methods

UNIT – I

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS Technologies, Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, probe testing, integrated resistors and capacitors, CMOS nanotechnology

UNIT – II

Basic Electrical properties: Basic electrical properties of MOS and BiCMOS Circuits I_{ds} – V_{ds} relationship, MOS transistor threshold voltage, g_m – g_{ds} figure of merit, pass transistor, NMOS inverter, various pull ups, CMOS inverter analysis and design, BiCMOS Inverters.

UNIT – III:

VLSI Circuit design processes: VLSI Design Flow, MOS layers, stick diagrams, design rules and layout, 2µm CMOS design rules for wires, contacts and transistors layout diagrams for NMOS and CMOS Inverters and gates, scaling of MOS circuits

Gate level design: Logic Gates and other complex gates, switch logic, alternate gate circuits, time delays, driving large capacitive loads, wiring capacitance, fan-in, fan-out, choice of layers

UNIT – IV

Data path subsystems: subsystem Design, shifters, adders, ALUs, multipliers, parity generators, comparators, zero/one detectors, counters.

Array subsystems: SRAM, DRAM, ROM, Serial Access Memories, content addressable memory.

UNIT – V

Semiconductor integrated circuit design: PLAs, FPGAs, CPLDs standard cells. Programmable array logic, design approach,.

MOS Testing: CMOS testing need for testing, test principles, design strategies for test, chip level test techniques, system-level test techniques layout design for improved testability.

TEXT BOOKS:

1. K. Eshraghian, Eshraghian Dougles and A. Pucknell, "Essentials of VLSI circuits and systems", PHI 2005 Edition.
2. Neil H.E. Weste, David Harris, Ayan Banerjee, "CMOS VLSI Design – A circuits and systems perspective", Pearson, 2009.

REFERENCE BOOKS:

1. Wayne Wolf, "Modern VLSI Design", Pearson education, 3rd edition. 1997.
2. Mead, C.A and Convey,L.A, "Introduction to VLSI systems", Wesley-Wesley.
3. Charles H.Roth,Jr, Lizy Kurian John "Digital systems design"2nd Edition Cengage Learning.
4. John M. Rabaey, "Digital Integrated Circuits" PHI, IEEE, 1997.

(EE125) HIGH VOLTAGE ENGINEERING
(Professional Elective-3)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Understand Breakdown mechanisms of gaseous, liquids and solid dielectrics
2. Explain generation and measurement of High voltages and currents
3. Analyze high voltage testing methods
4. Evaluate the causes for over voltages and lightening phenomenon.
5. Discuss about insulation coordination concept.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Understand and describe breakdown of gaseous insulator.
2. Distinguish breakdown of liquid and solid insulation.
3. Describe about the concept of over voltages.
4. Memorize the applications of the insulating materials
5. Examine the High Voltages and High Currents
6. Asses the natural causes for over voltages and currents
7. Test the Electrical materials and apparatus of the system
8. Mention the Insulation co – ordination of the high voltage systems

UNIT- I

Introduction to High Voltage Technology and Applications: Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

UNIT- II

Break Down in Solid, Gaseous and Liquid Dielectrics: 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- III

Generation and Measurement of High Voltages and Currents: Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT- IV

Over Voltage Phenomenon and Insulation Co-Ordination: Natural causes for over voltages – Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

UNIT- V

Non-Destructive Testing of Material and Electrical Apparatus: Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements. Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements.

TEXT BOOKS:

1. E. Kuffel, W.S. Zaengl, J .Kuffel, "High Voltage Engineering: Fundamentals", 2nd ed., Elsevier, 2008.
2. M.S. Naidu and V. Kamaraju, "High Voltage Engineering", 4th ed., TMH Publications, 2009, ISBN :0-07-066928-7, 780070669284.

REFERENCE BOOKS:

1. C.L. Wadhwa, "High Voltage Engineering", 3rd ed., New Age Internationals (P) Limited, 2005, ISBN: 81-224-0613-0.
2. Ravindra Arora, Wolfgang Mosch, "High Voltage Insulation Engineering", New Age International (P) Limited, 1995.

(EE126) SWITCH GEAR AND PROTECTION
(Professional Elective-3)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Analyze principles of arc interruption.
2. Evaluate recovery voltage, restriking voltage, average voltage and maximum RRRV of the system.
3. Understand the concepts of current chopping, resistance switching, neutral grounding, insulation co-ordination.
4. Distinguish the operation of types of circuit breakers.
5. Understand types of relays and protection of power system equipment.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Understand recovery voltage, restriking voltage ,average voltage and maximum RRRV .
2. Recall the concepts of arc interruption, current chopping, resistance switching, insulation co-ordination.
3. Differentiate the operation of circuit breakers.
4. Select suitable relay for the system protection.
5. Distinguish between static and electromagnetic relays.
6. Recommend suitable protection scheme for generator, transformer, feeder and bus-bar.
7. Compare methods of neutral grounding.
8. Categorize lighting arresters.

UNIT – I

Circuit Breakers-1: Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages. Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Auto reclosures.

UNIT –II

Circuit Breakers-2: Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT – III

Electromagnetic and Static Relays: Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. Relays Classification: Instantaneous, DMT and IDMT types. Application of relays: Over current/ Under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays. Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. Static Relays: Static Relays verses Electromagnetic Relays.

UNIT – IV

Generator Protection, Transformer Protection, Feeder and Bus-Bar Protection: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection. Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay. Protection of Bus bars – Differential protection.

UNIT – V

Neutral Grounding, Protection Against Over Voltages: Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices. Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

TEXT BOOKS:

1. Sunil S. Rao, "Switchgear and Protection", 13th ed., Khanna Publishers, 2013, ISBN: 9788174092328, 8174092323.
2. Badari Ram, D.N. Viswakarma, "Power System Protection and Switchgear", 2nd ed., TMH Publications, 2011, ISBN:007107774X, 9780071077743.

REFERENCE BOOKS:

1. Paithankar and S.R. Bhide, "Fundamentals of Power System Protection", 2nd ed., PHI, 2010, ISBN: 8120341236.
2. C. R. Mason, "Art & Science of Protective Relaying", 1st ed., Wiley Eastern Ltd, 1966.
3. C.L. Wadhwa, "Electrical Power Systems", 6th ed., New Age international (P) Limited, Publishers, 2007.
4. M.L. Soni, P.V. Gupta, U.S. Bhatnagar and A. Chakraborti, **"**A Text Book on Power System Engineering", 1st ed., Dhanpat Rai & Co. Pvt. Ltd., 1999, ISBN:0070647917.

(EE127) RELIABILITY ENGINEERING
(Professional Elective-3)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Learn the elements of probability theory and reliability logic diagrams.
2. Know the meaning of failure and measure of reliability
3. Understand the network reduction techniques
4. Learn Discrete Markov chains and reliability evaluation of repairable systems.
5. Ability to use statistical tools to characterize the reliability of an item and learn the significance of reliability and hazard models.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Understand the probability of success and failure of a system and hazard rate
2. Implement reduction techniques for series parallel systems with tie-set, cut-set methods
3. Apply cut-set & tie-set in real time applications
4. Understand the modeling concepts of Markov's chain and evaluation of a system
5. Apply the appropriate methodologies and tools for enhancing the inherent and actual reliability of components and systems.
6. Determine ways of coping with failures that does occur, if their causes have not been corrected.
7. Understand the network reduction techniques.
8. Apply various distribution models for enhancing the reliability of the systems.

UNIT – I

Elements of probability theory: Probability distributions: Random variables, density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution.

UNIT – II

Definition of Reliability. Significance of the terms appearing in the definition. Component reliability, Hazard rate, derivation of the reliability function in terms of the hazarad rate. Hazard models. Failures: Causes of failures, types of failures (early failures, chance failures and wear-out failures). Modes of failure. Bath tub curve. Effect of preventive maintenance. Measures of reliability: mean time to failure and mean time between failures.

UNIT – III

Reliability logic diagrams (reliability block diagrams), Classification of engineering systems: series, parallel, series-parallel, parallel-series and non-series-parallel configurations. Expressions for the reliability of the basic configurations. Reliability evaluation of Non-series-parallel configurations: minimal tie-set, minimal cut-set and decomposition methods. Deduction of the minimal cutsets from the minimal pathsets.

UNIT – IV

Discrete Markov Chains: General modelling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation. Absorbing states. Continuous Markov Processes: Modelling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating limiting state Probabilities. Reliability evaluation of repairable systems.

UNIT – V

Series systems, parallel systems with two and more than two components, Network reduction techniques. Minimal cutest / failure mode approach.

TEXT BOOKS :

1. Roy Billinton and Ronald N Allan, "Reliability Evaluation of Engineering Systems", Plenum Press, New York, Second Edition, 2010.
2. R.L. Sullivan, "Power System Planning", McGraw Hill International Book Co., 1990

REFERENCE BOOKS:

1. Charles E. Ebeling, "An Introduction to Reliability and Maintainability Engineering", Tata McGraw Hill, 2010.
2. Roy Billinton and Ronald N Allan, "Reliability Evaluation of Power Systems", Pitman Advance Publishing Program, New York, Second Edition, 2010.

(EC153) PRINCIPLES OF SIGNAL PROCESSING
(Professional Elective-4)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recall the basic concepts of LTI systems
2. Apply Discrete Fourier Transform techniques to discrete time signals
3. Design different filters using different transformation techniques
4. Compare different realization techniques of digital filters
5. Illustrate concepts of multi rate signal processing techniques.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Define discrete time signals and systems.
2. Test the linearity, stability and causality of a system.
3. Compute DFT using Radix-2 FFT algorithms.
4. Sketch the frequency response of discrete time signals
5. Design different types of digital filters in various domains.
6. Distinguish between the IIR and FIR Filters.
7. Discuss multirate Signal Processing techniques
8. Discuss the architecture of DSP Processor

UNIT – I

Introduction: Introduction to digital signal processing: Discrete time signals and sequences, linear shift invariant systems, stability and causality. Frequency domain representation of discrete time signals and systems

UNIT – II

Discrete Fourier Transform (DFT):

Discrete-Time Fourier transform, computation of DFT, properties of DFT, linear convolution, circular convolution of sequences using DFT.

Fast Fourier Transform: Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT.

UNIT – III

IIR Digital Filters: Analog filter approximations-Butterworth and Chebyshev, design of IIR digital filters from analog filters, step and impulse invariant techniques. Bilinear transformation method, Realization of IIR Digital Filters – direct, Canonic, Cascade and Parallel forms.

UNIT – IV

FIR Digital Filters: Characteristics of FIR digital filters, frequency response, Design of FIR digital filters: Fourier method, window techniques, frequency sampling technique, comparison of IIR and FIR filters. Realization of FIR Digital Filters – direct, Canonic, Cascade and Parallel forms.

UNIT – V

Multirate Digital Signal Processing: Introduction, down sampling-decimation, up sampling- interpolation, sampling rate conversion.

Introduction to DSP Processors: Overview of Digital Processors, Von neuman architecture, Harvard Architecture, VLIW Architecture, Multiply Accumulate Unit (MAC) and Pipe Lining.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis,, "Digital signal processing, principles, Algorithms and applications", Pearson Education/PHI, 4th ed., 2007. ISBN-10: 0131873741 • ISBN-13: 9780131873742
2. Mithra , "Digital Signal Processing", Mc Graw Hill Publications. ISBN 10: 007736676X / 0-07-736676-X ISBN 13: 9780077366766

REFERENCE BOOKS:

1. Li Tan, "Digital Signal Processing- fundamentals and applications", Elsevier, 2008. ISBN : 9780124158931
2. Robert J. Schilling, Sandra L. Harris, Thomson, "Fundamentals of Digital signal processing using Matlab", 2007. ISBN-10: 084006909X

(EE128) MODERN CONTROL THEORY
(Professional Elective-4)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:
Students will be able to
1. Understand the basic concepts of matrices, Eigen values and Eigen vectors.
2. Model systems by using state-space Analysis.
3. Design controllers for several classes of plants.
4. Analyze the fundamental concepts of optimal control problems.
5. Test observability and controllability using state models

COURSE OUTCOMES:
At the end of the course, students will develop an ability to
1. Analyze the concepts of state space analysis
2. Design the electrical and mechanical systems
3. Evaluate the stability analysis of non-linear systems by describing function approach
4. Solve optimal control problems.
5. Design and control of full order and reduced order observers.
6. Determine the harmonic analysis and stability of non- Linear Systems.
7. Apply root locus methods to portray the pole behavior of systems as a function of loop gain
8. Apply feedback control strategy as the main design method

UNIT – I
FIELDS, VECTORS AND VECTOR SPACES: Linear combinations and Bases – Linear Transformations and Matrices – Scalar Product and Norms – Eigen values, Eigen Vectors and a Canonical form representation of Linear operators – The concept of state – State Equations for Dynamic systems – Time invariance and Linearity – Nonuniqueness of state model – State diagrams for Continuous-Time State models .

UNIT – II
STATE VARIABLE ANALYSIS: Linear Continuous time models for Physical systems– Existence and Uniqueness of Solutions to Continuous-Time State Equations – Solutions of Linear Time Invariant Continuous-Time State Equations – State transition matrix and its properties.
Controllability and Observability: General concept of controllability – General concept of Observability – Controllability tests for Continuous-Time Invariant Systems – Observability tests for Continuous-Time Invariant Systems – Controllability and Observability of State Model in Jordan Canonical form – Controllability and Observability Canonical forms of State model.

UNIT – III
NON LINEAR SYSTEMS-I*:* Introduction – Non Linear Systems - Types of Non-Linearities – Saturation – Dead-Zone - Backlash – Jump Phenomenon etc;– Singular Points – Introduction to Linearization of nonlinear systems, Properties of Non-Linear systems –

Describing function–describing function analysis of nonlinear systems – Stability analysis of Non-Linear systems through describing functions.
Non Linear Systems –II: Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT – IV
STABILITY ANALYSIS: Stability in the sense of Lyapunov, Lyapunov's stability and Lypanov's instability theorems - Stability Analysis of the Linear continuous time invariant systems by Lyapunov second method – Generation of Lyapunov functions – Variable gradient method – Krasooviski's method.
STATE FEEDBACK CONTROLLERS AND OBSERVERS: State feedback controller design through Pole Assignment – State observers: Full order and Reduced order.

UNIT – V
OPTIMAL CONTROL: Introduction to optimal control - Formulation of optimal control problems – calculus of variations – fundamental concepts, functionals, variation of functionals – fundamental theorem of theorem of Calculus of variations – boundary conditions – constrained minimization – formulation using Hamiltonian method – Linear Quadratic regulator.

TEXT BOOKS:
1. M.Gopal, "Modern Control System Theory," 2nd ed., New Age International, 2005.
2. Katsuhiko Ogata, "Modern Control Engineering", 3rd ed., Prentice Hall of India Pvt. Ltd., 1998.

REFERENCE BOOKS:
1. U.A. Bakshi, M.V. Bakshi, "Modern control theory", 1st ed., Technical Publications, 2008, ISBN: 8184315066, 9788184315066
2. William L. Brogan, "Modern Control Theory", Pearson Education India, 3rd ed., 2011, ISBN: 8131761673, 9788131761670.

(EE129) SPECIAL MACHINES
(Professional Elective-4)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recall the basics of stepper motor
2. Explain the torque-speed characteristics of switched reluctance motor
3. Analyze the properties of permanent magnet materials.
4. Evaluate the performance of Brushless DC motor
5. Compute the force on the rotor of linear induction motor.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Recognize the types of stepper motors
2. Identify different configurations of stepper motors
3. Discuss the principle of operation of switched reluctance motor
4. Analyse the properties of permanent magnet materials
5. Develop the torque equation for switched reluctance motor
6. Sketch the equivalent circuit of Permanent magnet
7. Assess the theoretical and transient analysis of Brushless DC motor
8. Explain the construction and principle of linear induction motor

UNIT-I

Stepper Motor: Introduction, Types, Hybrid stepper motor- construction, principle of operation, two phases energized at a time, conditions for operation, different configurations, VR Stepper motor- single stack and multi stack, Drive systems and circuit for open loop and Closed loop control of stepping motor. Dynamic characteristics. Single phase stepper Motor, Expression of voltage, current and torque for stepper motor and criteria for synchronization.

UNIT-II

Switched Reluctance Motor: Constructional features, principle of operation, Design Aspects and profile of the SRM, Torque equation, Power converters and rotor sensing mechanism, expression of torque and torque-speed characteristics.

UNIT-III

Permanent Magnet Materials: Permanent magnet materials, properties, minor hysteresis loop and recoil line, equivalent circuit, stator frames with permanent magnets.

UNIT-IV

Brushless DC Motor : Construction, operation, sensing and switching logic scheme, Drive and power circuit, Theoretical analysis and performance prediction, transient Analysis.

UNIT-V

Linear Induction Motor: Construction and principle of operation of Linear Induction Motor, Approximate calculation of the force on rotor.

TEXT BOOKS:

1. K. Venkataratnam, "Special Electrical Machines", 1st ed., Universities Press, 2008.
2. Kenjo. T and Nagamori. S, "Permanent Magnet and Brushless DC Motors", 1st ed., Clarendon Press, Oxford, 1989.

REFERENCE BOOKS:

1. Fitzerald and Kingsley, "Electrical Machines", 6th ed., McGraw Hill, 2008.
2. T. J. E. Millar, "Brushless Permanent Magnet and Reluctance Motor Drives", 1st ed., Clarendon Press, Oxford, 1989.
3. Krishnan R, "Switched Reluctance Motor Drives: Modelling, Simulation, Analysis, Design and applications", CRC press, 2015.

(EE130) UTILIZATION OF ELECTRICAL ENERGY
(Professional Elective-4)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Select drives and suitability of each drive.
2. Explain electric heating and welding and their applications.
3. Design a lighting scheme for street lighting
4. Calculate the tractive effort required for a traction unit
5. Compare the speed/time characteristics for different services of drives.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. List out types of electric drives
2. Explain the concept of drives.
3. Design a suitable electric heating.
4. Compare various electric welding methods.
5. Discuss electric sources of light
6. Design of lighting scheme
7. Estimate the speed time characteristics of different services
8. Calculate the traction effort required for the movement of locomotive.

UNIT – I

Electric Drives: Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT – II

Electric Heating and Welding: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

Electric welding, resistance & arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT – III

Illumination Fundamentals and Various Illumination Methods: Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Discharge lamps: MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT – IV

Electric Traction – I: System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging, rheostatic braking and regenerative braking.

Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT – V

Electric Traction-II: Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

TEXT BOOKS:

1. E. Openshaw Taylor, Orient Longman, "Utilisation of Electric Energy", 1st ed., University Press, 1971, ISBN: 978-1-886101-11-1.
2. H. Partab, "Art & Science of Utilization of electrical Energy", 2nd ed., Pritam Surat, 1975.

REFERENCE BOOKS:

1. N.V. Suryanarayana, "Utilization of Electrical Power including Electric drives and Electric traction", 1st ed., (Reprint 2005) New Age International (P) Limited, Publishers, 2005, ISBN: 81-224-0546-0.
2. C.L. Wadhwa, "Generation, Distribution and Utilization of electrical Energy", Revised ed., New Age International (P) Limited, Publishers, 2005, ISBN: 81-224-0613-0.
3. J.B. Gupta, "Utilization of Electric Power and Electric Traction", S.K. Kataria and sons, New Delhi.

(CS109) OBJECT ORIENTED PROGRAMMING CONCEPTS THROUGH JAVA LAB

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recall the various features of object oriented programming.
2. Identify the features of OOP specific to Java programming.
3. Apply exception handling mechanism to solve run time errors.
4. Discuss different inheritance techniques and multithreading.
5. Built user interfaces using swings and AWT controls.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. List all OOP features to design object oriented applications.
2. Explain design, compile, test and execute straightforward programs using a high level language.
3. Discuss the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements.
4. Analyze implementation, compilation, testing and run java programs comprising more than one class, to address a particular software problem.
5. Illustrate synchronization using multithreading.
6. Classify effective user interface applications through AWT controls and swings.
7. Examine use of members of classes in the Java API.
8. Summarize the framework and architecture for MVC's.

Recommended Systems/Software Requirements:

Intel based desktop PC with minimum of 166 MHZ or faster processor with at least 64 MB RAM and 100 MB free disk space JDK Kit. Recommended

Week-1:

1. Write a Java program that prints all real solutions to the quadratic equation ax2 + bx + c = 0. Read in a, b, c and use the quadratic formula. If the descriminent (b2 -4ac) is negative, display a message stating that there are no real solutions.
2. The Fibonacci sequence is defined by the following rule:

The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

Week-2:

1. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
2. Write a Java program to multiply two given matrices.
3. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java. util)

Week- 3:

1. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
2. Write a Java program for sorting a given list of names in ascending order.
3. Write a Java program to make frequency count of words in a given text

Week-4:

1. Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
2. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
3. Write a Java program that displays the number of characters, lines and words in a text file.

Week- 5:

1. Write a Java program that:
   i. Implements stack ADT.
   ii. Converts infix expression into Postfix form
   iii. Evaluates the postfix expression

Week-6:

1. Develop an applet that displays a simple message.
2. Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

Week-7:

Write a Java program that works as a simple calculator. Use a grid layout to arrange Buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.

Week-8:

1. Write a Java program for handling mouse events.

Week-9:

1. Write a Java program that creates three threads. First thread displays "Good Morning"
2. every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.
3. Write a Java program that correctly implements producer consumer problem using the
4. concept of inter thread communication.

Week-10:

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

Week-11:

1. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.
2. Write a Java program that allows the user to draw lines, rectangles and ovals.

Week-12

1. A demonstration of the Progress Monitor toolbar. A timer is used to induce progress.
2. This example also shows how to use the UI Manager properties associated with progress monitors.
3. sample Swing application that manages several internal frames. This is the main class
4. for working with the Site Frame and Page Frame classes.

TEXT BOOKS:

1. H.M. Dietel and P.J. Dietel, "Java How to Program", 6th Edition, Pearson Education/PHI, ISBN:10:0132575663
2. Y. Daniel Liang, "Introduction to Java programming", 6th Edition, Pearson Education, ISBN:10:0132221586

WEB LINKS:

1. www.tatamcgrawhill.com/html/9780070636774.html
2. http://nptel.iitm.ac.in
3. www.roseindia.net
4. www.java2s.com

(EE138) POWER SYSTEMS SIMULATION LAB

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	I	-	-	3	2	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Apply programming idea and logic for power system study.
2. Understand the concept of Ferranti effect and reactive power absorption in a transmission line by simulation.
3. Perform simulation study of load flow analysis.
4. Understand the concepts of harmonic analysis and filtering.
5. Know the application of FC-TCR.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Analyze the transient stability of a given power system.
2. Analyze load flow studies for a given power system
3. Able to calculate the efficiency and regulation of a transmission line.
4. Understand the reactive power compensation in a distribution system.
5. Evaluate the voltages at all buses for any type of faults.
6. Conclude the harmonic values of supply voltage and current.
7. Develop the admittance matrix of system.
8. Designing of filter for mitigation of source harmonics.

LIST OF EXPERIMENTS:

Any 10 Experiments are to be performed.

1. Write a program to find the efficiency and regulation of a transmission line.
2. Write a program to find the bus admittance matrix of a given system.
3. Write a program to perform load flow analysis for a given power system data using Gauss-Seidel method.
4. Simulate and analyze the performance of ac voltage controller circuit for a given load and determination of THD of source voltage and current.
5. Write a program to perform transient stability analysis of a given power system.
6. Write a program to perform short circuit study of a given system.
7. Unit Commitment by dynamic programming method using MATLAB.
8. Write a program to perform economic load dispatch with and without losses.
9. Perform simulation analysis of single area load – frequency control of power systems.
10. Formation of Z-bus, using Z-bus build Algorithm without mutual coupling.
11. Load flow analysis using Newton-Raphson method.
12. Optimal generator scheduling for thermal power plants.

(CS102) COMPUTER ARCHITECTURE AND ORGANIZATION
(Professional Elective-5)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	II	3	-	--	3	30	70	100

COURSE OBJECTIVES:

1. Discuss the basic concepts and structure of computers
2. Understand concepts of register transfer logic and arithmetic operations.
3. Explain different types of addressing modes and memory organization.
4. Learn the different types of serial communication techniques.
5. Summarize the Instruction execution stages.

COURSE OUTCOMES:

1. Understand the theory and architecture of central processing unit.
2. Analyze some of the design issues in terms of speed, technology, cost, performance.
3. Design a simple CPU with applying the theory concepts.
4. Use appropriate tools to design verify and test the CPU architecture.
5. Learn the concepts of parallel processing, pipelining and interprocessor communication.
6. Understand the architecture and functionality of central processing unit.
7. Exemplify in a better way the I/O and memory organization.
8. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

UNIT – I

Digital Logic Circuits: Basic Logic Functions, Synthesis of Logic Functions Using AND, OR, and NOT Gates, Minimization of Logic Expression, Synthesis with NAND and NOR Gates, Flip-Flops, Registers and Shift Registers, Counters, Decoders, Multiplexers, Programmable Logic Devices (PLDs).

Basic Structure of Computers: Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers.

UNIT – II

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation, Other binary codes, Error Detection codes.

Register and Micro operations: Register Transfer language, Register Transfer Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

UNIT –III

Processing Unit: Instruction Codes, Computer Registers, Computer Instructions, Instruction Cycle, Memory Reference Instructions, Hardwired Control, Micro Programmed Control, Register organisation, Stack organisation, Instruction formats, Addressing modes, Data Transfer and manipulations, RISC, CISC.

Computer Arithmetic: Addition, subtraction, multiplication and division operations, Floating point Arithmetic operations.

UNIT – IV

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input-Output Processor , Serial communication.

Parallel and Vector Processing: Parallel and Vector Processing, Pipelining, Arithmetic pipeline, Instruction pipeline, RISC Pipeline, Vector Processing, Array Processors.

UNIT – V

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Virtual memory, Cache memory, Memory management hardware.

TEXT BOOKS:

1. Car Hamacher, Zvonks Vranesic, Safwat Zaky, "Computer Organization", V Edition, Mc Graw Hill, 2002. *ISBN*: 0071122184.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann / Elsevier, 2009.

REFERENCE BOOKS:

1. William Stallings, "Computer Organization and Architecture", Seventh Edition, PHI/Pearson, 2006. ISBN-10: 0131856448 ISBN-13: 9780131856448.
2. Andrew S. Tanenbaum, "Structured computer organization", 4th Edition PHI. ISBN-10: 0130661023 ISBN-13: 9780130661029.
3. M. Moris Mano, "Computer System Architecture", III rd Edition, PHI / Pearson, 2006. ISBN-10: 0131755633 | ISBN-13: 978-0131755635.

WEB LINKS:

1. http://nptel.iitm.ac.in
2. http://computerscience.jbpub.com/ecoa/2e/student_resources.cfm

(EE131) HIGH VOLTAGE DC TRANSMISSION
(Professional Elective-5)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Memorize the importance of HVDC Ttransmission Lines
2. Analyze HVDC System Converters.
3. Evaluate the faults and protections required in HVDC system
4. Analyze the idea of Harmonics and Filters
5. Describe the concepts of multiterminal DC links.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1) Analyze the functioning of HVDC System.
2) Discuss the advantages and applications of HVDC System.
3) Sketch the wave form for 6 pulse &12 pulse converter system.
4) Evaluate the operation and control of different converter system.
5) Analyze the faults in HVDC System.
6) Analyze the types of protection system in the HVDC System.
7) Describe the effects of Harmonics and its suppression by using Filters.
8) Elaborate the concept of Filters & its types.

UNIT – I

H.V.D.C. Transmission: General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration.

UNIT – II

Static Power Converters: 3-pulse, 6-pulse and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter -special features of converter transformers. Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters.

UNIT – III

Control of HVDC Converters and systems: constant current, constant extinction angle and constant Ignition angle control- Individual phase control and equidistant firing angle control, DC power flow control. Interaction between MV AC and DC systems - Voltage interaction, Harmonic instability problems and DC power modulation.

UNIT – IV

Multi-terminal DC links and systems; series, parallel and series parallel systems, their operation and control. Transient over voltages in HVDC systems: Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults.

UNIT – V

Converter faults and protection in HVDC Systems: Converter faults, over current protection - valve group, and DC line protection. Over voltage protection of converters, surge arresters.

TEXT BOOKS:

1. E.W. Kimbark, "Direct current Transmission", Wiely Inter Science- New York.
2. J. Arilaga, "H.V.D.C. Transmission", Peter Peregrinus Ltd., London UK, 1983

REFERENCE BOOKS:

1. K.R. Padiyar, "High Voltage Direct current Transmission", Wiely Eastern Ltd,, New Delhi –1992.
2. E. Uhlman, "Power Transmission by Direct Current", Springer Verlag, Berlin Helberg - 1985

(EE132) POWER SEMICONDUCTOR DRIVES
(Professional Elective-5)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. List out the different converters used for different motor.
2. Draw speed torque characteristics of drive system.
3. Discuss four quadrant converter circuits.
4. Apply closed loop system for drive applications.
5. Summarize self and separate control operations.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Apply rectifiers and choppers for speed control of DC motors.
2. Draw speed torque characteristics of DC motor by using different converters for different firing angles.
3. Discuss four quadrant operation of DC Motors by dual converter and chopper.
4. Develop closed loop blocks for speed control of DC Motor.
5. Classify voltage source inverter and current source inverter for AC drive system.
6. Analyze PWM techniques for AC Motors.
7. Compare speed control of induction motor at stator side and rotor side.
8. Apply cyclo converter and inverter for speed control of synchronous motor.

UNIT – I

Control of DC Motors By Single Phase Converters & Three Phase Converters: Introduction to Thyristor controlled Drives, Single Phase semi and Fully controlled converters connected to DC separately excited and DC series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed DC motors. Three phase semi and fully controlled converters connected to DC separately excited and DC series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – 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 (Block Diagram Only).

UNIT – III

Control of DC Motors By Choppers: 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 DC Motors – Closed Loop operation (Block Diagram Only).

UNIT – IV

Control of Induction Motor Through Stator Voltage and Stator Frequency: Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics. Variable frequency characteristics-Variable frequency control of induction motor by Voltage source and current source inverter and cyclo converters- PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only).

UNIT –V

Control of Induction Motor of Rotor Side and Control of Synchronous Motors: Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages applications – problems. Separate control & self control of synchronous motors – Operation of self controlled synchronous motors by VSI and CSI cycloconverters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control – using Cyclo converter, PWM Controlled VFI, CSI.

TEXT BOOKS:

1. G.K. Dubey, “Fundamentals of Electric Drives”, 2nd ed., Narosa Publications, 2002, ISBN:81-7319-031-3.
2. M.H. Rashid, “Power Electronic Circuits, Devices and Applications”, 2nd ed., PHI, 1995, ISBN: 81-203-0869-7.

REFERENCE BOOKS:

1. M.D. Singh and K B Khanchandani, “Power Electronics”, 2nd ed., Tata – McGraw-Hill Publishing Company, 2006, ISBN: 0070583897.
2. B.K. Bose, “Modern Power Electronics and AC Drives”, Eastern Economy Edition, PHI, 2005, ISBN: 8120327497, 9788120324498.
3. Vedam Subramanyam, “Thyristor Control of Electric drives”, 2nd ed., (Eight Reprint) Tata McGraw Hill Publications, 2008, ISBN: 81-224-0878-8.

(EE133) FLEXIBLE AC TRANSMISSION SYSTEMS
(Professional Elective-5)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Recognize the power flow in transmission system concepts.
2. Understand the operations of voltage source converters
3. Discuss the Objectives of shunt & Series compensation
4. Analyze the behavior of various FACTS devices
5. Describe the concepts of thyristor switched capacitors

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1) Analyze the facts controllers
2) Draw the Bridge converter transformer connection.
3) Identify the benefits of FACTS.
4) Aanalyze the objectives of shunt compensation.
5) Draw the V-I characteristics of VAR generators.
6) Analyze the Transient stability system.
7) Discuss the types of static series compensator.
8) Identify the difference between shunt and series compensators.

UNIT – I

Facts Concepts: Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

UNIT – II

Voltage Source Converters : Single phase three phase full wave bridge converters transformer connections for 12 pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, comparison of current source converters with voltage source converters.

UNIT – III

Static Shunt Compensation: Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation, variable impedance type static var generators switching converter type var generators hybrid var generators.

UNIT – IV

SVC and Statcom: Regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping operating point control and summary of compensator control.

UNIT – V

Static Series Compensators: Concept of series capacitive compensation, improvement of transient stability, power oscillation damping Functional requirements. GTO thyristor controlled series capacitor(GSC),thyristor switched series capacitor(TSSC), and thyristor controlled series capacitor(TCSC)control schemes for GSC TSSC and TCSC.

TEXT BOOKS:

1. N.G. Hingorani and L. Gyugi, "Understanding FACTS Concepts and Technology Of FACTS", B. S. Publications, Indian Reprint, 2000.
2. K.R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International Publishers, 2007.

REFERENCE BOOKS:

1. R. Mohan Mathur, Rajiv K. Varma, "Thyristor based FACTS Controller for Electrical Power Systems", John Wiley Sons, 2011.
2. X. P. Zhang, C. Rehtanz, B. Pal, "Flexible AC Transmission System Modeling and Control", Springer, 2006.

(EC118) EMBEDDED SYSTEMS
(Professional Elective-6)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Explain the design issues of embedded systems.
2. Comprehend embedded system design process
3. Interprets advanced architectures
4. Describes networked embedded systems
5. Interprets the basics of real-time operating system.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Interprets embedded system basic concepts and designing.
2. Explains challenges in designing embedded systems
3. Describes architecture of advanced processors
4. Explains instruction set and programming model of ARM processors
5. Describes bus protocols for embedded systems
6. Comprehends the architecture of the kernel of an operating system
7. Interprets task scheduling algorithms and other embedded RTOS concepts.
8. Develop an ability in designing and implementing embedded system

UNIT – I

Introduction to embedded systems: Embedded systems, classification of embedded systems, processor Embedded into a system, hardware units, software units in a system, Embedded SoC and use of VLSI Circuit Design Technology

UNIT – II

Embedded System Design Process, Examples of embedded systems, challenges in embedded system design, design examples.

UNIT – III

Introduction to Advanced Architectures: Architecture of advanced processors, 80x86 architecture, ARM, instruction set of ARM 7, SHARC, Tiger SHARC, Processor and memory organization , Instruction level parallelism.

UNIT – IV

Networked embedded systems: Bus protocols, I2C bus and CAN bus, USB bus, parallel bus device protocols, Internet – Enabled Systems.

UNIT – V

Embedded / RTOS Concepts: Architecture of the Kernel, Tasks and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes , Message Queues, Event Registers, Pipes, Signals, Timers, Memory Management, Priority inversion problem, Embedded operating systems, Embedded Linux, Real-time operating systems, RT Linux.

TEXT BOOKS:

1. Raj Kamal, "Embedded Systems – architecture, programming and design", 2nd edition, TMH.
2. KVKK Prasad, "Embedded/real time systems", Dreamtech Press, 2005.

REFERENCE BOOKS:

1. Wayne Wolf, "Computers as Components – Principles of Embedded Computing System Design", Elsevier (2nd Edition), ISBN-13: 9781558605411.
2. David E. Simon, "An Embedded Software Primer", Pearson Education.
3. Shibu K.V, "Introduction to Embedded Systems", Mc Graw Hill Systems.

(EE134) ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-6)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Memorize modelling of loads and their characteristics
2. Understand design of substations
3. Compare voltage drops for uniformly distributed loads and concentrated loads
4. Illustrate compensation methods for voltage drops and pf improvements
5. Analyze the Coordination of Protective Devices.

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Differentiate the types of loads and their characteristics
2. Design a radial and loop type distribution feeders.
3. Calculate the voltage drop and power loss in a distribution system.
4. Identify and design protection system.
5. Recognize the necessity of distribution system protection and devices available for discriminating faults
6. Discuss the need of pf correction and voltage drop compensation
7. Identify the best methods for pf improvement and voltage control
8. Design a suitable capacitance for voltage control in a distribution system.

UNIT – I

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

UNIT – II

Distribution Feeders: Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

UNIT – III

Substations and System Analysis: Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations. Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

UNIT – IV

Protection and Coordination: Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit reclosures, line sectionalizes, and circuit breakers. Coordination of Protective Devices: General coordination procedure.

UNIT – V

Compensation for Power Factor Improvement and Voltage Control: Capacitive compensation for power-factor control. Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors. (Fixed and switched), Power factor correction, capacitor allocation - Economic justification - Procedure to determine the best capacitor location. Voltage Control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

TEXT BOOKS:

1. Turan Gonen, "Electric Power Distribution system, Engineering", McGraw Hill Book Company, ISBN:142006200X, 9781420062007.
2. A.S. Pabla, "Electric Power Distribution", Tata McGraw Hill Publishing company, 2008, ISBN: 0070965528, 9780070965522.

REFERENCE BOOKS:

1. S. Sivanagaraju, V. Sankar, "Electrical Power Distribution and Automation", Dhanpat Rai & Co, 2006, ISBN: 978-93-8746-03-6.
2. V. Kamaraju, "Electrical Power Distribution Systems", Right Publishers, 1st edition, 2009, ISBN; 0070151415.

(EE136) ENERGY STORAGE SYSTEMS
(Professional Elective-6)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:

Students will be able to

1. Outline the various Electrical Storage Technologies
2. Identify the need of Electrical Energy storage in the present scenario
3. Categorize the Energy Storage systems and estimate the suitable system
4. List various types of energy systems based on their features
5. Apply the Energy system to various domestic and industrial requirements

COURSE OUTCOMES:

At the end of the course, students will develop an ability to

1. Explain and analyze the various Electrical Storage technologies existing
2. Predict the suitable Electrical Storage storage technologies
3. Identify the Electrical Storage significance
4. Distinguish various Electrical Storage systems
5. Select the Electrical Storage systems within the available system for the required application
6. Identify the necessary of Electrical Storage systems at the load end
7. Apply the Electrical Storage systems for domestic purpose
8. Apply the Electrical Storage systems for new emerging technologies like smart grid, non-conventional energy sources

UNIT - I

Electrical Energy Storage Technologies: Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

UNIT - II

Needs for Electrical Energy Storage: Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT - III

Features of Energy Storage Systems: Classification of EES systems , Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

UNIT - IV

Types of Electrical Energy Storage systems: Electrical storage systems, Double-layer capacitors (DLC) ,Superconducting magnetic energy storage (SMES),Thermal storage systems ,Standards for EES, Technical comparison of EES technologies.

UNIT - V

Applications: Present status of applications, Utility use (conventional power generation, grid operation & service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA–aggregation of many dispersed batteries.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Jim Eyer, Garth Corey: Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.
2. Ru-shiliu, Leizhang, Xueliangsun, "Electrochemical technologies for energy storage and conversion" , Wiley publications, 2012.

(EE137) SMART GRID
(Professional Elective-6)

Year	Semester	Hours / Week			C	Marks		
		L	T	P/D		CIE	SEE	Total
IV	II	3	-	-	3	30	70	100

COURSE OBJECTIVES:
Students will be able to
1. Remember the concepts of power systems operation
2. Recollect the Generation, Transmission, Distribution systems
3. Understand the smart grid is a perfect power system configuration in various aspects
4. Analyze the intelligent architecture of the smart grid and its dynamics
5. Understand the market implementation and efficient end use technologies

COURSE OUTCOMES:
At the end of the course, students will develop an ability to
1. Know the electricity network, integrated power system in smart grid technology
2. Understand the AC Vs DC system and importance of DC distribution, DC data centre
3. Understand the smart grid vision based on the intelligent architecture and it barriers
4. Analyze the integrated communications architecture and smart grid dynamics
5. Understand the energy port, its features and market implementation
6. Analyze the policies to encourage end use customers
7. Evaluate the performance of smart grid technologies and its monitoring
8. Apply their knowledge for efficient electric end use technology

UNIT–I
INTRODUCTION
Introduction to smart grid, Electricity network-Local energy networks- Electric transport-action- Low carbon central generation-Attributes of the smart grid- Alternate views of a smart grid.
SMART GRID TO EVOLVE A PERFECT POWER SYSTEM: Introduction- Overview of the perfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems- Fully integrated power system-Nodes of innovation.

UNIT–II
DC DISTRIBUTION AND SMART GRID
AC Vs DC sources-Benefits of and drives of DC power delivery systems-Powering equipment and appliances with DC-Data centers and information technology loads-Future neighborhood Potential future work and research.

INTELLIGRID ARCHITECTURE FOR THE SMARTGRID: Introduction- Launching intelligrid- Intelligrid today- Smart grid vision based on the intelligrid architecture-Barriers and enabling technologies.

UNIT–III

DYNAMIC ENERGY SYSTEMS CONCEPT:

Smart energy efficient end use devices-Smart distributed energy resources-Advanced whole building control systems- Integrated communications architecture-Energy management-Role of technology in demand response- Current limitations to dynamic energy management-Distributed energy resources-Overview of a dynamic energy management-Key characteristics of smart devices- Key characteristics of advanced whole building control systems-Key characteristics of dynamic energy management system.

UNIT–IV

ENERGY PORT AS PART OF THE SMART GRID:

Concept of energy -Port, generic features of the energy port.

POLICIES AND PROGRAMS TO ENCOURAGE END – USE ENERGY EFFICIENCY: Policies and programs in action -multinational - national-state-city and corporate levels.

MARKET IMPLEMENTATION: Framework-factors influencing customer acceptance and response - program planning-monitoring and evaluation.

UNIT–V

EFFICIENT ELECTRIC END–USE TECHNOLOGY ALTERNATIVES: Existing technologies – lighting - Space conditioning - Indoor air quality - Domestic water heating - hyper efficient appliances - Ductless residential heat pumps and air conditioners – Variable refrigerant flow air conditioning-Heat pump water heating - Hyper efficient residential appliances - Data center energy efficiency- LED street and area lighting - Industrial motors and drives -Equipment retrofit and replacement - Process heating - Cogeneration, Thermal energy storage - Industrial energy management programs - Manufacturing process-Electro-technologies, Residential, Commercial and industrial sectors.

TEXT BOOKS:

1. Clark W Gellings, “The Smart Grid, Enabling Energy Efficiency and Demand Side Response,” 1st ed., CRC Press, 2009.
2. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, Nick Jenkins, “Smart Grid: Technology and Applications”, Student Edition, Wiley, 2015.

REFERENCE BOOKS:

1. Nicolás Rubido, “Energy Transmission and Synchronization in Complex Networks Mathematical Principles,” 1st ed., Springer and Kindle edition, 2016.
2. S K Gupta, “Power System Operation Control and Restructuring”, Kindle Edition, PHI, 2015.
3. James Momoh, “Smart Grid: Fundamentals of Design and Analysis”, 1st ed., Wiley, IEEE Press, 2012.