School of Electrical Sciences
Dept. of Electrical and Electronics Engineering

UG SYLLABUS AND CURRICULUM

Choice Based Credit System (CBCS)
(Applicable for students admitted with effect from 2015 – 16)

HINDUSTAN
INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)

"TO MAKE EVERY MAN A SUCCESS AND NO MAN A FAILURE"

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VISION, MISSION OF THE DEPARTMENT

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

- To educate the students in the recent developments of emerging fields in Electrical and Electronics Engineering, to encourage research activities, innovate techniques and to develop managerial abilities so as to make them excel globally.

MISSION

- To impart quality education in Electrical and Electronics Engineering.
- To upgrade curriculum continuously to meet the industrial requirement.
- To develop ability for research, innovation and entrepreneurship.
- To promote awareness about social and ethical responsibilities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO) – *(to be achieved by the graduate after 4 to 5 years of graduation)*	
PEO-1	To prepare students for successful careers in Industry and Academics that meets the need of global industries.
PEO -2	To enable the students to obtain breadth and depth through required core courses in circuits, electronics, communications, control systems, microprocessors, electromagnetics and electric machines, elective courses consistent with the range of technical specialties and required courses from other disciplinary.
PEO -3	To enable the students to function as accomplished professionals in electrical engineering field with due emphasis on personality development and communication skills.
PEO -4	To provide opportunity for students to work as part of teams on multidisciplinary projects
PEO-5	To enable the student to adapt to absorb new techniques and innovate in modern technological environment.

PROGRAMME OUTCOMES

PROGRAMME OUTCOMES *(To be achieved by the student after every semester/year/and at the time of graduation)*	
PO-1	Ability to apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex Electrical and Electronics engineering problem.
PO -2	Ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
PO -3	Ability to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, cultural, societal and environmental considerations.

PO -4	Ability to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO -5	Ability to create, select and apply appropriate techniques, resources and modern engineering tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO-6	Ability to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO -7	Ability to understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development
PO -8	Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO -9	Ability to function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
PO -10	Ability to communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, comprehension and writing effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO -11	Ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO-12	Ability to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SEMESTER I

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	ELA101	CF	Technical English	3	0	0	3	3
2	MAA101	CF(BS)	Engineering Mathematics–I	3	1	0	4	4
3	PHA101/ CYA101	CF(BS)	Engineering Physics / Engineering Chemistry	3	0	0	3	3
4	CSA101	CF(ES)	Computer Programming	3	0	0	3	3
Practical								
5	PHA131/ CYA131	CF(BS)	Physics lab/Chemistry Lab*	0	0	3	1	3
6	CSA131	CF(ES)	Computer Programming Lab	0	0	3	1	3
7	ELA131	CF	Communication Skills Lab-I	0	0	3	1	3
8	GEA131	CF(ES)	Engineering Practices Lab-I	0	0	3	1	3
Total							**17**	**25**

SEMESTER II

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	MAA102	CF (BS)	Engineering Mathematics – II	3	1	0	4	4
2	PHA101/ CYA101	CF(BS)	Engineering Physics* / Engineering Chemistry	3	0	0	3	3
3	CYA102	CF (BS)	Environmental Sciences	3	0	0	3	3
4	EEB101	CC(PC)	Circuit Theory	3	1	0	4	4

5	EEB102	CC(PC)	Electronic Devices	3	0	0	3	3
6	ELA102	CF	Personality Development and Soft Skills	3	0	0	3	3
Practical								
7	MEA101	CF(ES)	Computer Aided Engineering Drawing	1	1	3	3	5
8	PHA131/ CYA131	CF(BS)	Physics lab/Chemistry Lab*	0	0	3	1	3
9	GEA132	CF(ES)	Engineering Practices Lab-II#	0	0	3	1	3
10	EEB131	CC(PC)	Circuit Theory Laboratory	0	0	3	1	3
Total							**26**	**34**

SEMESTER III

Sl. No.	**Course Code**	**Course classification**	**Course Title**	**L**	**T**	**P**	**C**	**TCH**
Theory								
1	MAA202	CF (BS)	Engineering Mathematics – III	3	1	0	4	4
2	EEB201	CC (PC)	Electromagnetic Theory	3	1	0	4	4
3	EEB 202	CC (PC)	Electrical Machines – I	3	1	0	4	4
4	EEB203	CC (PC)	Electronic Circuits	3	0	0	3	3
5	EEB204	CC (PC)	Measurements and Instrumentation	3	0	0	3	3
6	SSA231	CF	Aptitude III	1	0	1	1	2
7		EE	EE I	3	0	0	3	3
Practical								
8	EEB231	CC (PC)	Electrical Machines Laboratory- I	0	0	3	1	3
9	EEB232	CC (PC)	Electronic Devices and Circuits Laboratory	0	0	3	1	3
10	EEB233	CC (PC)	Measurement and Instrumentation Laboratory	0	0	3	1	3
Total							**25**	**32**

SEMESTER IV

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	MAA202	CF (BS)	Numerical Methods	3	1	0	4	4
2	EEB205	CC (PC)	Electrical Machines – II	3	1	0	4	4
3	EEB206	CC (PC)	Control Systems	3	1	0	4	4
4	EEB207	CC (PC)	Digital Logic Circuits	3	1	0	4	4
5	SSA232	CF	Aptitude IV	1	0	1	1	2
6		EE	Engineering Elective-II	3	0	0	3	3
7		OE	Open Elective-I	3	0	0	3	3
Practical								
8	EEB 234	CC(pc)	Electrical Machines Laboratory- II	0	0	3	1	3
9	EEB235	CC(pc)	Control System Laboratory	0	0	3	1	3
10	EEB236	CC(pc)	Digital Logic Circuits Laboratory	0	0	3	1	3
11	EEB237	CC(pc)	Design Project-I*	0	0	8	3	8
Total								

SEMESTER V

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	EEB301	CC (PC)	Power Electronics	3	1	0	4	4
2	EEB302	CC (PC)	Transmission and Distribution	3	1	0	4	4
3	SSA331	CF	Placement Preparatory Program	1	0	1	1	2
4		PE	PE I	3	0	0	3	3

5		PE	PE II	3	0	0	3	3
6		EE	Engineering Elective-III	3	0	0	3	3
7		OE	Open Elective-II	3	0	0	3	3
Practical								
8	EEB331	CC (PC)	Linear Integrated Circuits Laboratory	2	0	2	3	4
9	EEB332	CC (PC)	Power Electronics Laboratory	0	0	3	1	3
10	EEB333	CC (PC)	Solar energy systems lab	2	0	2	3	4
Total							**28**	**32**

SEMESTER VI

Sl. No.	**Course Code**	**Course classification**	**Course Title**	**L**	**T**	**P**	**C**	**TCH**
Theory								
1	EEB304	CC (PC)	Power System Analysis	3	1	0	4	4
2	EEB305	CC (PC)	Microprocessor and Microcontroller	3	0	0	3	3
3	EEB306	CC (PC)	Design of Electrical Apparatus	3	1	0	4	4
4		PE	Professional Elective-III	3	0	0	3	3
5		PE	Professional Elective-IV	3	0	0	3	3
6		EE	Engineering Elective-IV	3	0	0	3	3
Practical								
7	EEB334	CC (PC)	Microprocessor and Microcontroller Laboratory	0	0	3	1	3
8	EEB335	CC (PC)	Power System Simulation Laboratory	0	0	3	1	3
9	ELA331	CF	Communication Skills and Personality Development	2	0	2	3	4
Total							**25**	**30**

SEMESTER VII

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	EEB401	CC (PC)	Power System Operation and Control	3	1	0	4	4
2	CSB411	CC (PC)	DSA + OOPS	3	0	0	3	3
3		PE	Professional Elective-V	3	0	0	3	3
4		PE	Professional Elective-VI	3	0	0	3	3
5		EE	Engineering Elective-V	3	0	0	3	3
6		OE	Open Elective-IV	3	0	0	3	3
Practical								
7	CSB435	CC (PC)	DSA + OOPS LAB	0	0	3	1	3
8	EEB431	CC (PC)	Electrical Drives and Control Laboratory	0	0	3	1	3
9	EEB432	CC (PC)	Comprehension and Viva – voce	0	0	3	1	3
10	EEB433	CC(PC)	Design Project	0	0	9	3	9
Total							**25**	**37**

SEMESTER VIII

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Practical								
1	EEB441	CC (PC)	Project & Viva-voce	0	0	24	6	24
Total							**6**	**24**

PROFESSIONAL ELECTIVE COURSES

ELECTIVE I

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	ECC351	PE	Digital Signal Processing	3	0	0	3	3
2	EEC351	PE	Protection and Switchgear/PS	3	0	0	3	3
3	EEC352	PE	Solar Energy Systems/EE	3	0	0	3	3

ELECTIVE II

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	EEC353	PE	Linear Integrated Circuits	3	0	0	3	3
2	EEC354	PE	High Voltage Direct Current Transmission/PS	3	0	0	3	3
3	EEC355	PE	Wind Energy Conversion System/EE	3	0	0	3	3

ELECTIVE III

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	EEC356	PE	High Voltage Engineering	3	0	0	3	3
2	EEC357	PE	Renewable Energy Systems	3	0	0	3	3
3	EEC358	PE	Micro Controller and DSP Based System Design	3	0	0	3	3
4	EEC359	PE	Solid State Drives/EDC	3	0	0	3	3

ELECTIVE IV

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	EEC360	PE	Real Time Systems	3	0	0	3	3
2	EEC361	PE	Advanced Control Theory/EDC	3	0	0	3	3
3	EEC362	PE	Nuclear Science and Engineering/EE	3	0	0	3	3
4	EEC363	PE	Power Plant Engineering	3	0	0	3	3

ELECTIVE V

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	EEC451	PE	Power Quality/PS	3	0	0	3	3
2	EIC451	PE	Fiber Optics and Laser Instruments	3	0	0	3	3
3	EEC452	PE	Special Electrical Machines/EDC	3	0	0	3	3

ELECTIVE VI

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	EIC452	PE	Biomedical Instrumentation	3	0	0	3	3
2	EEC453	PE	Embedded System Design/EDC	3	0	0	3	3
3	EEC454	PE	Power System and Smart Grid/PS	3	0	0	3	3
4	EEC455	PE	Electrical Energy Generation Utilization and Conservation	3	0	0	3	3

ENGINEERING ELECTIVES

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	EED251	EE I	Electrical Drives and Control	3	0	0	3	3
2	EED252	EE II	Electronics and Microprocessors	3	0	0	3	3
3	EED351	EE III	Control Engineering	3	0	0	3	3
4	EED352	EE IV	Energy Audit and Energy Regulation/EE	3	0	0	3	3
5	EED451	EE V	Building Services	3	0	0	3	3

SEMESTER WISE CREDIT

Course Category		I	II	III	IV	V	VI	VII	VIII	Total	Grand Total
CF	**English**	3+1	0+3	1	1	1	3	-	-	**13**	**49**

	BS	7+1	7+4	4	4	-	-	-	-	**27**	
	ES	5	4	-	-	-	-	-	-	**9**	
CC	**PC (Theory)**	-	7	14	12	8	11	7	-	**59**	**108**
	PC (Practical)	-	1	3	6	7	2	6	6	**31**	
	PE	-	-	-	-	6	6	6	0	**18**	
EE		-	-	3	3	3	3	3	-	**15**	**15**
OE		-	-	-	3	3	3	3	-	**12**	**12**
Total											**184**

SEMESTER I

ELA101 TECHNICAL ENGLISH

3 CREDITS

GOAL

The goal of the programme is to provide a theoretical input towards nurturing accomplished learners who can function effectively in the English language skills; to cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning; to help them become responsible members or leaders of the society in and around their workplace or living space; to communicate successfully at the individual or group level on engineering activities with the engineering community in particular, and on multi-disciplinary activities in general, with the world at large.

OBJECTIVES

The course should enable the students:

(i) To widen the capacity of the learners to listen to English language at the basic level and

understand its meaning.

(ii) To enable learners to communicate in an intelligible English accent and pronunciation.

(iii) To assist the learners in reading and grasping a passage in English.

(iv) To learn the art of writing simple English with correct spelling, grammar and punctuation.

(v) To cultivate the ability of the learners to think and indulge in divergent and lateral thoughts.

OUTCOME

(i) The learners will have the self-confidence to improve upon their informative listening skills by an enhanced acquisition of the English language.

(ii) The learners will be able to speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.

(iii) The learners will be able to read, comprehend and answer questions based on literary, scientific and technological texts.

(iv) The learners will be able to write instructions, recommendations, checklists, process-description, letter-writing and report writing.

(v) The learners will have the confidence to develop thinking skills and participate in brainstorming, mind-mapping, audiovisual activities, creative thinking and also answer tests in the job-selection processes.

UNIT I LISTENING SKILL 9

Topics: Listening to the sounds, silent letters & stress in English words & sentences - Listening to conversation & telephonic conversation -- Listening for general meaning & specific information -- Listening for positive & negative comments - Listening to technical topics - Listening to prose & poetry reading -- Listening exercises.

Embedded language learning: Sentence definition -- Spelling & punctuation -- Imperative form - Sequencing of sentences -- Gerunds -- Infinitives -- 'Wh-'questions.

UNIT II SPEAKING SKILL 9

Topics: Self-introduction - Expressing personal opinion - Dialogue - Conversation - Simple oral interaction -- Speaking on a topic -- Expressing views for & against -- Speaking on personal topics like hobbies, topics of interest, present & past experiences, future plans - Participating in group discussions, role plays, debates, presentations, power-point presentations & job-interviews.

Embedded language learning: Adverbs -Adjectives - Comparative and Numerical adjectives – Nouns & compound nouns -- Prefixes and suffixes.

UNIT III READING SKILL 9

Topics: Reading anecdotes, short stories, poems, parts of a novel, notices, message, time tables, advertisements, leaflets, itinerary, content page - Reading pie chart & bar chart -- Skimming and scanning -- Reading for contextual meaning - Scanning for specific information -- Reading newspaper & magazine articles - Critical reading -- Reading-comprehension exercises.

Embedded language learning: Tenses - Active and passive voice -- Impersonal passive -- Words and their function -- Different grammatical forms of the same word.

UNIT IV WRITING SKILL 9

Topics: Writing emails, notes, messages, memos, notices, agendas, advertisements, leaflets, brochures, instructions, recommendations & checklists -- Writing paragraphs -- Comparisons & contrasts - Process description of Flow charts - Interpretation of Bar charts & Pie charts - Writing the minutes of a meeting -- Report writing -- Industrial accident reports -- Letter-writing --

Letter to the editors - Letter inviting & accepting or declining the invitation - Placing orders - Complaints – Letter requesting permission for industrial visits or implant training, enclosing an introduction to the educational institution -- Letters of application for a job, enclosing a CV or Resume - Covering letter.
Embedded language learning: Correction of errors - Subject-verb Concord -- Articles - Prepositions -- Direct and indirect speech.

UNIT V THINKING SKILL **9**

Topics: Eliciting & imparting the knowledge of English using thinking blocks - Developing thinking skills along with critical interpretation side by side with the acquisition of English -- Decoding diagrams & pictorial representations into English words, expressions, idioms and proverbs.
Embedded language learning: General vocabulary -- Using expressions of cause and effect -- Comparison & contrast -- If-conditionals -- Expressions of purpose and means.

TOTAL=45

REFERENCES

1. Norman Whitby. Business Benchmark: Pre-Intermediate to Intermediate - BEC Preliminary. New Delhi: Cambridge University Press, 2008 (Latest South Asian edition).
2. Devaki Reddy & Shreesh Chaudhary. Technical English. New Delhi: Macmillan, 2009.
3. Rutherford, Andrea J. Basic Communication Skills for Technology. 2nd edition. New Delhi: Pearson Education, 2010.

MAA101 ENGINEERING MATHEMATICS - I

4 CREDITS

GOAL

To impart comprehensive knowledge in engineering mathematics.

OBJECTIVES

The course should enable the students to:

(i) Find the inverse of the matrix by using Cayley Hamilton Theorem and Diagonalisation of matrix using transformation.
(ii) Understand the Evolutes and Envelope of the curve.
(iii) Learn the solutions of second order linear differential equations of standard types and Legendre's linear differential equation.
(iv) Learn partial differentiations involving two and three variables and expansions of functions using Taylor series.
(v) Learn the expansions of trigonometric, hyperbolic functions and their relations.

OUTCOME

The students should be able to:

(i) Identify Eigen value problems from practical areas and obtain its solutions. Using transformation, diagonalising the matrix would render Eigen values.
(ii) Find out effectively the geometrical aspects of curvature and use mathematical skills in constructing evolutes and envelopes in mechanics and engineering drawing.
(iii) Recognize and model mathematically and solve the differential equations arising in science and engineering.
(iv) Understand and model the practical problems and solve it using maxima and minima as elegant applications of partial differentiation.
(v) Acquire skills using trigonometric, hyperbolic and inverse hyperbolic functions.

UNIT I MATRICES **12**

Review: Basic concepts of matrices-addition, subtraction, multiplication of matrices - adjoint - inverse - solving cubic equations.Characteristic equation - Properties of Eigen values - Eigen values and Eigen vectors - Cayley Hamilton theorem (without proof) - Verification and inverse using Cayley Hamilton theorem. Diagonalisation of matrices - Orthogonal matrices - Quadratic form - Reduction of symmetric matrices to a Canonical form using orthogonal transformation - Nature of quadratic form.

UNIT II DIFFERENTIAL CALCULUS **12**

Review: Basic concepts of differentiation - function of function, product and quotient rules.Methods of differentiation of functions - Cartesian form - Parametric form - Curvature - Radius of curvature - Centre of curvature - Circle of curvature. Evolutes of parabola, circle, ellipse, hyperbola and cycloid - Envelope.

UNIT III ORDINARY DIFFERENTIAL EQUATIONS **12**

Review: Definition, formation and solutions of differential equations.Second order differential equations with constant coefficients - Particular integrals - , eaxCosbx, eaxSinbx. Euler's homogeneous linear differential equations - Legendre's linear differential equation - Variation of parameters.

UNIT IV PARTIAL DIFFERENTIATION **12**

Partial differentiation - differentiation involving two and three variables - Total differentiation - Simple problems.Jacobian - verification of properties of Jacobians - Simple problems.Taylor's series - Maxima and minima of functions of two and three variables.

UNIT V TRIGONOMETRY **12**

Review: Basic results in trigonometry and complex numbers - De Moivre's theorem. Expansions of sinn, cosn, tann where n is a positive integer. Expansions of in terms of sines and cosines of multiples of where m and n are positive integers.Hyperbolic and inverse hyperbolic functions - Logarithms of complex numbers - Separation of complex functions into real and imaginary parts - Simple problems.

Note: Questions need not be asked from review part.

TOTAL: 60

TEXT BOOKS

1. Erwin Kreyzig, A Text book of Engineering Mathematics, John Wiley, 1999.
2. Grewal B.S, Higher Engineering Mathematics, Thirty Eighth Editions, Khanna Publisher, Delhi, 2004.
3. Chandrasekaran A, A Text book of Engineering Mathematics I, Dhanam Publications, Chennai, 2010.

REFERENCES

1. Venkataraman M.K, Engineering Mathematics, Volume I, The National Publishing Company, Chennai, 1985.
2. Kandaswamy P, Thilagavathy K and Gunavath K, Engineering Mathematics, Volume I & II, S.Chand and Company, New Delhi, 2005.
3. Bali N.P, Narayana Iyengar. N.Ch., Engineering Mathematics, Laxmi Publications Pvt. Ltd, New Delhi, 2003.
4. Veerarajan T, Engineering Mathematics (for first year), Fourth Edition,Tata McGraw - Hill Publishing Company Limited, New Delhi, 2005.

PHA101 ENGINEERING PHYSICS

3 CREDITS

GOAL

To impart fundamental knowledge in various fields of Physics and its applications.

OBJECTIVES

The course should enable the students:

(i) To develop strong fundamentals of properties and behavior of the materials
(ii) To enhance theoretical and modern technological aspects in acoustics and ultrasonics.
(iii) To enable the students to correlate the theoretical principles with application oriented study of optics.
(iv) To provide a strong foundation in the understanding of solids and materials testing.
(v) To enrich the knowledge of students in modern engineering materials.

OUTCOME

The students should be able to:

(i) Understand the properties and behavior of materials.
(ii) Acquire fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and ultrasonic.
(iii) Understand the concept, working and application of lasers and fiber optics.
(iv) Know the fundamentals of crystal physics and non-destructive testing methods.
(v) Have an understanding of the production, characteristics and application of the new engineering materials. This would aid them in the material selection stage.

UNIT I PROPERTIES OF MATTER 9

Elasticity - types of moduli of elasticity - Stress-Strain diagram - Young's modulus of elasticity - Rigidity modulus - Bulk modulus - Factors affecting elasticity - twisting couple on a wire - Torsional pendulum - determination of rigidity modulus of a wire - depression of a cantilever - Young's modulus by cantilever - uniform and non-uniform bending - viscosity - Ostwald's viscometer - comparison of viscosities.

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - characteristics of musical sound - intensity - loudness - Weber Fechner law Decibel - Reverberation - Reverberation time, derivation of Sabine's formula for reverberation time(Jaeger's method) - absorption coefficient and its determination - factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics - production - Magnetostriction and Piezoelectric methods - properties applications of ultrasonics with particular reference to detection of flaws in metal (Non - Destructive testing NDT) - SONAR.

UNIT III LASER AND FIBRE OPTICS 9

Principle of lasers - Stimulated absorption - Spontaneous emission, stimulated emission - population inversion - pumping action - active medium - laser characteristics - Nd-Yag laser - CO2 laser - Semiconductor laser - applications - optical fiber - principle and propagation of light in optical fibers - Numerical aperture and acceptance angle - types of optical fibers - single and multimode, step index and graded index fibers - applications - fiber optic communication system.

UNIT IV CRYSTAL PHYSICS AND NON- DESTRUCTIVE TESTING 9

Crystal Physics: Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - coordination number

- Packing factor for SC, BCC, FCC and HCP structures.
Non Destructive Testing: Liquid penetrate method - Ultrasonic flaw detection - ultrasonic flaw detector (block diagram) - X-ray Radiography - Merits and Demerits of each method.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS 9

Modern Engineering Materials: Metallic glasses: Preparation properties and applications. Shape memory alloys (SMA): Characteristics, applications, advantages and disadvantages of SMA. Nano Materials: Synthesis -Properties and applications.
Superconducting Materials: Superconducting phenomena - Properties of superconductors - Meissner effect - Type I and Type II superconductors - High Tc superconductors (qualitative) - uses of superconductors.

TOTAL = 45

TEXT BOOKS:

1. Gaur R.K. and Gupta S.L., "Engineering Physics", 8th edition, Dhanpat rai publications (P) Ltd., New Delhi 2010.
2. P.Mani, "Engineering Physics", Vol-I, Dhanam Publications, Chennai 2011.
3. Rajendran V. an Marikani A., "Applied Physics for engineers" , 3rd edition, Tata Mc Graw -Hill publishing company Ltd., New Delhi,2003.

REFERENCES:

1. Uma Mukherji, "Engineering Physics ", Narosa publishing house, New Delhi, 2003.
2. Arumugam M., "Engineering Physics", Anuradha agencies, 2007.
3. Palanisamy P.K., "Engineering Physics", SciTech Publications, Chennai 2007.
4. Arthur Beiser, "Concepts of Modern Physics", Tata Mc Graw -Hill Publications, 2007.
5. P.Charles, Poople and Frank J. Owens, "Introduction to Nanotechnology", Wiley India, 2007.

CYA101 ENGINEERING CHEMISTRY

3 CREDITS

GOAL

To impart basic principles of chemistry for engineers.

OBJECTIVES

(i) To make the students conversant with the basics of Water technology.
(ii) To make the students conversant with the basics of Polymer science.
(iii) To provide knowledge on the requirements and properties of a few important engineering materials.
(iv) To educate the students on the fundamentals of corrosion and its control.
(v) To give a sound knowledge on the basics of a few significant terminologies and concepts in thermodynamics.
(vi) To create an awareness among the present generation about the various conventional energy sources

OUTCOME

(i) The students will gain basic knowledge in water analysis and suitable water treatment method.
(ii) The study of polymer chemistry will give an idea on the type of polymers to be used in engineering applications.
(iii) Exposure of the students to the common engineering materials will create awareness among the students to search for new materials.
(iv) Knowledge on the effects of corrosion and protection methods will help the young minds

to choose proper metal / alloys and also to create a design that has good corrosion control.

(v) Students with good exposure on the important aspects of basic thermodynamics will be able to understand the advanced level thermodynamics in engineering applications.

(vi) A good background on the various aspects of energy sources will create awareness on the need to utilize the fuel sources effectively and also for exploring new alternate energy resources.

UNIT I WATER TECHNOLOGY AND POLYMER CHEMISTRY 9

Hardness (Definition, Types, Units) - problems - Estimation of Hardness (EDTA Method) - Water softening - Carbonate conditioning and Calgon conditioning - Demineralization (Ion-Exchange Method) - Water Quality Parameters - Municipal Water Treatment- Desalination - Reverse Osmosis.

Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys - Definition, Examples.

UNIT II ENGINEERING MATERIALS 9

Properties of Alloys - Heat Treatment of Steel - Polymer Composites - types and applications.- Lubricants - Classification, properties and applications - Mechanism of Lubrication - MoS2 And Graphite - Adhesives - classification and properties - Epoxy resin (Preparation, properties and applications) - Refractories - Classification, Properties and General Manufacture - Abrasives - Classification, Properties and Uses - Carbon nano tubes - preparation, properties and applications.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Conductometric Titration - HCl vs NaOH and mixture of acids vs NaOH - Electrochemical Series and its applications - Nernst Equation - problems - Polarization, Decomposition Potential, Over-voltage (definitions only) - Galvanic series - Corrosion (Definition, Examples, effects) - Mechanism of Dry Corrosion and Wet Corrosion - Differential aeration Corrosion , examples - Factors Influencing Corrosion - Metal and Environment - Corrosion Control - Design -Cathodic Protection methods - Protective Coatings - Galvanising - Anodising - Electroplating (Cu and Ni) and Electroless plating (Cu and Ni) - Constituents of Paints and varnish.

UNIT IV CHEMICAL THERMODYNAMICS 9

Thermodynamic terminology- First Law of Thermodynamics-Internal energy- enthalpy - heat capacity - work done in isothermal expansion of an ideal gas -problems - second law of thermodynamics - entropy change - phase transformations and entropy change - problems - Work Function & Free Energy Function- Maxwell's Relations-Gibbs Helmholtz equation- van't Hoff Isotherm- van't Hoff Isochore - Problems.

UNIT V FUELS AND ENERGY SOURCES 9

Fuels - classification - Calorific Value - Dulong's Formula - Problems - Determination of Calorific Value by Bomb Calorimeter - Coal - Proximate Analysis - problems - Octane Number - Cetane Number - Diesel Index (Definitions only) - Bio Gas - Producer Gas -Water Gas - Preparation, Properties and Uses - Batteries - Primary Cells - Leclanche Cell -Secondary Cell - Nickel Cadmium Battery - Fuel Cells - Hydrogen -Oxygen Fuel Cell - Solar Battery - Lead Acid Storage Cell - Nuclear Energy - Light water nuclear power plant.

TOTAL : 45

TEXT BOOKS

1. S. S. Dara, Text Book of Engineering Chemistry, S. Chand & Company Ltd., New Delhi, 2003
2. Murthy, Agarwal & Naidu, Text Book of Engineering Chemistry, BSP, 2003.
3. S.Sumathi, Engineering Chemistry, Dhanam Publications, 2008.
4. S.Sumathi and P.S.Raghavan, Engineering Chemistry II, Dhanam Publications, 2008.

REFERENCES

1. B. K. Sharma, Engineering chemistry, Krishna Prakasam Media (P) Ltd., 2003
2. A. Gowarikar, Text Book of Polymer Science, 2002
3. Kuriacose & Rajaram, Vols. 1 & 2, Chemistry in Engineering and Technology, 2004
4. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing Co. Jalandar, 2004.

CSA101 COMPUTER PROGRAMMING

3 CREDITS

GOAL

To introduce computers and programming and to produce an awareness of the power of computational techniques that are currently used by engineers and scientists and to develop programming skills to a level such that problems of reasonable complexity can be tackled successfully.

OBJECTIVES

The course should enable the students to:

1. Learn the major components of a Computer system.
2. Learn the problem solving techniques.
3. Develop skills in programming using C language.

OUTCOME

The student should be able to:

1. Understand the interaction between different components of Computer system and number system.
2. Devise computational strategies for developing applications.
3. Develop applications (Simple to Complex) using C programming language.

UNIT I COMPUTER FUNDAMENTALS 9

Introduction - Evolution of Computers - Generations of Computer - Classification of Computers - Application of Computers - Components of a Computer System - Hardware - Software - Starting a Computer (Booting) - Number Systems.

UNIT II COMPUTER PROGRMMING AND LANGUAGES 9

Introduction - Problem-Solving Techniques: Algorithms, Flowchart, Pseudocode - Program Control Structures - Programming Paradigms - Programming languages - Generations of Programming Languages - Language Translators - Features of a Good Programming Languages.

UNIT III PROGRAMMING WITH C 9

Introduction to C - The C Declaration - Operators and Expressions - Input and Output in C - Decision Statements - Loop Control Statements.

UNIT IV FUNCTIONS, ARRAYS AND STRINGS **9**

Functions - Storage Class - Arrays - Working with strings and standard functions.

UNIT V POINTERS, STRUCTURES AND UNION **9**

Pointers - Dynamic Memory allocation - Structure and Union - Files.

TOTAL = 45

TEXT BOOK

1. ITL Education Solution Limited, Ashok Kamthane, "Computer Programming", Pearson Education Inc 2007 (Unit: I to V).

REFERNCES

1. Byron S. Gottfried, "Programming with C", Second Edition, Tata McGraw Hill 2006.
2. Yashvant Kanetkar, "Let us C", Eighth edition, BPP publication 2007.
3. Stephen G.Kochan, "Programming in C - A Complete introduction to the C programming language", Pearson Education, 2008.
4. T.JeyaPoovan, "Computer Programming Theory and Practice", Vikas Pub, New Delhi.

PHA131 PHYSICS LAB

1 CREDIT

OBJECTIVES

The course should enable the students to:

I. Determine the of rigidity modulus of the material of a wire by Torsional Pendulum experiment
II. Find the Young's Modulus of a Non Uniform Bending material .
III. Determination of thermal conductivity of a bad conductor by Lee's disc method
IV. Determination of thickness of a thin wire by Air Wedge method
V. Find the Refractive index of a prism by using Spectrometer

OUTCOME

The students should be able to:

1. Determine the rigidity modulus of the material of a wire
2. Determine the Young's Modulus of a Non Uniform Bending material.
3. Determine the thermal conductivity of a bad conductor
4. Determine the thickness of a thin wire
5. Find the Refractive index of a prism using Spectrometer

LIST OF EXPERIMENTS

S.No.	List of Experiments	Batch 2			Batch 1		
		Week	Periods allotted		Week	Periods allotted	
			L	P		L	P
1	Torsional Pendulum - Determination of rigidity modulus of the material of a wire.	1		3	2		3
2	Non Uniform Bending - Determination of Young's Modulus.	3		3	4		3
3	Viscosity -Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.	5		3	6		3

4	Lee's Disc - Determination of thermal conductivity of a bad conductor.	7	3	8	3
5	Air Wedge - Determination of thickness of a thin wire.	9	3	10	3
6	Spectrometer - Refractive index of a prism.	11	3	12	3
7	Semiconductor laser - Determination of wavelength of Laser using Grating.	13	3	14	3
	TOTAL	**7**		**7**	
					21 Periods

LIST OF EQUIPMENTSREQUIRED FOR A BATCH OF 30 STUDENTS

1	Torsional Pendulum(500 gm, wt, 60 cm wire Al-Ni Alloy)	5 nos.
2	Travelling Microscope(X10)	15 nos.
3	Capillary tube(length 10cm, dia 0.05mm)	5 nos.
4	Magnifying lens(X 10)	15 nos.
5	Lee's disc apparatus(std form)	5 nos.
6	Stop watch(+/- 1 s)	5 nos.
7	Meter scale1m length	5 nos.
8	Spectrometer(main scale 360 deg, ver 30")	5 nos.
9	Grating(2500 LPI)	5 nos.
10	Laser (632.8 nm)	5 nos.
11	Semi transparent glass plateAl coating, 65 nm thickness, 50% visibility	5 nos.
12	Equilateral prism (n = 1.54)	5 nos.
13	Thermometer +/- 1 deg	8 nos.
14	Screw gauge (+/- 0.001cm)	12 nos.
15	Vernier caliper (+/- 0.01 cm)	8 nos.
16	Steam Boiler 1 L	5 nos.
17	Scale 50 cms	5 nos.
18	Cylindrical mass 100 gms	10 sets
19	Slotted wt 300 gms	5 sets
20	Heater 1.5 KW	5 nos.
21	Transformer sodium vapour lamp 1 KW	10 nos.
22	Sodium vapour lamp 700 W	5 nos
23	Burette 50 mL	5 nos
24	Beaker 250 Ml	5 nos
25	Spirit level	10 nos

TOTAL : 21

REFERENCES:

1. P.Mani, Engineering Physics Practicals, Dhanam Publications, Chennai, 2005.

CYA131 CHEMISTRY LAB

1 CREDIT

GOAL

To impart fundamental knowledge in various chemistry experiments.

OBJECTIVES

The course should enable the students to:

1. Estimate the Commercial soda by acid-base titration
2. Determine the Percentage of nickel in an alloy
3. Determine the Temporary, permanent and total hardness of water by EDTA method
4. Determine the Chloride content in a water sample
5. Do conductometric Titration of mixture of acids
6. Determine the Degree of polymerization of a polymer by Viscometry

OUTCOME

The students should be able to:

1. Estimate the Commercial soda by acid-base titration
2. Determine the Percentage of nickel in an alloy
3. Determine the Temporary, permanent and total hardness of water by EDTA method
4. Determine the Degree of polymerization of a polymer by Viscometry.

LIST OF EXPERIMENTS

S.No.	List of Experiments (Any Five)	Batch 1			Batch 2		
		Week	Periods allotted		Week	Periods allotted	
			L	P		L	P
1	Estimation of Commercial soda by acid-base titration	1		3	2		3
2	Determination of Percentage of nickel in an alloy	3		3	4		3
3	Determination of Temporary, permanent and total hardness of water by EDTA method	5		3	6		3
4	Determination of Chloride content in a water sample	7		3	8		3
5	Potentiometric Estimation of iron	9		3	10		3
6	Conductometric Titration of a strong acid with a strong base	11		3	12		3
7	Conductometric Titration of mixture						
	of acids.	13		3	14		3
8	Determination of Degree of polymerization of a polymer by Viscometry	15		3	16		3
	TOTAL			**24**			**24**

24 Periods

LIST OF GLASSWARE AND EQUIPMENTS REQUIRED FOR A BATCH OF 30 STUDENTS

1	Burette (50 mL)	30 nos.
2	Pipette (20 mL)	30 nos.
3	Conical Flask (250 mL)	30 nos.
4	Distilled water bottle(1 L)	30 nos.
5	Standard flask (100 mL)	30 nos.
6	Funnel (small)	30 nos.
7	Glass rod 20 cm length	30 nos.
8	Reagent Bottle (250 mL)	30 nos.
9	Reagent Bottle (60 mL)	30 nos.
10	Beaker (100 mL)	30 nos.
11	Oswald Viscometer Glass	30 nos.
12	Measuring Cylinder (25 mL)	30 nos.
13	Digital Conductivity Meter PICO make	8 nos.
14	Conductivity cell (K=1)	12 nos.
15	Digital Potentiometer PICO make	8 nos.
16	Calomel Electrode Glass	12 nos.
17	Platinum Electrode Polypropylene	12 nos.
18	Burette Stands Wooden	30 nos.
19	Pipette stands Wooden	30 nos.
20	Retard stands Metal	30 nos.
21	Porcelain Tiles White	30 nos.
22	Clamps with Boss heads Metal	30 nos.
		TOTAL :24

References:

1. J.Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantative Chemical Analysis, 6th Edition, Pearson Education, 2004.
2. C. W. Garland, J. W. Nibler, D. P. Shoemaker, ;"Experiments in Physical Chemistry, 8th ed.," McGraw-Hill, New York, 2009.
3. S. Sumathi, Engineering Chemistry Practicals, Dhanam Publications, 2011.

CSA131 COMPUTER PROGRAMMING LAB

1 CREDIT

GOAL

To provide an awareness to develop the programming skills using computer languages.

OBJECTIVES

The course should enable the students :

(i) To gain knowledge about Microsoft office, Spread Sheet.

(ii) To learn a programming concept in C.

OUTCOME

The student should be able to:

(i) Use MS Word to create document, table, text formatting and Mail merge options.

(ii) Use Excel for small calculations using formula editor, creating different types of charts and including pictures etc,

(iii) Write and execute the C programs for small applications.

LIST OF EXPERIMENTS:

a) Word Processing **12**

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

b) Spread Sheet **9**

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document

c) Programming in C **24**

8. To write a C program to prepare the electricity bill.
9. Functions:
   (a) Call by value (b) Call by reference.
10. To write a C program to print the Fibonacci series for the given number.
11. To write a C program to find the factorial of number using recursion.
12. To write a C program to implement the basic arithmetic operations using Switch Case statement.
13. To write a C program to check whether the given number is an Armstrong number.
14. To write a C program to check whether the given string is a Palindrome.
15. To write a C program to create students details using Structures.
16. To write a C program to demonstrate the Command Line Arguments.
17. To write a C program to implement the Random Access in Files.
18. To write C programs to solve some of the Engineering applications

TOTAL : 45

HARDWARE/SOFTWARE REQUIRED FOR BATCH OF 30 STUDENTS

HARDWARE

LAN system with 33 nodes (OR) Standalone PCs - 33 Nos

Printers - 3 Nos

SOFTWARE

OS - Windows / UNIX

Application package - MS office

Software - C language

ELA131 COMMUNICATION SKILLS LAB - I

1 CREDIT

GOAL

The goal of the programme is to improve the communication skills of the students especially in English and assist them for their personal development as well

OBJECTIVES

The course should enable the students to:

(i) Extend the ability of the learners to be able to listen to English and comprehend its message.

(ii) Enable the learners to have a functional knowledge of spoken English.

(iii) Assist the learners to read and grasp the meaning of technical and non-technical passages in English.

(iv) Help the learners develop the art of writing without mistakes.

(v) Expand the thinking capability of the learners so that they would learn how to view things from a different angle.

OUTCOME

The students should be able to:

(i) Listen to and evaluate English without difficulty and comprehend its message.

(ii) Developed a functional knowledge of spoken English so as to use it in the institution and at job interviews.

(iii) Read and comprehend the meaning of technical and non-technical passages in English.

(iv) Developed the art of writing so as to put down their thoughts and feelings in words.

(v) Think independently and contribute creative ideas.

UNIT I LISTENING SKILL **9**

Topics: Listening to conversations and interviews of famous personalities in various fields -- Listeningpractice related to the TV-- Talk shows - News - Educative programmes -- Watching films for critical comments - Listening for specific information - Listening for summarizing information - Listening to monologues for taking notes - Listening to answer multiple-choice questions.

UNIT II SPEAKING SKILL **9**

Topics: Self-introduction -- Group discussion - Persuading and negotiating strategies - Practice indialogues -- Presentations based on short stories / poems -- Speaking on personal thoughts and feelings -- academic topics - News reading - Acting as a compere -- Speaking about case studies on problems and solutions - Extempore speeches.

UNIT III READING SKILL **9**

Topics: Reading anecdotes to predict the content - Reading for interpretation -- Suggested reading -- Short stories and poems -- Critical reading - Reading for information transfer - Reading newspaper and magazine articles for critical commentary - Reading brochures,

advertisements, pamphlets for improved presentation.

UNIT IV WRITING SKILL **9**

Topics: At the beginning of the semester, the students will be informed of a mini dissertation of 1000 words they need to submit individually on any non-technical topic of their choice. The parts of the dissertation will be the assignments carried out during the semester and submitted towards the end of the semester on a date specified by the department. This can be judged as part of the internal assessment.

UNIT V THINKING SKILL **9**

Topics: Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms and proverbs - Inculcating interest in English using thinking blocks. Making pictures and improvising diagrams to form English words, phrases and proverbs -- Picture reading.

TOTAL : 45

REFERENCES

1. Raman, Meenakshi, and Sangeetha Sharma. Technical Communication: English Skills for Engineers. 2nd edition. New Delhi: Oxford University Press, 2010.
2. Riordian, Daniel. Technical Communication. New Delhi. Cengage Learning, 2009

Websites for learning English

1. British: Learn English - British Council (Listen & Watch) - <http://learnenglish. british council.org/>
2. American: Randall's ESL Cyber Listening Lab - <http://www.esl-lab.com/>
3. Intercultural: English Listening Lesson Library Online http://www.elllo.org/

Equipments required

1. Career Lab:1 room
2. Computers as a Server for Labs (with High Configuration)
3. LCD Projectors - 4 Nos
4. Headphones with Mic (i-ball) - 100 Nos
5. Speakers with Amplifiers, Wireless Mic and Collar Mic - 2 Sets
6. Teacher table, Teacher Chair - 1 + 1
7. Plastic Chairs - 75 Nos

GEA131 ENGINEERING PRACTICES LAB - I
(common to all branches)

1 CREDIT

GOAL

To provide the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

OBJECTIVES

The course should enable the students to

(i) Relate theory and practice of basic Civil and Mechanical Engineering
(ii) Learn concepts of welding and machining practice
(iii) Learn concepts of plumbing and carpentry practice

OUTCOMES

The students should be able to

(i) Indentify the use of tools, Types of joints used in welding, carpentry and plumbing

operations.

(ii) Have hands on experience on basic fabrication techniques such as carpentry and plumbing practices.

(iii) Have hands on experience on basic fabrication techniques of different types of welding and basic machining practices.

LIST OF EXPERIMENTS

I. MECHANICAL ENGINEERING PRACTICE 24

1. Welding
   Arc welding: Butt joints, Tee and lap joints.
2. Basic Machining
   Facing, turning, threading and drilling practices using lathe and drilling operation with vertical drilling machine.
3. Machine assembly practice
   Study of centrifugal pump
4. Study on
   a. Smithy operations - Productions of hexagonal headed bolt.
   b. Foundry operations - Mould preparation for gear and step cone pulley.

II. CIVIL ENGINEERING 21

1. Basic pipe connection using valves, couplings, unions, reducers, elbows in household fitting.
2. Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.
3. Wood work: Sawing, Planning and making common joints.
4. Study of joints in door panels, wooden furniture.

LIST OF EQUIPMENT AND COMPONENTS
(For a Batch of 30 Students)

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:
   (a) Rotary Hammer 2 Nos
   (b) Demolition Hammer 2 Nos
   (c) Circular Saw 2 Nos
   (d) Planer 2 Nos
   (e) Hand Drilling Machine 2 Nos
   (f) Jigsaw 2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos

9. Study-purpose items: centrifugal pump, air-conditioner One each.

TOTAL : 45

Reference:

Jeyapoovan T and Saravanapandian M., Engineering practices lab manual, 4th Edition, Vikas publishing House, New Delhi, 2010.

SEMESTER-II

MAA102 ENGINEERING MATHEMATICS -II

4 CREDITS

GOAL

To create the awareness and to impart comprehensive knowledge in engineering mathematics.

OBJECTIVES

The course should enable the students to:

(i) Understand the evaluation of the double and triple integrals in Cartesian and polar forms.
(ii) Know the basics of Vector calculus.
(iii) Know Cauchy - Riemann equations, Milne - Thomson method and Conformal mapping
(iv) Grasp the concept of Cauchy's integral formula, Cauchy's residue theorem and contour integration.
(v) Know Laplace transform and inverse Laplace transform and their properties.

OUTCOME

The students should be able to:

(i) Find area as double integrals and volume as triple integrals in engineering applications.
(ii) Evaluate the gradient, divergence, curl, line, surface and volume integrals along with the verification of classical theorems involving them.
(iii) Apply analytic functions and their interesting properties in science and engineering.
(iv) Evaluate the basics of complex integration and the concept of contour integration which is important for evaluation of certain integrals encountered in practice.
(v) Have a sound knowledge of Laplace transform and its properties and their applications in solving initial and boundary value problems.

UNIT I MULTIPLE INTEGRALS 12

Review: Basic concepts of integration - Standard results - Substitution methods - Integration by parts - Simple problems.

Double integrals: Cartesian and polar co-ordinates - Change of variables - simple problems - Area as a double integral. Triple integrals: Cartesian co-ordinates - Volume as a triple integral - simple problems.

UNIT II VECTOR CALCULUS 12

Review: Definition - vector, scalar - basic concepts of vector algebra - dot and cross products-properties.

Gradient, Divergence and Curl - Unit normal vector, Directional derivative - angle between surfaces-Irrotational and solenoidal vector fields. Verification and evaluation of Green's theorem – Gauss divergence theorem and Stoke's theorem. Simple applications to regions such as square, rectangle, triangle, cuboids and rectangular parallelopipeds.

UNIT III ANALYTIC FUNCTIONS 12

Review: Basic results in complex numbers - Cartesian and polar forms - Demoivre's theorem.

Functions of a complex variable - Analytic function - Necessary and sufficient conditions (without proof) - Cauchy - Riemann equations - Properties of analytic function - Harmonic function - Harmonic conjugate - Construction of Analytic functions by Milne - Thomson method. Conformal mapping: $w = z + a$, az, $1/z$ and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Statement and application of Cauchy's integral theorem and Integral formula - Evaluation of integrals using the above theorems - Taylor and Laurent series expansions -Singularities - Classification. Residues - Cauchy's residue theorem (without proof) - Contour integration over

unit circle and semicircular contours (excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM 12

Laplace transform - Conditions of existence - Transform of elementary functions - properties - Transforms of derivatives and integrals - Derivatives and integrals of transforms - Initial and final value theorems - Transforms of unit step function and impulse function - Transform of periodic functions. Inverse Laplace transform - Convolution theorem - Solution of linear ODE of second order with constant coefficients.

TOTAL: 60

Note: Questions need not be asked from review part.

TEXT BOOKS

1. Venkatraman M.K, Mathematics, Volume - II, National Publishing Company, Chennai, 1985.
2. Grewal B.S, Higher Engineering Mathematics, Thirty Eighth Editions, Khanna Publisher, Delhi, 2004.
3. Chandrasekaran A, Engineering Mathematics, Volume - II, Dhanam Publication, 2008.

REFERENCES

1. Kandasamy P, Engineering Mathematics Volume II, S. Chand & Co., New Delhi, 1987.
2. Grewal B.S, Engineering Maths - II, Sultan Chand, New Delhi, 1993.
3. Bali N.P, Manish Goyal, Text book of Engineering Mathematics, 3rd Edition, Lakshmi Publications, 2003.

PHA101 ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

To impart fundamental knowledge in various fields of Physics and its applications.

OBJECTIVES

The course should enable the students to:

1. Develop strong fundamentals of properties and behaviour of the materials
2. Enhance theoretical and modern technological aspects in acoustics and ultrasonics.
3. Enable the students to correlate the theoretical principles with application oriented study of optics.
4. Provide a strong foundation in the understanding of solids and materials testing.
5. Enrich the knowledge of students in modern engineering materials.

OUTCOME

The students should be able to:

1. Understand the properties and behaviour of materials.
2. Have a fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and on ultrasonics and be able to employ it as an engineering tool.
3. Understand the concept, working and application of lasers andfiber optics.
4. Know the fundamentals of crystal physics and non destructive testing methods.
5. Have an understanding of the production, characteristics and application of the new engineering materials. This would aid them in the material selection stage.

UNIT I PROPERTIES OF MATTER 9

Elasticity - types of moduli of elasticity - Stress-Strain diagram - Young's modulus of elasticity Rigidity modulus - Bulk modulus - Factors affecting elasticity - twisting couple on a wire - Torsional pendulum - determination of rigidity modulus of a wire - depression of a cantilever -

Young's modulus by cantilever - uniform and non-uniform bending - viscosity - Ostwald's viscometer - comparison of viscosities.

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - characteristics of musical sound - intensity - loudness - Weber Fechner law - Decibel - Reverberation - Reverberation time, derivation of Sabine's formula for reverberation time(Jaeger's method) - absorption coefficient and its determination - factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics - production - Magnetostriction and Piezoelectric methods - properties - applications of ultrasonics with particular reference to detection of flaws in metal (Non - Destructive testing NDT) - SONAR.

UNIT III LASER AND FIBRE OPTICS 9

Principle of lasers - Stimulated absorption - Spontaneous emission, stimulated emission - population inversion - pumping action - active medium - laser characteristics - Nd-Yag laser - CO2 laser Semiconductor laser - applications - optical fiber - principle and propagation of light in optical fibers Numerical aperture and acceptance angle - types of optical fibers - single and multimode, step index and graded index fibers - applications - fiber optic communication system.

UNIT IV CRYSTAL PHYSICS AND NON- DESTRUCTIVE TESTING 9

Crystal Physics: Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - coordination number Packing factor for SC, BCC, FCC and HCP structures.

Non Destructive Testing: Liquid penetrate method - Ultrasonic flaw detection - ultrasonic flaw detector (block diagram) - X-ray Radiography - Merits and Demerits of each method.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS 9

Modern Engineering Materials: Metallic glasses: Preparation properties and applications. Shape memory alloys (SMA): Characteristics, applications, advantages and disadvantages of SMA. Nano Materials: Synthesis -Properties and applications.

Superconducting Materials: Superconducting phenomena - Properties of superconductors - Meissner effect - Type I and Type II superconductors - High Tc superconductors (qualitative) - uses of superconductors.

TOTAL : 45

TEXT BOOKS

1. Gaur R.K. and Gupta S.L., "Engineering Physics ", 8th edition, Dhanpatrai publications (P) Ltd., New Delhi 2010.
2. P.Mani, "Engineering Physics", Vol-I, Dhanam Publications, Chennai 2011.
3. Rajendran V. an Marikani A., "Applied Physics for engineers" , 3rd edition, Tata McGraw - Hill publishing company Ltd., New Delhi,2003.

REFERENCES

1. Uma Mukherji, Engineering Physics ,Narosa publishing house, New Delhi, 2003.
2. Arumugam M., Engineering Physics ,Anuradha agencies, 2007.
3. Palanisamy P.K., Engineering Physics, SciTech Publications, Chennai 2007.
4. Arthur Beiser, Concepts of Modern Physics, Tata McGraw -Hill Publications, 2007.
5. P.Charles, Poople and Frank J. Owens, Introduction to Nanotechnology, Wiley India,

CYA101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

To impart basic principles of chemistry for engineers.

OBJECTIVES

The course should enable the students to

1. Make the students conversant with the basics of
   (a) Water technology And (b) Polymer science
2. Provide knowledge on the requirements and properties of a few important engineering materials.
3. Educate the students on the fundamentals of corrosion and its control.
4. Give a sound knowledge on the basics of a few significant terminologies and concepts in thermodynamics.
5. Create an awareness among the present generation about the various conventional energy sources.

OUTCOME

The students should be able to

1. Gain basic knowledge in water analysis and suitable water treatment method.
2. Get an idea on the type of polymers to be used in engineering applications.
3. Get awareness about new materials
4. Get knowledge on the effects of corrosion and protection methods will help the young minds to choose proper metal / alloys and also to create a design that has good corrosion control.
5. Get exposure on the important aspects of basic thermodynamics will be able to understand the advanced level thermodynamics in engineering applications.
6. Get a good background on the various aspects of energy sources will create awareness on the need to utilize the fuel sources effectively and also for exploring new alternate energy resources.

UNIT I WATER TECHNOLOGY AND POLYMER CHEMISTRY 9

Hardness (Definition, Types, Units) - problems - Estimation of Hardness (EDTA Method) - Water softening - Carbonate conditioning and Calgon conditioning - Demineralization (Ion-Exchange Method) - Water Quality Parameters - Municipal Water Treatment- Desalination - Reverse Osmosis.

Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys Definition, Examples

UNIT II ENGINEERING MATERIALS 9

Properties of Alloys - Heat Treatment of Steel - Polymer Composites - types and applications.Lubricants - Classification, properties and applications - Mechanism of Lubrication - MoS2 And Graphite - Adhesives - classification and properties - Epoxy resin (Preparation, properties and applications) - Refractories - Classification, Properties and General Manufacture - Abrasives Classification , Properties and Uses - Carbon nano tubes - preparation, properties and applications.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Conductometric Titration - HClvsNaOH and mixture of acids vsNaOH - Electrochemical Series and its applications - Nernst Equation - problems - Polarization, Decomposition Potential, Over-voltage (definitions only) - Galvanic series - Corrosion (Definition, Examples, effects) -

Mechanism of Dry Corrosion and Wet Corrosion - Differential aeration Corrosion , examples - Factors Influencing Corrosion - Metal and Environment - Corrosion Control - Design -Cathodic Protection methods - Protective Coatings - Galvanising - Anodising - Electroplating (Cu and Ni) and Electroless plating (Cu and Ni) Constituents of Paints and varnish.

UNIT IV CHEMICAL THERMODYNAMICS **9**

Thermodynamic terminology- First Law of Thermodynamics-Internal energy- enthalpy - heat capacity work done in isothermal expansion of an ideal gas -problems - second law of thermodynamics entropy change - phase transformations and entropy change - problems - Work Function & Free Energy Function- Maxwell's Relations-Gibbs Helmholtz equation- van't Hoff Isotherm- van't Hoff Isochore - Problems.

UNIT V FUELS AND ENERGY SOURCES **9**

Fuels - classification - Calorific Value - Dulong's Formula - Problems - Determination of Calorific Value by Bomb Calorimeter - Coal - Proximate Analysis - problems - Octane Number - Cetane Number - Diesel Index (Definitions only) - Bio Gas - Producer Gas -Water Gas - Preparation, Properties and Uses - Batteries - Primary Cells - Leclanche Cell -Secondary Cell - Nickel Cadmium Battery Fuel Cells - Hydrogen -Oxygen Fuel Cell - Solar Battery - Lead Acid Storage Cell - Nuclear Energy Light water nuclear power plant.

TOTAL : 45

TEXT BOOKS

1. S. S. Dara, Text Book of Engineering Chemistry, S. Chand & Company Ltd., New Delhi, 2003
2. Murthy, Agarwal& Naidu, Text Book of Engineering Chemistry, BSP, 2003.
3. S.Sumathi, Engineering Chemistry, Dhanam Publications, 2008.
4. S.Sumathi and P.S.Raghavan, Engineering Chemistry II, Dhanam Publications, 2008.

CYA102 ENVIRONMENTAL SCIENCES

3 CREDITS

GOAL

To impart basic knowledge on the significance of environmental science for engineers.

OBJECTIVES

The course should enable the students to:

(i) Make the students aware of the existing natural resources such as forest and water resources. To educate them to understand the need for preserving the resources.
(ii) Educate the students about the functions of various ecosystems and biodiversity.
(iii) Provide knowledge on the various aspects of different types of pollution such as air pollution, water pollution, soil pollution etc.
(iv) Give a basic knowledge on the social issues such as global warming, acid rain, ozone layer depletion, nuclear hazards etc. and to educate them about the various Environmental Protection Acts.
(v) To create an awareness among the present generation about the various aspects of human population and their effect on environment.

OUTCOME

The students should be able to:

(i) The students would have understood the effects of over exploitation of water resources, forest resources etc. and their impact on day to day life on earth.
(ii) Knowledge on the functions of several ecosystems will help the students to design the processes that are eco friendly.

(iii) Knowledge on the different types of pollution will help the young minds to device effective control measures to reduce rate of pollution.

(iv) Exposure on the issues such as global warming, acid rain, ozone layer depletion, and nuclear hazards will make the students understand the significances of sustainable development and the need to enforce Environmental Acts.

(v) Educating on the various aspects of population explosion will create awareness on population control for effective utilization of the resources and the need to explore new alternate energy resources for a healthy environment.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance - Need for public awareness - Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets - river / forest / grassland / hill / mountain.

UNIT II ECOSYSTEMS AND BIODIVERSITY 14

Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to Biodiversity - Definition: genetic, species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Field study of common plants, insects, birds Field study of simple ecosystems - pond, river, hill slopes, etc.

UNIT III ENVIRONMENTAL POLLUTION 8

Definition - Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards - Soil waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

Field Study of local polluted site - Urban / Rural / Industrial / Agricultural

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns, case studies - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents

and holocaust, case studies. - Wasteland reclamation - Consumerism and waste products - Environment Production Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public awareness

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations - Population explosion - Family Welfare Programme - Environment and human health - Human Rights - Value Education - HIV / AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health - Case studies.

TOTAL : 45

TEXT BOOKS

1. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co., 1971.
3. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, 1999.
4. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications, 1998.

REFERENCES

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India, 2004.
2. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
4. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998

EEB101 CIRCUIT THEORY

4 CREDITS

PREREQUISITE

MAA101 - Engineering Mathematics - I
MAA102 - Engineering Mathematics -II

GOAL

To provide knowledge about the application of mathematical concepts in analyzing circuits .

OBJECTIVES

The course will enable the students to:

(i) Get exposed to the basic laws in circuit analysis
(ii) Acquire adequate knowledge about the network theorems in dc and ac circuits.
(iii) Acquire knowledge about resonance and coupled circuits.
(iv) Get adequate knowledge about laplace transform in transients
(v) Get adequate knowledge about three phase circuits

OUTCOME

The students should be able to:

(i) Apply laplace transform in analyzing the circuits.

(ii) Apply theorem to find voltage,current and power through any element
(iii) Solve competitive technical questions.
(iv) Gain knowledge about the resonance circuits.
(v) Gain knowledge about the design of electrical circuits.

UNIT I BASIC CIRCUIT ANALYSIS 12

Ohm's Law - Kirchoffs laws - DC and AC Circuits - Resistors in series and parallel circuits - Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 12

Network reduction: voltage and current division, source transformation - star delta conversion. Thevenins and Norton Theorem - Superposition Theorem - Maximum power transfer theorem - Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series and parallel resonance - their frequency response - Quality factor and Bandwidth - Self and mutual inductance - Coefficient of coupling - Tuned circuits - Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSIS OF THREE PHASE CIRCUITS 12

Three phase balanced / unbalanced voltage sources - analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced - phaser diagram of voltages and currents - power and power factor measurements in three phase circuits.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuits Analysis,Tata McGraw Hill publishers, 6th edition, New Delhi, 2002.
2. Sudhakar A and Shyam Mohan SP, Circuits and Network Analysis and Synthesis,Tata McGraw Hill, 2007.

REFERENCES

1. Paranjothi SR, Electric Circuits Analysis, New Age International Ltd., New Delhi, 2006.
2. Joseph A. Edminister, Mahmood Nahri, Electric circuits, Schaum's Series, Tata McGraw-Hill, New Delhi 2001.
3. Chakrabati A,Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons,New Delhi, 2007.
4. Charles K. Alexander, Mathew N.O. Sadik, Fundamentals of Electric Circuits, Second Edition, McGraw Hill, 2007.

EEB102 ELECTRONIC DEVICES

3 CREDITS

PREREQUISITE
PHA101 - Engineering Physics
CYA101 - Engineering Chemistry

GOAL

To Provide Basic Knowledge About Various Semiconductor Devices and their Applications.

OBJECTIVES

To acquaint the students with construction, theory and characteristics of the following electronic devices

(i) P-N junction diode
(ii) Bipolar transistor
(iii) Field effect transistor
(iv) LED,LCD and other photo electronic devices
(v) Power control/regulator devices

OUTCOME

The students should be able to:

(i) Understand the operation of P-N junction diode and Zener diode
(ii) Understand the operation of BJT and FET, its biasing and input-output characteristics of different configurations
(iii) Understand the principle of photo emissivity, photo conductivity and different photo electronic devices
(iv) Use of P-N diode and BJT in switching applications in designing signal conditioning circuits
(v) Perform laboratory experiments on the mentioned different electronic devices.

UNIT I SEMICONDUCTOR DIODE 9

Theory of p-n junction - p-n junction as diode - p-n diode currents - Volt-amp characteristics - Diode resistance - Temperature effect of p-n junction - Transition and diffusion capacitance of p-n diode - Diode switching times.

UNIT II BI-POLAR TRANSISTOR 9

Junction transistor - Transistor construction - Detailed study of currents in transistor - Input and output characteristics of CE, CB and CC configurations - Transistor hybrid model for CE configuration - Analytical expressions for transistor characteristics - Transistor switching times - Voltage rating - Power transistors.

UNIT III FIELD EFFECT TRANSITORS 9

Junction field effect transistor - Pinch off voltage - JFET volt-ampere characteristics - JFET small signal model - MOSFETS and their characteristics - FET as a variable resistor - Unijunction transistor.

UNIT IV OPTO ELECTRONIC DEVICES 9

Photo emissivity and photo electric theory - Theory, construction and characteristics. Light emitting diodes, liquid crystal cell, seven segment display, photo conductive cell, photodiode, solar cell, photo transistor, opto couplers and laser diode.

UNIT V MISCELLANEOUS DEVICES 9

Theory, characteristics and application: SCR, TRIAC, PUT, tunnel diode, thermistors, piezo electric devices, zener diode, charge coupled devices, varactor diode and LDR.

L = 45 TOTAL = 45

TEXT BOOKS

1. Jacob. Millman, Christos C.Halkias, Electronic Devices and Circuits, Tata McGraw Hill Publishing Limited, New Delhi, 2003.
2. David A. Bell, Electronic Devices and Circuits, Prentice Hall of India Private Limited, New Delhi, 2003.

REFERENCES

1. Theodre. F. Boghert, Electronic Devices & Circuits, Pearson Education, VI Edition, 2003.
2. Ben G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, Pearson Education, 2002 / PHI
3. Allen Mottershead, Electronic Devices and Circuits - An Introduction, Prentice Hall of India Private Limited, New Delhi, 2003.

ELA102-Personality Development and Soft Skills

L	T	P	C
3	0	0	3

GOAL

- To enhance holistic development of students and improve their employability skills.
- To nurture the language skills and cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning
- To help them become responsible members or leaders of the society in and around their workplace or living space
- to communicate successfully at the individual or group level on engineering activities with the engineering community in particular, and on multi-disciplinary activities in general, with the world at large.

OBJECTIVES

The course should enable the students to

1. Develop inter personal skills and be an effective goal oriented team player.
2. Develop professionals with idealistic, practical and moral values.
3. Develop communication and problem solving skills.
4. To face the challenges in the world and enable the students excel in the world of work and life.

OUTCOME

The students should be able to:

1. Have the self-confidence to improve upon their informative listening skills by an enhanced acquisition of the English language.
2. Speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.
3. Read, comprehend and answer questions based on literary, scientific and technological texts.
4. Have the confidence to develop thinking skills and participate in brainstorming, mind-mapping, audiovisual activities, creative thinking and also answer tests in the job-selection processes.
5. Make right decisions , communicate effectively, and develop self-management talents , to lead a healthy and productive life.
6. Imbibe the requisite employability skills , learned skills, intuitive skills and people skills

UNIT I SPEAKING SKILLS **9 hours**

Art of Speaking- Body Language and speaking- Non Verbal communication- -Vocal Communication Techniques- Intercultural communication- The difference in Approach in five countries- Vocabulary Enrichment- Pronunciation of words-Mark the stress on appropriate syllable-split the word into syllables- Speaking as an Art-Simple Oral Interaction-Body Language and Speaking- Five characteristics of an ideal GD- group discussions - role plays- short speeches-Extempore – JAM –Debate-Talk shows-Power point presentation and speaking

UNIT II LANGUAGE SKILLS **12 hours**

Functional Grammar: Synonyms and Antonyms – Active and Passive Voice- Direct and Indirect Speech- Conditional Clauses- collocations- rearrange the jumbled sentences and make meaningful sentences- Language functions: apologising, greeting, clarifying, inviting, advising, agreeing, disagreeing, refusing, thanking, interrupting, expressing obligation, expressing preferences, CV / application letters- Job interviews-FAQ's – e- mail etiquette

UNIT III PEOPLE SKILLS/SOFT SKILLS **8 hours**

SWOT analysis- JOHARI window- Goal setting- speaking on Goals - goals to be achieved- modes of behaviour to achieve the goals- decision making- time management -stress management- power of positive attitude- leadership skills

UNIT IV COMPREHENSION SKILLS **7 hours**

Art of Listening- listening to English news- listening to debates on current issues - Listening to dialogues for general meaning and specific information- listening to toast master speeches- - cloze exercises-open comprehension questions-Art of Listening-Reading passages –interpreting in own words- reading articles in magazines/journals/newspapers- writing articles for newspaper-reporting events-completing the middle/end of a story

UNIT V PERSONALITY DEVELOPMENT **9 hours**

Define Personality- Types of Personality-Personality test- Leadership Skills - Interpersonal Skills- Team Work - Mind Mapping- concept maps- Study skills and techniques - Edward De Bono's lateral thinking-exercises-questionnaires-project

TEXT BOOK:

English for Life and the workplace through LSRW&T skills by Dr. Dolly John, Pearson Publications

REFERENCES

1. Education and Personality Development, Dr. P.K. Manoharan, APH Publishing Corporation.
2. Effective technical Communication, M. Ashraf Rizvi, Tata McGraw Hill Companies
3. Professional Speaking Skills, Aruna Koneru, Oxford University Press
4. Essential Grammar in Use, Fourth Edition by Raymond Murphy, Cambridge University Press
5. Covey Sean, Seven Habit of Highly Effective Teens, New York, Fireside Publishers, 1998.
6. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.

Web links for reference for Flipped classroom sessions

1. https://owl.english.purdue.edu/exercises/28/12/33
2. http://englishplaza.vn/flexpaper/pdf/english-collocations-in-use_1405952201.pdf
3. http://www.htsb.org/wp-content/uploads/2014/07/Academic-Language-Functions-toolkit.pdf
4. http://www.intelligencetest.com/puzzles/lateral.htm
5. http://www.teachingenglish.org.uk/sites/teacheng/files/mind_map.pdf
6. http://www.teachingenglish.org.uk/article/using-mind-maps-develop-writing.
7. http://www.teachingenglish.org.uk/article/jigsaw-readingArrange
8. http://www.teachthought.com/critical-thinking/10-team-building-games-that-promote-critical-thinking
9. http://www.myenglishpages.com/site_php_files/grammar-exercise-conditionals.php
10. http://flax.nzdl.org/greenstone3/flax?a=fp&sa=collActivity&c=copyrightlaw
11. http://www.humanmetrics.com/personality/type

MEA101 Computer Aided Engineering Drawing

3 CREDITS

GOAL

To develop graphical skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings using Computer Aided Design and Drafting practice.

OBJECTIVES

The course should enable the students to

1. Introduce drawing standards and use of drawing instruments.
2. Introduce first angle projection.
3. Practice of engineering hand sketching and introduce to computer aided drafting
4. Familiarize the students with different type of pictorial projections.
5. Introduction to Solid modeling
6. Introduce the process of design from sketching to parametric 3D CAD and 2D orthographic drawings to BIS

OUTCOME

The students should be able to

1. Develop Parametric design and the conventions of formal engineering drawing
2. Produce and interpret 2D & 3D drawings
3. Communicate a design idea/concept graphically
4. Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
5. Get a Detailed study of an engineering artifact

Note: Only first angle projection is to be followed

Unit I – BASICS OF ENGINEERING GRAPHICS AND PLANE CURVES 12

Importance of graphics Use of drawing instruments - BIS conventions and specifications - drawing sheet sizes, layout and folding - lettering - Dimensioning-Geometrical constructions - Scales. Introduction to plane curves like ellipse, parabola, cycloids and involutes Drafting methods - introduction to Computer Aided Drafting – Computer Hardware – Workstation – Printer and Plotter – Introduction to software for Computer Aided Design and Drafting – Exposure to Solid Modeling software – Geometrical Construction-Coordinate Systems/Basic Entities

Unit II – VISUALIZATION, ORTHOGRAPHIC PROJECTIONS AND FREE HAND SKETCHING 15

Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Pictorial Projection methods - Layout of views- Free hand sketching of multiple views from pictorial views of objects.Drafting of simple Geometric Objects/Editing

General principles of presentation of technical drawings as per BIS - Introduction to Orthographic projections - Naming views as per BIS - First angle projection method. Conversion to orthographic views from given pictorial views of objects, including dimensioning – Drafting of Orthographic views from Pictorial views.

Unit III – PROJECTIONS OF POINTS, LINES, SURFACES AND SOLIDS 18

Introduction to Projections of points – Projections of straight lines located in first quadrant using rotating line method only – Projections of plane surfaces when the surface of the lamina is inclined to one reference plane only – Projections of simple solids when the axis of the solid is

inclined to one reference plane only – Sectioning of above solids in simple positions – Section Views. Practice includes drafting the projection of lines and solids using appropriate software. 2D drawing commands: Zoom, Picture editing commands, Dimensioning and 2D drafting.

Unit IV GEOMETRICAL MODELING AND ISOMETRIC VIEWS 15

Solid Modeling – Types of modeling - Wire frame model, Surface Model and Solid Model – Introduction to graphic software for solid modeling. Principles of isometric projection and solid modeling. Isometric drawing - IsoPlanes and 3D Modelingcommands.Projections of Principal Views from 3-D Models

Unit V COMPUTER AIDED DESIGN AND DRAFTING 15

Preparation of solids of machine components like slide block, solid bearing block, bushed bearing, gland, wall bracket, guide bracket, shaft bracket, jig plate, shaft support (open type), vertical shaft support etc using appropriate modeling software.

Introduction to computer aided drafting and dimensioning using appropriate software. Generate 2D drawing from the 3D models – generate and develop the lateral surfaces of the objects. Presentation Techniques of Engineering Drawings – Title Blocks – Printing/Plotting of drawing.

TOTAL PERIODS: 75

TEXT BOOKS

1. Jeyapoovan T, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House Pvt Ltd.,New Delhi, 2010.
2. Warren J. Luzadder and Jon.M.Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt. Ltd., Eleventh Edition, 2003.

REFERENCE BOOKS

1. Introduction to AutoCAD – 2D and 3D Design, A.Yarmwood, Newnes Elsevier, 2011
2. Engineering Drawing and Graphic Technology-International Edition, Thomas E. French, Charles J. Vierck, Robert J. Foster, McGraw-Hill, 1993
3. Engineering Drawing and Design-Sixth Edition, C. Jensen, J.D. Helsel, D.R. Short, McGraw-Hill, 2002
4. Technical Drawing-Fourteenth Edition, F. E. Giesecke, A. Mitchell, H. C. Spencer, I.L. Hill, J.T. Dygdon, J.E., Novak, Prentice-Hall, 2012,
5. Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2007.
6. Mechanical Engineering Drawing-Self Taught, Jashua Rose, http://www.gutenberg.org/files/23319/23319-h/23319-h.htm

Bureau of Indian Standards (BIS) for Engineering Drawing:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation — Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.

PHA131 PHYSICS LAB

1 CREDIT

OBJECTIVES

The course should enable the students to:

I. Determine the of rigidity modulus of the material of a wire by Torsional Pendulum experiment
II. Find the Young's Modulus of a Non Uniform Bending material .
III. Determination of thermal conductivity of a bad conductor by Lee's disc method
IV. Determination of thickness of a thin wire by Air Wedge method
V. Find the Refractive index of a prism by using Spectrometer

OUTCOME

The students should be able to:

VI. Determine the rigidity modulus of the material of a wire
VII. Determine the Young's Modulus of a Non Uniform Bending material.
VIII. Determine the thermal conductivity of a bad conductor
IX. Determine the thickness of a thin wire
X. Find the Refractive index of a prism using Spectrometer

LIST OF EXPERIMENTS

S.No.	List of Experiments	Batch 2			Batch 1		
		Week	Periods allotted		Week	Periods allotted	
			L	P		L	P
1	Torsional Pendulum - Determination of rigidity modulus of the material of a wire.	1		3	2		3
2	Non Uniform Bending - Determination of Young's Modulus.	3		3	4		3
3	Viscosity -Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.	5		3	6		3
4	Lee's Disc - Determination of thermal conductivity of a bad conductor.	7		3	8		3
5	Air Wedge - Determination of thickness of a thin wire.	9		3	10		3
6	Spectrometer - Refractive index of a prism.	11		3	12		3
7	Semiconductor laser - Determination of wavelength of Laser using Grating.	13		3	14		3

	TOTAL	**7**			**7**		
							21 Periods

LIST OF EQUIPMENTSREQUIRED FOR A BATCH OF 30 STUDENTS

1	Torsional Pendulum(500 gm, wt, 60 cm wire Al-Ni Alloy)	5 nos.
2	Travelling Microscope(X10)	15 nos.
3	Capillary tube(length 10cm, dia 0.05mm)	5 nos.
4	Magnifying lens(X 10)	15 nos.
5	Lee's disc apparatus(std form)	5 nos.
6	Stop watch(+/- 1 s)	5 nos.
7	Meter scale1m length	5 nos.
8	Spectrometer(main scale 360 deg, ver 30")	5 nos.
9	Grating(2500 LPI)	5 nos.

10	Laser (632.8 nm)	5 nos.
11	Semi transparent glass plateAl coating, 65 nm thickness, 50% visibility	5 nos.
12	Equilateral prism (n = 1.54)	5 nos.
13	Thermometer +/- 1 deg	8 nos.
14	Screw gauge (+/- 0.001cm)	12 nos.
15	Vernier caliper (+/- 0.01 cm)	8 nos.
16	Steam Boiler 1 L	5 nos.
17	Scale 50 cms	5 nos.
18	Cylindrical mass 100 gms	10 sets
19	Slotted wt 300 gms	5 sets
20	Heater 1.5 KW	5 nos.
21	Transformer sodium vapour lamp 1 KW	10 nos.
22	Sodium vapour lamp 700 W	5 nos
23	Burette 50 mL	5 nos
24	Beaker 250 mL	5 nos
25	Spirit level	10 nos

TOTAL : 21

REFERENCES

2. P.Mani, Engineering Physics Practicals, Dhanam Publications, Chennai, 2005.

CYA131 CHEMISTRY LAB

1 CREDIT

GOAL

To impart fundamental knowledge in various chemistry experiments.

OBJECTIVES

The course should enable the students to:

I. Estimate the Commercial soda by acid-base titration
II. Determine the Percentage of nickel in an alloy
III. Determine the Temporary, permanent and total hardness of water by EDTA method
IV. Determine the Chloride content in a water sample
V. Do Conductometric Titration of mixture of acids
VI. Determine the Degree of polymerization of a polymer by Viscometry

OUTCOME

The students should be able to:

I. Estimate the Commercial soda by acid-base titration
II. Determine the Percentage of nickel in an alloy
III. Determine the Temporary, permanent and total hardness of water by EDTA method
IV. Determine the Degree of polymerization of a polymer by Viscometry.

LIST OF EXPERIMENTS

S.No.	List of Experiments (Any Five)	Batch 1			Batch 2		
		Week	Periods allotted		Week	Periods allotted	
			L	P		L	P
1	Estimation of Commercial soda by acid-base titration	1		3	2		3
2	Determination of Percentage of nickel in an alloy	3		3	4		3
3	Determination of Temporary, permanent and total hardness of water by EDTA Method	5		3	6		3
4	Determination of Chloride content in a water sample	7		3	8		3
5	Potentiometric Estimation of iron	9		3	10		3
6	Conductometric Titration of a strong acid with a strong base	11		3	12		3
7	Conductometric Titration of mixture						
	of acids.	13		3	14		3
8	Determination of Degree of polymerization of a polymer by Viscometry	15		3	16		3
	TOTAL			**24**			**24**

24 Periods

LIST OF GLASSWARE AND EQUIPMENTS REQUIRED FOR A BATCH OF 30 STUDENTS

1	Burette (50 mL)	30 nos.
2	Pipette (20 mL)	30 nos.
3	Conical Flask (250 mL)	30 nos.
4	Distilled water bottle(1 L)	30 nos.
5	Standard flask (100 mL)	30 nos.
6	Funnel (small)	30 nos.
7	Glass rod 20 cm length	30 nos.
8	Reagent Bottle (250 mL)	30 nos.
9	Reagent Bottle (60 mL)	30 nos.
10	Beaker (100 mL)	30 nos.
11	Oswald Viscometer Glass	30 nos.
12	Measuring Cylinder (25 mL)	30 nos.
13	Digital Conductivity Meter PICO make	8 nos.
14	Conductivity cell (K=1)	12 nos.
15	Digital Potentiometer PICO make	8 nos.
16	Calomel Electrode Glass	12 nos.
17	Platinum Electrode Polypropylene	12 nos.
18	Burette Stands Wooden	30 nos.
19	Pipette stands Wooden	30 nos.
20	Retard stands Metal	30 nos.
21	Porcelain Tiles White	30 nos.
22	Clamps with Boss heads Metal	30 nos.
		TOTAL :24

References

1. J.Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantative Chemical Analysis, 6th Edition, Pearson Education, 2004.
2. C. W. Garland, J. W. Nibler, D. P. Shoemaker, ;"Experiments in Physical Chemistry, 8th ed.," McGraw-Hill, New York, 2009.
3. S. Sumathi, Engineering Chemistry Practicals, Dhanam Publications, 2011.

GEA132 ENGINEERING PRACTICES LAB-II

1 CREDIT

GOAL

To provide knowledge of basic engineering concepts.

OBJECTIVES

The course should enable the students :

(i) To impart knowledge on basic engineering concepts.

OUTCOME

The students should be able to:

(i) To learn how to use Electrical and Electronics tools.

LIST OF EXPERIMENTS

S.No.	LIST OF EXPERIMENTS	No. of Hours
Electrical Engineering:		
1.	Wiring for a tube light.	6
2.	Wiring for a lamp and fan.	6
3.	Staircase wiring	3
4.	Study of (i) Iron box and (ii) Fan with Regulator	6
Electronics Engineering		
5.	Study of Electronic components and Equipments	3
6.	Characteristics of PN junction diode & measurement of Ripple factor of half wave and full wave rectifier.	9
7.	Applications of OP-AMP - Inverter, Adder and Subtractor.	9
8.	Study and verification of Logic Gates	3
		TOTAL : 45

Components Required:

Electrical Engineering

Choke	2 nos
Starter	2 nos
Tubelight stand	2 nos
36W tubelight	2 nos
Fan	2nos

40W lamp	5nos
Single way switch	10 nos
Two way switch	5 nos
Iron box	2nos
Fan with regulator opened (demo purpose)	1no
Connecting Wires as required	

Electronics Engineering

IC Trainer Kit, Resistors, Capacitors, CRO, Function Generator,BreadBoard,Regulated Power Supply, Zener Diode, PN Junction Diode, Potentiometer, Digital Multimeter,Ammeter, Voltmeter, Wattmeter, IC 7408,IC 7432,IC 7486, IC 7400, IC 7404, IC 7402

Text Book

1. T. Jeyapoovan, M.Saravanapandian and S. Pranitha, "Engineering Practices Lab Manual", 3rd Edition 2006, Vikas Publishing house (P) Ltd., New Delhi.

EEB131 CIRCUIT THEORY LABORATORY

1 CREDIT

COREQUISITE

EEB101 - Circuit Theory

GOAL

To provide practical knowledge in Circuit Analysis

OBJECTIVES

The course should enable the students to:

I. Basic Circuit laws : ohms and Kirchoff's law
II. Thevenin's and Norton's Theorem
III. Maximum power transfer and superposition theorem
IV. Mesh and nodal analysis
V. Transient and frequency response
VI. Series and parallel resonance
VII. Basic inductance circuits

OUTCOME

The students should be able to:

(i) Analyze basic laws in circuit analysis like KCL, KVL and ohms law
(ii) Analyze various network theorems
(iii) Analyze mesh and nodal analysis
(iv) Analyze transient and frequency response
(v) Analyze resonance and inductance circuit

LIST OF EXPERIMENTS

S.No.	List of Experiments
	Introduction
1	Verification of ohm's law and Kirchoff's laws.
2	Verification of Thevenin's and Norton's Theorem
3	Verification of superposition Theorem

4	Verification of maximum power transfer theorem.	
5	Verification of mesh and nodal analysis.	6
6	Transient response of RL and RC circuits for DC input.	3
7	Frequency response of series and parallel resonance circuits.	6
8	Frequency response of single tuned coupled circuits.	3
	Repeat classes	3
	Model Exam	3
		P:45, TOTAL:45

LIST OF EQUIPMENTS

S.No.	**EQUIPMENT**	**QUANTITY**
1	Regulated Power Supply	13
2	Function Generator	6
3	CRO	6
4	Bread Board	15 Nos.
5	Voltmeter of different ranges	10 Nos.
6	Milli Ammeter of different ranges	13 Nos.
7	Resistor of various ranges	50 Nos.
8	Inductor of various ranges	10 Nos.
9	Capacitor of various values	5 Nos.
8	SPST	2
9	Autotransformer	2
10	Stop Watch	2
11	Connecting Wires	Sufficient Numbers

SEMESTER-III

MAA202 ENGINEERING MATHEMATICS – III
(Common to ECE, E&I and EEE Branches)

L	T	P	C
3	1	0	4

UNIT – I: Partial Differential Equations **12**

Formation of partial differential equation differential equations by elimination arbitrary constant arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT – II: Boundary Value Problems **12**

Classification of second order linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two dimensional heat equations (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT – III: Fourier Transform **12**

Fourier Integral Theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of Simple functions – Convolution theorem – Parseval's identity.

UNIT – IV: Z – Transform and Difference Equations **12**

Z – Transform – Elementary Properties – Inverse Z – transform – Convolution theorem – Formation of Difference equations – Solution of difference equations using z – transform

UNIT V: BESSEL FUNCTIONS **12**

Bessel's equation, Bessel functions, recurrence relations, orthogonality property, generating function, equations reducible to Bessel's equation.

Total: 60

Text Books

1.M.K. Venkatraman, Mathematics, Vol – II, National Publishing Company, Chennai.
2.A.P.Santhakumaran, P.Titus, J.Xavier Pragasam, Transforms and Partial Differential Equations, Nimeric Publications.
3. M.K. Venkatraman, Higher Mathematics for Engineering and Science, National Publishing Company, Chennai.

References

1.Kandasamy. Engineering Mathematics Volume II, S. Chand & Co., New Delhi.
2.B.S. Grewal , "Engineering Maths – II, Sultem Chand, New Delhi.
3.Bali N.P & Manish Goyal, Text book of Engg. Maths, 3rd Edition, Lakshmi Publications.

EEB201 ELECTROMAGNETIC THEORY

L T P C
3 1 0 4

PREREQUISITE

EEB101 - Circuit Theory,
MA A102- Engineering Mathamatics - II

GOAL

To provide knowledge about the application of mathematical concepts in electromagnetic fields and waves.

OBJECTIVES

The course will enable the students to:

(i) Understand the concepts of vectors,curl and divergence
(ii) Acquire adequate knowledge about the electric potential and the electric field intensity
(iii) Acquire knowledge about the magnetic potential and the magnetic field intensity
(iv) Get adequate knowledge about Maxwell's equation
(v) Get adequate knowledge about waves through different media

OUTCOME

The students should be able to:

(i) Apply vectors in analyzing the electromagnetic fields
(ii) Understand the various aspects of electrostatics.
(iii) Understand the various aspects of magnetostatics
(iv) Gain knowledge about Electrodynamic fields.
(v) Gain knowledge in wave propagation in different media

UNIT I INTRODUCTION **8**

Sources and effects of electromagnetic fields - Vector fields - Different co-ordinate systems - Divergence theorem - Stoke's theorem.

UNIT II ELECTROSTATICS **16**

Coulomb's Law - Electric field intensity - Field due to point and continuous charges - Gauss's law and application - Electrical potential - Electric field and equipotential plots - Electric field in free space, conductors, dielectric - Dielectric polarization, Electric field in multiple dielectrics - boundary conditions, Poisson's and Laplace's equations - Capacitance-energy density - Dielectric strength.

UNIT III MAGNETOSTATICS 12

Lorentz Law of force, magnetic field intensity - Biot-savart Law - Ampere's Law - Magnetic field due to straight conductors, circular loop, infinite sheet of current - Magnetic flux density (B) - B in free space, conductor, magnetic materials - Magnetization - Magnetic field in multiple media – Boundary conditions - Scalar and vector potential - Magnetic force - Torque - Inductance - Energy density - Magnetic circuits.

UNIT IV ELECTRODYNAMIC FIELDS 12

Faraday's laws, induced emf - Transformer and motional EMF, Maxwell's equations (differential and integral forms) - Displacement current - Relation between field theory and circuit theory.

UNIT V ELECTROMAGNETIC WAVES 12

Generation - Electro Magnetic Wave equations - Wave parameters; velocity, intrinsic

impedance, propagation constant - Waves in free space, lossy and lossless dielectrics, conductors-skin depth, Poynting vector - Plane wave reflection and refraction.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. Sadiku, "Elements of Electromagnetics", Fifth edition, Oxford University Press, 2009.
2. William .H.Hayt, "Engineering Electromagnetics", Tata McGraw Hill edition, 2010.
3. John.D.Kraus, "Electromagnetics", McGraw Hill book Co., New York, Fourth Edition, 1991.

REFERENCES

1. Joseph. A.Edminister, "Theory and Problems of Electromagnetics", Second edition, Schaum Series, Tata McGraw Hill, 1993.
2. I.J. Nagrath, D.P. Kothari, "Electric Machines", Tata McGraw Hill Publishing Co Ltd, Second Edition, 1997.
3. Kraus and Fleish, "Electromagnetics with Applications", McGraw Hill International Editions, Fifth Edition, 1999.

EEB 202 ELECTRICAL MACHINES - I

L T P C
3 1 0 4

PREREQUISITE

EEB101- Circuit Theory,
EEB201 – Electromagnetic Theory

GOAL

To expose the students to the concepts of various types of DC Machines and Transformers.

OBJECTIVES

The course will enable the students to understand:

(i) Electro-mechanical energy conversions in D.C. machines and energy transfer in transformers
(ii) Constructional details, principle of operation, characteristics and performance of D.C. generator.
(iii) Constructional details, principle of operation, characteristics and speed control of D.C. motors.
(iv) Constructional details and principle of operation and performance of transformer
(v) Testing of D.C. machines and transformer

OUTCOME

The students should be able to:

(i) Understand Various types, Principle of Operation and Characteristics of DC Motors and DC Generators.
(ii) Understand Principle of Operation, types, Characteristics and parallel operation of DC Generators.
(iii) Understand Principle of Operation, types, Characteristics and speed control of DC Motors.
(iv) Understand Construction and Principle of Operation, Testing, Regulation , equivalent circuit of Transformers
(v) Understand Various direct and indirect test methods to find the efficiency of DC machines and transformer.

UNIT I BASIC CONCEPTS OF ROTATING MACHINES 8

Principles of electromechanical energy conversion - Single and multiple excited systems - m.m.f of distributed A.C. windings - Rotating magnetic field - Generated voltage - Torque in round rotor machine.

UNIT II DC GENERATORS 8

Constructional details - emf equation - Methods of excitation - Self and separately excited generators - Characteristics of series, shunt and compound generators - Armature reaction and commutation - Parallel operation of DC shunt and compound generators.

UNIT III DC MOTORS 9

Principle of operation - Back emf and torque equation - Characteristics of series, shunt and compound motors - Starting of DC motors - Types of starters - Speed control of DC series and shunt motors.

UNIT IV TRANSFORMERS 12

Constructional details of core and shell type transformers - Types of windings - Principle of operation - emf equation - Transformation ratio - Transformer on no-load - Parameters referred to HV / LV windings - Equivalent circuit - Transformer on load - Regulation - Parallel operation of single phase transformers - Auto transformer - Three phase transformers - Vector group.

UNIT V TESTING OF DC MACHINES AND TRANSFORMERS 8

Losses and efficiency in DC machines and transformers - Condition for maximum efficiency - Testing of DC machines - Brake test, Swinburne's test, Retardation test and Hopkinson's test - Testing of transformers - Polarity test, load test, open circuit and short circuit tests - All day efficiency.

L = 45 T = 15 Total = 60

Note: Unit 5 may be covered along with Unit 2, 3, and 4.

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, Reprint 2008.
2. V.K.Metha & Rohit Metha,'Principle of Electrical Machines', S.Chand Publishers, 2009.

REFERENCES

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002. 3 K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

EEB 203 ELECTRONIC CIRCUITS

L P T C
3 0 0 3

PREREQUISITE
EE B102 - Electronic Devices

GOAL
To provide knowledge in the analysis and design of amplifiers and their applications.

OBJECTIVES
The course will enable the students :
(i) To get exposed to the analysis and design of small signal and larger signal amplifiers.
(ii) To make students familiar with common mode and differential mode analysis of differential amplifier.
(iii) Study the characteristics and construction of tuned amplifiers.
(iii) To get exposed to negative feedback amplifiers and oscillators.
(iv) To familiarize the students with the applications such as wave form generation, clippers and clampers etc.,
(v) To get exposed to rectifiers and power supply circuits

OUTCOME
The students should be able to:
(i) Analyze and design small signal and large signal amplifiers.
(ii) Analyze and design Differential amplifiers and to explain the working of tuned amplifiers.
(iii) Explain the different type of negative feedback amplifiers and oscillator circuits with their design equations.
(iv) Enumerate the points on wave form generation, clipper and clamper applications using transistors and diodes.
(v) Explain the operation of Rectifiers and power supply cicuits.

UNIT I SMALL-SIGNAL AND LARGE SIGNAL AMPLIFIERS 9
Fixed and self biasing of BJT & FET - Small signal analysis of CE, CC & Common source amplifiers - Cascade and Darlington connections, transformer coupled class A, B & AB amplifiers - Push-pull amplifiers.

UNIT II DIFFERENTIAL AND TUNED AMPLIFIERS 9
Differential amplifiers - Common mode and differential mode analysis - DC and AC analysis - Characteristics of tuned amplifiers - Single & double tuned amplifier.

UNIT III FEEDBACK AMPLIFIER AND OSCILLATORS 9
Characteristics of negative feedback amplifiers - Voltage / Current, series/shunt feedback - Theory of sinusoidal oscillators - Phase shift and Wien bridge oscillators - Colpitts, Hartley and crystal oscillators.

UNIT IV PULSE CIRCUITS 9
RC wave shaping circuits - Diode clampers and clippers - Multivibrators - Schmitt triggers - UJT based sawtooth oscillators.

UNIT V RECTIFIERS AND POWER SUPPLY CIRCUITS 9
Halfwave & fullwave rectifier analysis - Inductor filter - Capacitor filter - Series voltage regulator - Switched mode power supply.

L= 45 TOTAL = 45

TEXT BOOKS

1. David A. Bell, 'Electronic Devices & Circuits', Prentice Hall of India/Pearson Education, IV Edition, ninth printing, 2007.
2. Jacob Millman & Christos.C.Halkias, Satyabrata Jit, 'Electronic Devices and Circuits ', Tata McGraw Hill, 2nd edition, 2008.
3. Robert. L. Boylestad & Lo Nashelsky, 'Electronic Devices & Circuit Theory', Ninth edition, Pearson Education, 2009 / PHI.

REFERENCES

1. Jacob Millman & Herbert Taub, 'Pulse, Digital & Switching Waveforms', Tata McGraw Hill, Edition 2000, 24th reprint, 2003.
2. Donald L.Schilling and Charles Belove, 'Electronic Circuits', 3rd Edition, Tata McGraw Hill, 2003.
3. Jacob Millman & Christos.C.Halkias, 'Integrated Electronics: Analog and Digital Circuits and System',50th reprint, Tata McGraw Hill, 2009.

EEB204 MEASUREMENTS AND INSTRUMENTATION

L P T C
3 0 0 3

PREREQUISITE

EE B101 - Circuit Theory
EE B203 - Electronic Circuits

GOAL

To learn how to design accurate meters with high precision and small size.

OBJECTIVES

The course will enable the students :

(i) To get the knowledge of various electrical instruments
(ii) To know how to improve the accuracy of instruments
(iii) To know about the calibration and measurements
(iv) To know about the digital instruments
(v) To know about various types of transducers.

OUTCOME

The students should be able to:

(i) Gain knowledge of various electrical instruments.
(ii) Analyze the accuracy of instruments.
(iii) Analyze various types of AC and DC bridges.
(iv) Know the principle of operation of various types of transducers.

UNIT I INTRODUCTION **9**

Functional elements of an instrument - Static and dynamic characteristics - Errors in measurement - Statistical evaluation of measurement data - Standards and calibration.

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS **9**

Principle and types of analog and digital voltmeters, ammeters, multimeters - Single and three phase wattmeters and energy meters - Magnetic measurements - Determination of B-

H curve and measurements of iron loss - Instrument transformers - Instruments for measurement of frequency and phase both analog and digital

UNIT III MEASUREMENTS USING COMPARISION 9

D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape - Recorders,FM recording, PDM recording,digital tape recording, digital plotters and printers, CRT display, digital CRO, LED, LCD & dot matrix display.

UNIT V TRANSDUCERS 9

Classification of transducers - Selection of transducers - Resistive, capacitive & inductive transducers - Piezoelectric, optical and digital transducers - LVDT , Thermocouples,Hall effect transducers, Non electrical measurements- Displacement, pressure, strain.

L = 45 TOTAL = 45

TEXT BOOKS

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2006.

REFERENCES

1. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1984 edition
2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd,2009 edition.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, 2010 edition.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 1989 edition.
5. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2010 edition.

SSA231 APTITUDE – I

L	T	P	C
1	0	1	1

PURPOSE:

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES

1. To guide thought process
2. Appear for placement aptitude tests confidently
3. To develop Communication skill
4. To build confidence
5. Acquire aptitude skills for employment

METHODOLOGY:

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group Activities + Individual activities

2. Collaborative learning
3. Interactive sessions
4. Ensure participation
5. Empirical learning

LOGICAL REASONING:

Number, Letter series, Analogies- Coding, Decoding – Blood relations, direct sense, Operator based questions – Clock & Calendars
Distribution, Binary Logic and Puzzles – Arrangements, Selections.
Routes & Networks, Comparison – Cubes & Venn Diagrams.

VERBAL ABILITY:

Critical Reasoning – Antonym, Synonym
Odd man – fill in the blank
Sentence Construction / Completion – Idiomatic expression
Detection of errors.
Jumbled sentences, Vocabulary, Alphabetical sequence, cloze passage.

EVALUATION:

1. University Theory Question paper
2. Activities assessed by both group and individual participation
3. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION:

Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:

Complete internal evaluation on regular basis.

EED251 ELECTRICAL DRIVES AND CONTROL
(Common to Mechanical and Production)

L P T C
3 0 0 3

Objectives:

To make the understanding of different speed controlling methods applied to motors

OUTCOME:

1. To understand the speed torque characteristics of motor
2. To apply modern speed control techniques to the motor

INTRODUCTION

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.

DRIVE MOTOR CHARACTERISTICS

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound – single phase and three phase induction motors.

STARTING METHODS

Types of D.C Motors starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system – Using controlled rectifiers and DC choppers – applications.

CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

TEXT BOOKS

1. Vedam Subramaniam, “Electric Drives (concepts and applications)”, Tata McGraw-Hill, 2001

2.Nagrath.I.J & Kothari.D.P, “Electrical Machines”, Tata McGraw-Hill, 1998

REFERENCES

1. Pillai.S.K“ A first course on Electric drives”, Wiley Eastern Limited, 1998

2. M.D.Singh, K.B.Khanchandani, “Power Electronics”, Tata McGraw-Hill, 1998

1. H.Partab, “Art and Science and Utilisation of electrical energy”, Dhanpat Rai and Sons, 1994

EEB231 ELECTRICAL MACHINES LABORATORY-I

L T P C
0 0 3 1

CO-REQUISITE

EE B 202 - Electrical Machines - I

GOAL

To expose the students to the basic operation in electrical machines and help them to develop experimental skills.

OBJECTIVES

The course should enable the students to :

(i) Study practically DC machines and transformers by direct loading.

(ii) Study practically DC machines and transformers by indirect methods.

OUTCOME

The students should be able to:

(i) Understand the operation of DC machines and Transformers .

(ii) Analyze the performance under varying load conditions.

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
	Introduction	3

1.	Open circuit and load characteristics of separately excited and self excited D.C. generator	6
2.	Load test on D.C. shunt motor	3
3.	Load test on D.C. series motor	3
4.	Speed Control of DC Shunt Motor	3
5.	Swinburne's test and speed control of D.C. shunt motor	3
6.	Load test on single phase transformer and open circuit and short circuit test on single phase transformer	3
7.	Hopkinson's Test	3
8.	Sumpner's test	3
9.	Load test on DC Compound motor	3
10.	Load test on DC compound generator	3
11.	Study of D.C. motor and induction motor starters	3
	Repeat Class	3
	Model Exam	3
		P = 45 TOTAL = 45

LIST OF EQUIPMENT

S.No.	Name of the Equipment	Quantity required
1.	D.Cmotor-Shunt Generator	2set
2.	D.C.Shunt Motor	2Nos.
3.	D.C.Series Motor	1No.
4.	D.C.Compound Motor	1No.
5.	Single phase transformers	7Nos.
6.	Three phase transformers	2Nos.
11.	Resistive load 3 phase-2,single phase-3	5Nos.
13.	Single phase Autotransformer	5Nos.
14.	Three phase Autotransformer	3Nos.
15.	Moving Coil Ammeter of different ranges	20Nos.
16.	Moving Coil Voltmeter of different ranges	20Nos.
17.	Moving Iron Ammeter of different ranges	20Nos.
18.	Moving Iron voltmeter of different ranges	20Nos.
19.	Wire wound rheostats of different ratings	30Nos.
20.	Tachometers	10Nos.
21.	Single element watt -meters of different ranges	20Nos.

EEB 232 ELECTRONIC DEVICES AND CIRCUITS LABORATORY

L T P C
0 0 3 1

PREREQUISITE / CO REQUISITE

EE B102 - Electronic Devices

EE B 203 - Electronic Circuits

GOAL

To expose the students to study the characteristics and to determine the device parameters of various solid-state devices.

OBJECTIVES

The course should enable the students to :

(i) Obtain the performance characteristics of various solid state devices.

(ii) Construct and obtain the performance parameters of Oscillator circuits,Rectifier circuits,Amplifier circuits using solid state devices

OUTCOME

The students should be able to:

(i) Understand the performance of various solid state devices.

(ii) Understand the working of Oscillator circuits, Rectifier circuits and Amplifier

List of Experiments

S.No.	Title of Experiments	No. of Hours
1	Static Characteristics of transistor under CE, CB, CC and determination of hybrid parameters.	6
2	Static characteristics and parameter determination of JFET.	3
3	Static characteristics of semiconductor diode, zener diode and study of simple voltage regulator circuits.	6
4	Static characteristics of UJT and its application as a relaxation oscillator.	6
5	Photodiode, Phototransistor characteristics and study of light activated relay circuit.	3
6	Static characteristics of Thermistors.	6
7	Single phase half wave and full wave rectifiers with inductive and capacitive filters.	3
8	Phase shift oscillators and Wien bridge oscillators.	6
9	Frequency response of common emitter amplifiers.	3
10	Differential amplifiers using FET.	3

P : 45 TOTAL : 45

S.No	Component	Specification	Quantity
1	Transistor	BC 107/108, BC548, BFW11/10, 2N2646	Each 5
2	Resistor	1k Ω	20
		330 Ω,470 Ω,68k Ω	Each 1
		2.2k Ω	2
		100k Ω	3
		56 Ω,47 Ω	Each 1
		4.7k Ω	8
		6.8k Ω,27k Ω,3.3k Ω	Each 1
		5.6k Ω, 47k Ω,3.9k Ω,15k Ω	Each 2
		100 Ω	1
3	Potentiometer	10k Ω	1
4	Capacitor	0.1µF	3
		100 µF	2
		0.01 µF	3
		10 µF	4
		2.2 µF	1
		22 µF	2
5	Inductor	100mH	1
6	Diode	IN4001/4007	3
7	Regulated power supply		13
8	Ammeter	(0-15) µA	1
		(0-30) mA	2
		(0-1)mA	2
		(0-500)µA	1
9	Voltmeter	(0-1)V	2
		(0-30)V	7
10	Photodiode		1
11	Phototransistor		1

12	Muffel furnace		1
13	Thermistor		1
14	Soldering Iron		1
15	Thermometer		1
16	Multimeter		5
17	Transformer	(15-0-15) V	1
18	CRO		5
19	Probes		10
20	BreadBoard		10

EEB233 MEASUREMENTS AND INSTRUMENTATION LABORATORY

L T P C
0 0 3 1

CO REQUISITE

EE B 204 - Measurements and Instrumentation

GOAL

To familiarize the students with different measuring instruments and digital simulation of linear systems

OBJECTIVES

The course should enable the students to :

(i) Bridges, amplifiers and calibration of current transformers.

(ii) Digital simulation of linear systems

OUTCOME

The students should be able to:

(i) Understand the functioning Bridges, amplifiers and calibration of current transformers.

(ii) Obtain the characteristics of linear systems using digital simulation.

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
1	Introduction Class	3
2	DC Bridges i) Wheastones bridge	3
	ii) kelvin's double bridge	3
3	AC Bridges i) Anderson bridge	3
	ii) schering bridge	3
4	Instrumentation amplifiers	3
5	Study of Transients	3
6	Calibration of 1-phase energy meter	3

7	Calibration of current transformers	3
8	Study of Synchros	3
9	Digital simulation of linear first order for step input Digital simulation of linear second order for step input	3
10	Voltage measurement using LVDT	3
11	Digital simulation of instrumentation amplifier	3
12	Digital simulation of RC transient circuit	3
13	Model lab test	3
		P : 45 TOTAL : 45

SEMESTER - IV

MAA202 NUMERICAL METHODS

L T P C
3 1 0 4

GOAL

To create the awareness and comprehensive knowledge in numerical solutions.

OBJECTIVES

The course should enable the students to:

(i) Learn the techniques of solving the algebraic and transcendental equations.

(ii) Learn to interpolate using Newton's forward and backward difference formulae for equal and unequal intervals

(iii) Understand the use of numerical differentiation and to find the approximate area using numerical integration.

(iv) Understand solving numerically the initial value problems for ordinary differential equations using single step and multi step method.

(v) Learn the methods of solving second order partial differential equations numerically and use it
to solve initial and boundary value problems for partial differential equations.

OUTCOME

The students should be able to:

(i) Find out the roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations by direct and indirect methods.

(ii) Solve problems where huge amounts of experimental data are involved; the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.

(iii) Use the numerical differentiation and integration when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.

(iv) Solve engineering problems which are characterized in the form of nonlinear ordinary differential equations, since many physical laws are couched in terms of rate of change of one independent variable

(v) Solve the initial and boundary value problems related heat flow, one and two dimensional and vibration problems. Understands the numerical techniques of solving the partial differential equation in engineering applications.

UNIT I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS **12**

Linear interpolation methods (method of false position) - Newton's method - Statement of Fixed PointTheorem - Fixed point iteration: x=g(x) method. Solution of linear algebraic system of equations - Direct methods - Gauss-Jordon method and Crout's method - Iterative method: Gauss-Seidel method.

UNIT II INTERPOLATION AND APPROXIMATION **12**

Interpolation - equal intervals - Newton's forward and backward difference formulae - problems. Interpolation-unequal intervals - Newton's divided difference formula -

Lagrange's and inverse interpolation-problems.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION **12**

Numerical differentiation - Newton's forward and backward difference - Divided differences and finite differences - Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules. Two and Three point Gaussian quadrature formulae - Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS **12**

Single step methods: Taylor series method - first order-second order and simultaneous - Euler and Modified Euler methods. Fourth order Runge - Kutta method for solving first and second order equations - Multi-step methods: Milne's and Adam's predictor and corrector methods.

UNIT V INITIAL AND BOUNDARY VALUE PROBLEMS FOR PARTIAL DIFFERENTIAL EQUATIONS **12**

Finite difference solution of second order ordinary differential equation - classification of partial differential equations - Finite difference solution of two dimensional heat flow equations Laplace and Poisson equations.One dimensional heat equation by explicit and implicit methods - One dimensional wave equation.

TOTAL: 60

TEXT BOOKS

1. Kandasamy P, Thilagavathy K, Gunavathy K, "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
2. Chandrasekaran A. and Beena James, "Numerical Methods", Dhanam publications, Chennai, 2011.

REFERENCES

1. Burden R.L, and Faires T.D, "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Gerald C.F, Wheatley P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
3. Balagurusamy E, "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi

EEB205 ELECTRICAL MACHINES-II

L	T	P	C
3	1	0	4

PREREQUISITE

EE B 201 - Electromagnetic Theory
EE B 202 - Electrical Machines - I

GOAL

To expose the students to the concept of operation of synchronous machines and induction motor.

OBJECTIVES

The course will enable the students to:

(i) Understand the construction and operation of synchronous generator

(ii) Understand the construction and operation and torque equation of synchronous motor.

(iii) Understand the construction and operation of three phase induction motor.

(iv) Understand various types of starters and speed control of three phase induction motor.

(v) Understand the construction and operation of single phase induction motor and the special machines.

OUTCOME

The students should be able to:

(i) Explain the concept of synchronous generator and their performance characteristics.

(ii) Explain the concept of V-curves and power developed.

(iii) Explain the concept, losses and circle diagram of three phase induction motor.

(iv) Explain the concept of starter and speed control of three phase induction motor.

(v) Explain the concept of equivalent circuit and no load and blocked rotor test and special machines.

UNIT I SYNCHRONOUS GENERATOR 12

Constructional details - Types of rotors - emf equation - Synchronous reactance - Armature reaction - Voltage regulation - e.m.f, m.m.f, z.p.f and A.S.A methods - Synchronizing and parallel operation - Synchronizing torque - Change of excitation and mechanical input - Two reaction theory - Determination of direct and quadrature axis synchronous reactance using slip test - Operating characteristics - Capability curves.

UNIT II SYNCHRONOUS MOTOR 12

Principle of operation - Torque equation - Operation on infinite bus bars - V-curves - Power input and power developed equations - Starting methods - Current loci for constant power input, constant excitation and constant power developed.

UNIT III THREE PHASE INDUCTION MOTOR **12**

Constructional details - Types of rotors - Principle of operation - Slip - Equivalent circuit - Sliptorque characteristics - Condition for maximum torque - Losses and efficiency - Load test - No load and blocked rotor tests - Circle diagram - Separation of no load losses - Double cage rotors - Induction generator - Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 12

Need for starting - Types of starters - Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters - Speed control - Change of voltage, torque, number of poles and slip - Cascaded connection - Slip power recovery scheme.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 12

Constructional details of single phase induction motor - Double revolving field theory and operation - Equivalent circuit - No load and blocked rotor test - Performance analysis - Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, Reprint 2008.

2. V.K.Metha & Rohit Metha,'Principle of Electrical Machines', S.Chand Publishers, 2009.

REFERENCES

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002. 3 K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

EEB206 CONTROL SYSTEMS

L	T	P	C
3	1	0	4

PREREQUISITE / COREQUISITE

MA A 102 - Engineering Maths - II

EE B 202 - Electrical Machines - I

EE B 205 - Electrical Machines - II

GOAL

To familiarize the students with the basic concepts of linear control theory and design of control system.

OBJECTIVES

The course will enable the students to:

(i) Understand the methods of representation of systems and getting their transfer function models

(ii) Provide adequate knowledge in the time response of systems and steady state error analysis.

(iii) Give basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.

(iv) Understand the concept of stability of control system and methods of stability analysis.

(v) Study the three ways of designing compensation for a control system

OUTCOME

The students should be able to:

(i) Understand the various methods of representation of systems.

(ii) Apply time response analysis and to determine steady state error.

(iii) Analyse the stability of the system using frequency response plots and able to

adjust the gain of the system to satisfy the desired specifications.

(iv) Determine the stability of the sytem by applying various stability criterian.

(v) Design a suitable compensator to stabilize the system and to obtain the desired performance.

UNIT I SYSTEMS AND THEIR REPRESENTATION 12

Basic elements in control systems - Open and Closed loop systems - Electrical analogy of Mechanical and Thermal systems - Transfer function - Synchros - AC and DC servomotors - Block diagram reduction techniques - Signal flow graphs. Programmable Logic Control- operation.

UNIT II TIME RESPONSE 12

Time response - Time domain specifications - Types of test input - I and II order system response - Error coefficients - Generalized error series - Steady state error - P, PI, PID modes of feed back control.

UNIT III FREQUENCY RESPONSE 12

Frequency response - Bode plot - Polar plot - Constant M and N circles - Nichol's chart - Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications.

UNIT IV STABILITY OF CONTROL SYSTEM 12

Characteristics equation - Location of roots in S plane for stability - Routh Hurwitz criterion - Root locus construction - Effect of pole, zero addition - Gain margin and phase margin - Nyquist stability criterion.

UNIT V COMPENSATOR DESIGN 12

Performance criteria - Lag, lead and lag-lead networks - Compensator design using bode plots.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. K. Ogata, "Modern Control Engineering", 5th edition, Pearson Education, New Delhi, 2009 / PHI

2. I.J. Nagrath & M. Gopal, "Control Systems Engineering", New Age International Publishers,2003.

REFERENCES

1. B.C. Kuo, "Automatic Control Systems", Prentice Hall of India Ltd., New Delhi, 1995.

2. M. Gopal, "Control Systems, Principles & Design", Tata McGraw Hill, New Delhi, 2002.

3. M.N. Bandyopadhyay, "Control Engineering Theory and Practice", Prentice Hall

EEB207DIGITAL LOGIC CIRCUITS

L T P C
3 1 0 4

PREREQUISITE

EE B 203 - Electronic Circuits

GOAL

To familiarize the students with the basics of number systems, codes, Encoders, Decoders, Multiplexers, DeMultiplexers, Analysis & Design of synchronous & asynchronous sequential circuits and Programmable Logic Devices.

OBJECTIVES

(i) In Number system & Boolean algebra unit the student will be learning about the basics of number systems, codes, Simplification of functions.

(ii) In Combinational circuits unit the student will be learning about logic gates, adders, subtractors, Encoders, Decoders, Multiplexers and DeMultiplexers.

(iii) In Synchronous sequential circuits unit the student will be learning about different types of Flip Flops, Analysis & Design of synchronous sequential circuits and counters.

(iv) In Asynchronous sequential circuit unit the student will be learning about Analysis & Design of asynchronous sequential circuits

(v) In programmable logic devices, memory and logic families unit the student will be learning about different types of memories and logical families.

OUTCOME

The students should be able to:

(i) Gain knowledge about code conversions and to simplify any complex circuit.

(ii) Understand about design of adder circuit & subtractor circuit. Also he/she will be able to realize any function using multiplexers.

(iii) Design synchronous sequential circuits and counters.

(iv) Design asynchronous sequential circuits.

(v) Understand different types of memories and logical families.

UNIT I NUMBER SYSTEM & BOOLEAN ALGEBRA 12

Review of number system; types and conversion, codes. Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps & Quine McCluskey method.

UNIT II COMBINATIONAL CIRCUITS 12

Design of Logic gates.Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 12

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits - Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENCTIAL CIRCUIT 12

Analysis of asynchronous sequential machines, state assignment, asynchronous design

problem.

UNIT V PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES 12

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 2002.
2. R.P. Jain , 'Modern Digital Electronics' , Tata McGraw-Hill Education, 2003.
3. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 200REFERENCES
4. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
5. Floyd, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
6. John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education, 2002.

SSA232 APTITUDE – IV

L	T	P	C
1	0	1	1

PURPOSE:

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES

1. To guide thought process
2. Appear for placement aptitude tests confidently
3. To develop Communication skill
4. To build confidence
5. Acquire aptitude skills for employment

METHODOLOGY:

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group Activities + Individual activities
2. Collaborative learning
3. Interactive sessions
4. Ensure participation
5. Empirical learning

QUANTITATIVE APTITUDE:

Sample Equation, Ratio, Proportion, Variation.

Percentage, Profit & Loss, Partnership.

Averages, Mixtures, Allegations: Simple & Compound Interest.

Time Work, Time Distance.

Geometry & Mensuration.

Permutation, Combination & Probability.

Data Interpretation & Data Sufficiency.

Analytical reasoning:

Non- Verbal Reasoning

Word problem

EVALUATION:

1. Activities assessed by both group and individual participation
2. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION:

Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:

Complete internal evaluation on regular basis.

EED252 ELECTRONICS AND MICROPROCESSORS

L	P	T	C
3	0	0	3

OBJECTIVE

To enable the students to understand the fundamental concepts of Semi Conductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors

OUTCOME

1. To understand the solid state devices and digital circuits
2. To understand the digital processors for hardware control

UNIT I SEMICONDUCTORS AND RECTIFIERS 9

Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic semiconductors-P type and N type-PN junction-Zenor effect-Zenor diode characteristics-Half wave and full wave rectifiers -Voltage regulation.

UNIT II TRANSISTORS AND AMPLIFIERS

12

Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits-Class A, Band C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier-SCR, Diac,Triac, UJT-Characteristics and simple applications-Switching transistors-Concept of feedback-Negative feedback-Application in temperature and motor speed control.

UNIT III DIGITAL ELECTRONICS
9

Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra-Exclusive OR gate -Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion.

UNIT IV 8085 MICROPROCESSOR
9

Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set-Addressingmodes-Simple programs using arithmetic and logical operations.

UNIT V INTERFACING AND APPLICATIONS OF MICROPROCESSOR
6

Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessorTemperature control, Stepper motor control, traffic light control.

TOTAL : 45
PERIODS

TEXT BOOKS:

1. Milman and Halkies, “Integrated Electronics”, Tata McGraw-Hill publishers, 1995.
2. Ramesh Grammar, “Microprocessor Architecture”, Programming and Applications with 8085, Wiley Eastern, 1998.

REFERENCES:

1. Malvino and Leach, “Digital Principles and Applications”, Tata McGraw-Hill, 1996
2. Mehta V.K, “Principles of Electronics”, S. Chand and Company Ltd, 1994
3.Dougles V.Hall, “Microprocessor and Interfacing”, Programming and Hardware, Tata McGraw-Hill, 1999.
4. Salivahanan S, Suresh Kumar N, Vallavaraj A, “Electronic Devices and Circuits” First Edition,Tata McGraw-Hill, 1999.

EEB234ELECTRICAL MACHINES LABORATORY-II

L	T	P	C
0	0	3	1

COREQUISITE

EE B 205 - Electrical Machines II

GOAL

To expose the students to the basic operation in electrical machines and help them to develop experimental skills.

OBJECTIVES

The course will enable the students to:

(i) Obtain regulation of three-phase alternator and three-phase synchronous motor using various methods.

(ii) Obtain the performance characterstics of three- phase and single-phase induction motor.

OUTCOME

The students should be able to:

(i) Understand the regulation of three-phase alternator and three-phase synchronous motor using various methods.

(ii) Understand performance of three- phase and single-phase induction motor

List of Experiments

S.No	Title of Experiments	No. of Hours
	Introduction	3
1.	Regulation of three phase alternator by emf methods	3
2.	Regulation of three phase alternator by mmf methods	3
3.	Regulation of three phase alternator by ZPF methods	3
4.	Regulation of three phase alternator by ASA methods	3
5.	Regulation of three phase salient pole alternator by slip test	3
6.	V and Inverted V curves of Three Phase Synchronous Motor.	3
7.	Load test on three-phase induction motor.	3
8.	No load and blocked rotor test on three-phase induction motor	3
9.	Separation of No-load losses of three-phase induction motor.	3
10.	Load test on single-phase induction motor	3
11.	No load and blocked rotor test on single-phase induction motor	3
	Repeat Class	6
	Model Exam	3
		P:45 TOTAL :45

S.No.	Name of the Equipment	Quantity required
1.	DC shunt motor coupled three phase alternator	2
2.	Synchronous motor	1
3.	Three phase induction motors-	
	Squirrel cage	2
	Slipring	1
4.	DC Shunt motor coupled salient pole three phase alternator	1
5.	Single phase induction motors	2
6.	Air core inductor to do ZPF	1

7.	Starter-	
	Three point Starters	4
	Three phase induction motor starter	4
	Single phase induction motor starter	2
8.	Meters-	
	Voltmeter (MI)	15
	Ammeter (MI)	15
	Voltmeter (MC)	5
	Ammeter (MC)	5
	Wattmeter(LPF)	15
	Wattmeter(UPF)	15
9.	Single phase autotransformer	2
10.	Three phase autotransformer	4
11.	Rheostats of various range	30
12.	DC panel boards (220V)	1
13.	AC panel board	1
14.	Tachometer	12
15.	Lamp set	1
16.	Frequency meter	1

EEB235 CONTROL SYSTEM LABORATORY

L T P C
0 0 3 1

COREQUISITE

EE B 206 - Control System

GOAL

To provide a platform for understanding the basic concepts of linear control theory and its application to practical systems.

OBJECTIVES

The course will enable the students to

(i) Determine the transfer function parameters of AC servomotor.

(ii) Simulate type-0 and type-1 system.

(iii) Simulate linear systems and non-linear systems using digital simulation.

(iv) Design of P, PI and PID controllers.

(v) Learn Stability analysis of linear systems.

OUTCOME

The students should be able to:

(i) Understand the transfer function parameters for any type of system

(ii) Understand and Simulate(Digital and Analog)time response characteristics of type-0 and type-1 system

(iii) Understand and Design linear and nonlinear systems

(iv) Understand the stability Analysis of the linear system using Bode /Root locus and Nyquist plot.

LIST OF EXPERIMENTS

Sl. No.	Title of Experiment	No. of Hours
	Introduction Class	3
1	Determination of transfer function parameters of AC servo motor	3
2	Determination of transfer function parameters of DC motor	6
3	Analog simulation of Type-0 and Type-1 system	3
4	Digital simulation of Linear system	3
5	Digital simulation of Non-Linear system	3
6	Design and implementation of Compensators	3
7	Stability analysis of linear systems using Routh-Hurwitz and Root Locus method	3
8	Stability analysis of linear systems using Bode plot and Nyquist plot method	3
9	Design of P, PI, PID controllers	3
10	Study of Synchros	3
	Repeat Class	6
	Model Exam	3
		P : 45 Total : 45

LIST OF EQUIPMENTS

Sl. No.	Description	Specification	Quantity

1	AC servo motor	100W	1
2	DC motor	3HP	1
3	Rheostat	1100 Ω' 1.1A, 50 Ω, 5A' 250 Ω, 1.5A	1 Each
4	Ammeter	(0-2)A, (0-5)A, (0-10)A (MC)	2 Each
5	Voltmeter	(0-60)V, (0-300) V (MC&MI)	2 Each
6	Single phase Auto transformer	0-270V, 5A	1
7	RPS	5,15V Combined	4
8	Resisters	1K, 2.7K, 5.6K, 10K, 47K,56K, 68K	20 Each
9	Inductors	Decade Inductance Box	1
10	Capacitors	DCB, 1000μF	1, 5
11	IC 741		10
12	Multimeter		3
13	Computer with MATLAB	Pentium 4	5

EEB236DIGITAL LOGIC CIRCUITS LABORATORY

L T P C
0 0 3 1

COREQUISITE

EE B 207 - DIGITAL LOGIC CIRCUITS

GOAL

To expose the students to various digital logic circuits used in simple system configuration such as adder, encoder, multiplexer, counters etc.,

OBJECTIVES

The course will enable the students to :

i. Study Basic gates

ii. Implement Boolean Functions

iii. Design Half Adder, Full Adder, Half Subtractor and Full Subtractor circuits.

iv. Design and Implement the following code converters

   a. BCD to XS3 Converter

   b. XS3 to BCD Converter

   c. BINARY to GRAY Converter

   d. GRAY to BINARY Converter

v. Design and Implement 4:1 multiplexer using gates

vi. Design and Implement 1:4 demultiplexer using gates

vii. Design Decoder and Encoder circuits.

viii. Design and implement 3-bit asynchronous and synchronous counters

ix. Design and implement 4-bit shift registers in SISO, SIPO, PISO, PIPO

OUTCOME

The students should be able to:

i. To analyze Basic gates

ii. To Implement of any Boolean Functions

iii. To Design of Adder and Subtractor

iv. To Implementof different code converters

v. To Implement of 4:1 multiplexer using gates

vi. To Implement of 1:4 demultiplexer using gates

vii. To analyze Decoder and Encoder circuits.

viii. To Implement of 3-bit asynchronous and synchronous counters

ix. To Implement of 4-bit shift registers in SISO, SIPO, PISO, PIPO

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
1	Study of Basic Digital ICs. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND)	3
2	Implementation of Boolean Functions	3
3	Adder/ Subtractor circuits	3+3
4	Code converters	
	a. BCD to XS3 Converter	
	b. XS3 to BCD Converter	
	c. BINARY to GRAY Converter	
	d. GRAY to BINARY Converter	3+3
5	Multiplexer : Design of 4:1 multiplexer using gates. Study of Multiplexer IC.	3
6	Demultiplexer : Design of 1:4 demultiplexer using gates. Study of Demultiplexer IC	3
7	Design of Decoder and Encoder circuits	3+3

8	Study of Basic Flip Flops using gates and ICs. (Verification of truth table for JK Flip Flop, RS F/F, D F/F and TF/F)	3
9	Counters: Design and implementation of 3-bit asynchronous up and down counter using J-K F/F	3
10	Counters: Design and implementation of Mod 5 synchronous counter using J-K F/F	3
11	Shift Registers : Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable ICs	3+3

P : 45 Total : 45

COMPONENTS REQUIRED

Sl. No.	Description	Quantity
1	Digital IC Trainer Kit	12
2	IC 7408, 7432, 7404, 7400,7402, 7486	20
3	IC 7411, 7410	10
4	IC 74153, 74139	5
5	IC 7474, 7473	10

EEB237 DESIGN PROJECT -I

L T P C
0 0 8 3

GOAL

To provide an opportunity to the students to implement the principles of engineering learnt by them in practical applications with innovative ideas and thus enable them to have a practical expos

EVALUATION PROCEDURE

Review	Requirement	Weightage in Internal	Weightage in External	Duration
Zeroth Review	Title selection	-		At the end of 2 week from the start of semester
First Review	Literature review, Proposal for the project	10 %		At the end of 5 week from the start of semester

Second Review	Mathematical Analysis and Circuit Working	20 %		At the end of 8 week from the start of semester
Model Review	Final simulation / Hardware presentation	20%		At the end of 11 week from the start of semester
University Exam	Final Demo		50%	At the end of 12 week from the start of semester

SEMESTER V

EEB301POWER ELECTRONICS

L T P C
3 1 0 4

PREREQUISITE

EE B 102 - Electronic Devices

EE B 203 - Electronic Circuits

EE B 202 - Electrical Machines - I

EE B 205 - Electrical Machines - II

MA A 201 - Engineering Maths - III

GOAL

To introduce the application of electronic devices for conversion, control and conditioning of electric power.

OBJECTIVES

The course will enable the students to:

(i) Get an overview of different types of power semiconductor devices and their switching characteristics.

(ii) Understand the operation, characteristics and performance parameters of controlled rectifiers.

(iii) Study the operation, switching techniques and basic topologies of DC-DC switching regulators.

(iv) Learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction techniques.

(v) Study the simple applications.

OUTCOME

The students should be able to:

(i) Analyse the dynamic and switching characteristics of power semiconductor devices.

(ii) Determine the performance parameters of controlled rectifiers and AC voltage controller.

(iii) Design Choppers and Switching Regulators.

(iv) Understand Fixed DC to Variable AC converters, Various Modulation Techniques employed in Inverters and the Effect of Harmonics.

(v) Apply Power Converters in a Power System such as HVDC Transmission and FACTS.

UNIT I POWER SEMI-CONDUCTOR DEVICES 12

Structure, operation and characteristics of SCR, TRIAC, power transistor, MOSFET and IGBT.Driver and snubber circuits for MOSFET - Turn-on and turn-off characteristics and switching losses.

UNIT II PHASE-CONTROLLED CONVERTERS 12

2-pulse, 3-pulse and 6-pulse converters - Inverter operation of fully controlled converter - Effect of source inductance - Distortion and displacement factor - Ripple factor - Single phase AC voltage controllers.

UNIT III DC TO DC CONVERTERS 12

Step-down and step-up choppers - Time ratio control and current limit control - Switching mode regulators: Buck, boost, buck-boost and cuk converter - Resonant switching based SMPS.

UNIT IV INVERTERS 12

Single phase and three phase (both 120degree mode and 180 mode) inverters - PWM techniques: Sinusoidal PWM, modified sinusoidal PWM and multiple PWM - Voltage and harmonic control - Series resonant inverter - Current source inverters.

UNIT V APPLICATIONS 12

Uninterrupted power supply topologies - Flexible AC transmission systems - Shunt and series static VAR compensator - Unified power flow controller- HVDC Transmission.

L = 45 T=15 TOTAL = 60

TEXT BOOKS :

1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, Third edition, 2004 / PHI.

2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, "Power Electronics: Converters, Applications and Design", John Wiley and sons, third edition, 2003.

REFERENCES

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third edition, 1993.

2. Bimal K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, 2003.

3. Mr. Jaganathan, "Introduction to Power Electronics", Prentice Hall of India, 2004.

EEB302 TRANSMISSION AND DISTRIBUTION

L T P C
3 1 0 4

PREREQUISITE

EE B 201 - Electromagnetic Theory

EE B 101 - Circuit Theory

EE B 202 - Electrical Machines - I

EE B 205 - Electrical Machines - II

GOAL

The optimal goal of the course is to describe the journey of electricity from the power plant to customers.

OBJECTIVES

The course will enable the students

(i) To gain knowledge of how transmission and distribution systems deliver power from a power plant to customers.

(ii) To identify the basic components of a transmission and distribution system and explain their functions.

(iii) To gain knowledge of how power grids help in continuous flow of power to customers

(iv) To model the transmission line with compensators.

(v) To Design Proper grounding and insulation coordination of transmission line.

OUTCOME

The students should be able to:

(i) Calculate the technical losses due to energy dissipated in the conductors and equipment

used for transmission

(ii) Do load management and Energy audits.

(iii) Know the advantages and application of grounding system in the power system.

(iv) Gain knowledge about substation and distribution system.

(v) Establish the types of distribution system.

UNIT I INTRODUCTION 12

Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability, application of HVDC transmission system. FACTS (qualitative treatment only): TCSC, SVC, STATCOM, UPFC.

UNIT II TRANSMISSION LINE PARAMETERS 12

Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance of solid, stranded and bundled conductors: Symmetrical and unsymmetrical spacing and transposition; application of self and mutual GMD; skin and proximity effects; interference with neighboring communication circuits. Typical configuration, conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines.

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES 12

Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge- impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.

UNIT IV INSULATORS AND CABLES 12

Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

UNIT V SUBSTATION,GROUNDING AND DISTRIBUTION SYSTEM 12

Types of substations; bus-bar arrangements; substation bus schemes: single bus scheme, double bus with double breaker and single breaker, main and transfer bus, ring bus, double bus-bar with bypass isolators.Resistance of grounding systems: Resistance of driven rods, resistance of grounding point electrode, grounding grids; design principles of substation grounding system; neutral grounding.Radial and ring-main distributors; interconnectors; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

L=45 T = 15 TOTAL =60

TEXT BOOKS

1. V. K. Mehta & Rohit Mehta Principles of Power System,S.Chand fourth edition, 2008

2. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2008.

3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

4. S.L.Uppal 'Electrical power' khanna publishers,edition 8th , 2003

REFERENCES

1. Luces M.Fualkenberry ,Walter Coffer, 'Electrical Power Distribution and Transmission',

Pearson Education, 1996.

2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2007.
3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4. 'Tamil Nadu Electricity Board Handbook', 2003.

SSA331 PLACEMENT PREPARATORY PROGRAMME- V

L	T	P	C
1	0	1	1

PURPOSE:

The Purpose of the course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES:

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

1. Acquire the important soft skills for employment
2. Take part in group discussions and job interviews confidently
3. Gain self confidence to face the placement process.

METHODOLOGY:

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities & Individual activities
2. Collaborative learning
3. Interactive Sessions
4. Ensure Participation
5. Empirical Learning

- Resume writing
- SWOT Analysis
- Interview techniques
- Presentation skills
- Body Language for Interview
- Rules of Group Discussion
- FAQs

EVALUATION:

1. Activities assessed by both group and individual participation
2. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION:

Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:

Complete Internal Evaluation on a regular Basis.

ECC351DIGITAL SIGNAL PROCESSING

L TP C
3 0 0 3

PREREQUISITE

EE B 101 - Circuit Theory

EE B 207 - Digital Logic Circuits

MA A 201 - Engineering Maths

- III

GOAL

To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.

OBJECTIVES

The course will enable the students to :

(i) Classify signals and systems & their mathematical representation.

(ii) Analyse the discrete time systems.

(iii) Study various transformation tech-niques & their computation.

(iv) Study about filters and their design for digital implementation.

(v) Study about a programmable digital signal processor & quantization effects.

OUTCOME

The students should be able to:

(i) Understand Signals and systems & their mathematical representation.

(ii) Understand Z-transform, inverse z-transform, stability analysis

(iii) Understand DFT, FFT, DIT and DIF

(iv) Understand Various digital filter design

(v) Understand Programmable digital signal processor

UNIT I INTRODUCTION 9

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation, analog to digital conversion.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

Z-transform and its properties, inverse z-transforms; difference equation - Solution by z-transform, application to discrete systems - Stability analysis, frequency response - Convolution - Fourier transform of discrete sequence - Discrete Fourier series.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION9

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm - DIT & DIF - FFT using radix 2 - Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR & IIR filter realization - Parallel & cascade forms. FIR design: Windowing Techniques - Need and choice of windows - Linear phase characteristics.

IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

UNIT V PROGRAMMABLE DSP CHIPS 9

Architecture and features of TMS 320C54 signal processing chip - Quantisation effects in designing digital filters.

L = 45 TOTAL = 45

TEXT BOOKS

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2003 / PHI.
2. S.K. Mitra, 'Digital Signal Processing - A Computer Based Approach', Tata McGraw Hill, New Delhi, 2001.

REFERENCES

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, 'Discrete - Time Signal Processing', Pearson Education, New Delhi, 2003.
2. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003
3. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, 'Digital Signal Processing', Tata McGraw Hill, New Delhi, 2003.
4. Texas TMS 320C54X user manual (website).

EEC351 PROTECTION& SWITCHGEAR

L	P	T	C
3	0	0	3

PREREQUISITE

EE B 302 - Transmission & Distribution

GOAL

To expose the students to various faults in power systems and the methods of detecting them; the basics of arc interruption and the various types of switchgear.

OBJECTIVES

The course will enable the students to:

(i) Study the different types of faults in a power system

(ii) Provide knowledge on different methods of earthing power system.

(iii) Give basic knowledge on different types of protective relays and their applications.

(iv) Provide the concept of arc interruption models and their application with respect to switchgear Study the various types of circuit breakers and testing

OUTCOME

The students should be able to:

(i) Apply the Symmetrical Components techniques for fault analysis.

(ii) Evolve appropriate protection schemes and select the necessary protective relays

(iii) Have adequate knowledge on circuit breakers

UNIT I INTRODUCTION 9

Principles and need for protective schemes - nature and causes of faults - types of faults - fault current calculation using symmetrical components - Power system earthing - Zones of protection and essential qualities of protection - Protection scheme.

UNIT II OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS 9

Electromagnetic relays - Over current, directional, distance and differential, under frequency relays - static relays.

UNIT III APPARATUS PROTECTION 9

Apparatus protection: transformer, generator, motor- protection of bus bars & transmission lines - CTs and PTs and their applications in protection schemes.

UNIT IV THEORY OF CIRCUIT INTERRUPTION 9

Physics of arc phenomena and arc interruption. Restriking voltage & Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, interruption of capacitive current - DC circuit breaking.

UNIT V MICRO PROCESSOR BASED RELAYS

Microprocessor control for overcurrent relay, impedance relay,direction and mho relay, digital distance relay algorithm

Text Book:

1. Badri Ram & D N Vishwakarma,"Power system protection & switch gear" TMH pub. 2007

EEC352 SOLAR ENERGY SYSTEMS

L P T C
3 0 0 3

Prerequisite
PH A 101- Engineering Physics
EE B 102 - Electronic Devices

Goal:
To familiarize the students with the basics of Solar Energy Technology, it's subsystems, Various Government Regulations. Also they will learning advanced topics in Solar Technology.

OBJECTIVES:

(i) In Solar Energy Technology & Engineering unit the student will be learning about different types of solar systems, tracking and storage

(ii) In Solar Subsystems and Installationunit the student will be learning about Subsystems of PV systems, Planning of solar installation and it's monitoring and control.

(iii) In Regulations unit the student will be learning Solar Policies,Solar Purchase Obligation, Grid Parity and Energy saving and payback

(iv) In Solar Thermal systemsunit the student will be learning about Modelling of Solar Thermal Systems,Design of Active Systems,Solar Distillation and Solar Drying

(v) In Advanced Topics in Solar Technology unit the student will be learning about Effect of

OUTCOMES:

(i) Gain Knowledge about different types of solar systems, tracker selection and storage systems
(ii) Understand about the Subsystems of PV, it's installation and control.
(iii) Gain Knowledge about different Solar Policies, Solar Purchase Obligation, Grid Parityand to calculate Energy saving and payback.
(iv) UnderstandSolar Thermal Systems, How to design Active Systems, Solar Distillation and Solar Drying
(v) Understand and analyseEffect of Shading, integration with grid systems and Multilayered cells

UNIT I: SOLAR ENERGY TECHNOLOGY AND ENGINEERING 9

Introduction to Solar Energy ;Solar cell basics, Roof Top and Off Grid Solar Systems, Grid Connected Solar System; Tracking / Static Solar Systems, Types of trackers, Tracker type selection; Concentrating Solar Power, Single and multijunction cell efficiency chart,Thermal Storage Systems.

UNIT II SOLAR SUBSYSTEMS AND INSTALLATION 9

Components and subsystems of PV systems, Converters, different configurations; Inverter location trade -off studies; Planning of solar installation, Conditions & limits,Yield/loss study, Yield assessment for photovoltaic systems ;Monitoring and control system, connection to grid, diesel plants, other renewable sources.

UNIT III REGULATION 9

Solar Policies, Jawaharlal Nehru National Solar Mission ,Tax Incentivesand Subsidies , Policies supporting Grid-interactive Renewable Power,Renewable Energy for Urban, Industrial and Commercial Applications;Solar Purchase Obligation, Renewable Energy Certificates; Grid Parity, Power Purchase Agreement, Energy saving and payback

UNIT IV SOLAR THERMAL SYSTEMS 9

Modelling of Solar Thermal Systems and Simulations in Process Design , Design of Active Systems by f-chart and Utilizability Methods;- Water Heating Systems, Active and Passive; Passive Heating and Cooling of Buildings; Solar Distillation , Solar Drying.

UNIT V ADVANCED TOPICS IN SOLAR TECHNOLOGY 9

Power Point Tracker for PV systems, Effect of Shading, Power Electronics for Efficient Interface; PV distributed generation units, integration with grid systems; Nano-structured solar cells; organic, hybrid, and dye-sensitized solar cells; Multilayered cells, Sunlight Concentrator; Biomimetic solar fuels.

L = 45 TOTAL = 45

TEXTBOOKS

1.D.Yogi Goswami,FrankKreith, Jan F. Kreider, " Principles of Solar Engineering" 2nd Edition, Taylor & Francis, 2000, Indian reprint, 2003

2. Solanki: Solar Photovoltaics- Fundamentals, Technologies and Applications, PHI, Eastern Economy Edition,2012.

REFERENCES

1. J.A. Duffie and W.A. Beckman, "Solar Engineering of Thermal Processes", John Wiley,1991.

2. Edward e. Anderson, "Fundamentals for solar energy conversion", Addison Wesley Publ.Co.,1983

3. G.N. Tiwari, Solar Energy,"Fundamentals, Design, Modelling and Applications", Narosa Publishers,2002

4. H.P.Garg, S.C.Mullick and A.K. Bhargava: "Solar Thermal Energy /Storage", 1985, Springer

5. S.P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storag"e, Tata McGraw-Hill, 1984.

EEC353 LINEAR INTEGRATED CIRCUITS

L P T C
3 0 0 3

PREREQUISITE

EE B 203 - Electronic Circuits

GOAL

To provide knowledge about the applications of op amp and Special ICs.

OBJECTIVES

The course will enable the students:

(i) To study the IC fabrication.

(ii) To study characteristics; of op-Amp ICs.

(iii) To study the applications of Op-amp.

(iv) To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, Opto-electronic ICs.

OUTCOME

The students should be able to:

(i) Understand IC fabrication

(ii) Understand DC and AC characteristics analysis of different Linear Op-Amp ICs.

(iii) Understand various applications of Op-amp

(iv) Gain knowledge about IC Timers, PLL circuits and Regulator circuits

UNIT I IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities.Realisation of monolithic ICs and packaging.

UNIT II CHARACTERISTICS OF OP-AMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp - summer, differentiator and integrator.

UNIT III APPLICATIONS OF OP-AMP 9

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

UNIT IV SPECIAL ICs 9

555 Timer circuit - Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase locked loop-circuit functioning and applications, Analog multiplier ICs.

UNIT V APPLICATION ICs 9

IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

L = 45 TOTAL = 45

TEXT BOOKS

1. D. Roy Choudhury & Shail B. Jain, 'Linear Integrated Circuits', New Age International Publishers, Fourth Edition, 2010.

2. Ramakant A. Gayakwad, 'Op-Amps and Linear Integrated Circuits', Prentice Hall of India, Fourth Edition, 2009.

REFERENCES

1. S. P. Bali , 'Linear Integrated Circuits', Tata Mcgraw Hill Publishers, First Edition, 2008.

2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Prentice Hall of India, 6th edition, 2009.

EEC354HIGH VOLTAGE DIRECT CURRENT TRANSMISSION

L	P	T	C
3	0	0	3

Goal

To provide knowledge about the High Voltage DC transmission Systems

Objectives

The course will enable the students to:

1. Study the basics of dc power transmission technologyand its modern trends,
2. StudytheanalysisofGraetzcircuitsfor6-pulse&12-pulseconvertercharacteristics,
3. Studythesystemcontrol hierarchyandfiringanglecontrol.
4. Studythecharacteristicsandnon-characteristicsharmonicsinHVDCsystemandtypesofFilters
5. Study aboutthecomponent models of AC/DC systems.

Outcomes

After completion of the course the students are expected to be able to:

1. Know thecomparisonofACandDCtransmissionandapplicationofHVDCtransmission systems,
2. Onecanlearnabouttheapplicationsofdifferentconverterbridges,
3. KnowtheHVDCsystemcontrolandstart-stopDClink,
4. KnowthedifferenttypesofharmonicsinHVDCsystemFilterstoremovethem

UNITI DC POWER TRANSMISSION TECHNOLOGY **9**

Introduction-comparison of AC and DC transmission-application of DC transmission-description of DC transmission–system planning for HVDC transmission-modern trends in DC transmission.

UNITII ANALYSISOFHVDCCONVERTERS **9**

Pulse number,choice of converterconfiguration-simplified analysis of Graetzcircuit-converterbridge characteristics-characteristicsof a twelve pulse converter-detailed analysisof converters.

UNIT III C O N V E R T E R ANDHVDCSYSTEMCONTROL **9**

General principlesofDClinkcontrol-converter controlcharacteristics-systemcontrolhierarchy-firing angle control-current and extinction angle control-starting and stopping of DC link-power control- higherlevelcontrollers-telecommunicationrequirements.

UNITIV H A R M O N I C S ANDFILTERS **9**

Introduction-generationofharmonics-designofACfilters-DCfilters-carrierfrequencyandRInoise.

UNITV COMPONENT MODELS FOR THE ANALYSIS OF AC/DC SYSTEMS **9**

Converter Model-Converter Control-Modelling of DC Network-Modelling of AC Network.

Text books

L=45 Total 45

1. Padiyar,K.R.,"HVDCPowerTransmissionSystem",WileyEasternLimited,NewDelhi 1990.Firstedition.

2. EdwardWilsonKimbark,"DirectCurrentTransmission",Vol.I,Wileyinterscience,New York,London,Sydney,1971.

Reference books

1. RakoshDasBegamudre,ExtrahighvoltageACtransmissionengineeringNewAge International(P)Ltd.,NewDelhi,1990.

2. Arrillaga,J.,HighVoltagedirect current transmission,PeterPregrinus,London,1983.

EEC355 WIND ENERGY CONVERTION SYSTEM

L P T C
3 0 0 3

Goal:

To make understanding the fundamentals of wind power generation

Objectives:

1.To make understanding of wind energy concepts

2.To understand the types of wind generators
3.To make students should able to design wind Power projects with cost considerations

Outcomes:

1.Students get the idea about wind speed mechanism

2. Students get the idea about wind turbines designAnd wind electric generators

3.Students get the idea about wind project design and economics factors

UNIT I WIND ENERGY FUNDAMENTALS **9**

Wind energy basics, wind speeds, wind characteristics and power production, terrain

Roughness, turbulence, boundary layers, betz coefficient, limits

UNIT II AERODYNAMIC THEORY 9

Air foil terminology , blade element theory, blade design, number of blades,shapes,tipspeed, lift and drag ratio ,rotor dynamics, types of loads, balancing technique

UNIT III WIND TURBINES & GENERATORS 9

Vertical axis, Horizontal axis turbines, constant speed, variable speed turbines Pitch and yaw control, gear coupled and direct coupled generators, multipole synchronous Generators, doubly fed induction generators

UNIT IV CONCEPT OF WIND FARM AND PROJECT 9

Project planning, personal measurement, anemometer measurement, wind direction measurement, site selection, operation and maintenance, environmental concerns

UNIT V COST ECONOMICS 9

Fixed and variable costs, value of wind energy, return on investment, wind energy market, cash flow of wind power projects

L=45 ,Total:45

Text books

1. Freris L.L. “Wind energy conversion systems , prentice hall 1990
2. G.L.Johnson,”Wind energy systems”, prentice hall 1985
3. J.F.Manwell, J.G.McGowan, A.L.Rogers,”Wind energy explained”, john Wiley publication

References

1. C-WET,” Wind energy resource survey in India VI

EED351 CONTROL ENGINEERING

L	P	T	C
3	0	0	3

Objectives:

(i) To introduce the mathematical modeling of systems, open loop and closed loop systems and analysis in time domain and frequency domain.
(ii) To impart the knowledge on the concept of stability and various methods to analyze stability in both time and frequency domain.
(iii) To introduce sampled data control system.

Outcomes:

(i) Ability to apply mathematical knowledge to model the systems and analyse the frequency domain.
(ii) Ability to check the stability of the both time and frequency domain.

UNIT I INTRODUCTION

Historical review, Simple pneumatic, Hydraulic and thermal systems, Series and parallel system Analogies, mechanical and electrical components, Development of flight control systems.

UNIT II OPEN AND CLOSED LOOP SYSTEMS

Feedback control systems – Control system components – Block diagram representation of control systems. Reduction of block diagrams, Signal flow graphs, Output to input ratios.

UNIT III CHARACTERISTIC EQUATION AND FUNCTIONS

Laplace transformation, Response of systems to different inputs viz., Step impulse, pulse parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit.

UNIT IV CONCEPT OF STABILITY

Necessary and sufficient conditions, Routh-Hurwitz criteria of stability, Rootlocus and Bode techniques, Concept and construction, frequency response.

UNIT V SAMPLED DATA SYSTEMS

Z-Transforms Introduction to digital control system, Digital Controllers and Digital PID controllers.

TOTAL = 45 PERIODS

TEXT BOOKS

1.OGATO, Modern Control Engineering, Prentice-Hall of India Pvt. Ltd., New Delhi, 1998.

2. Azzo, J.J.D and C.H. Houpis Feed back control system analysis and synthesis, McGraw Hill International 3rd Edition, 1998.

REFERENCES:

1.Kuo.B.C, “Automatic Control Systems”, Prentice-Hall of India Pvt. Ltd, New Delhi, 1998.

2.Houpis. C.H. and Lamont.G.B, “Digital Control Systems”, McGraw Hill Boom co., New York, U.S.A.1995.

3.Naresh K Sinha, “Control Systems”, New Age International Publishers, New Delhi, 1998.

EEB331LINEAR INTEGRATED CIRCUITS LABORATORY

L	P	T	C
2	2		3

PREREQUISITE

EE B 101 - Circuit theory

GOAL

To make the students to understand the operation and concepts behind OP amp and to make them to develop OP amp application Circuits

OBJECTIVES

The course will enable the students:

(v) To study characteristics of op-Amp ICs.

(vi) To study the applications of Op-amp.

OUTCOME

The students should be able to:

(v) Understand DC and AC characteristics analysis of Op-Amp .

(vi) Understand and Design various Op-amp Circuits

CHARACTERISTICS OF OP-AMP 12

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Ideal OP-AMP characteristics, DC characteristicsAC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp - summer, differentiator and integrator.

Experiments

1. Inverting, Non inverting and Differential amplifiers
2. Frequency response of an OP amp
3. Summing Amplifier
4. Integrator and Differentiator.

APPLICATIONS OF OP-AMP 12

First and second order active filters, Comparators, clippers, clampers, Multivibrators, waveform generators, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

Experiments

5. Active lowpass, Highpass and bandpass filters.
6. Clippers and Clampers.
7. Astable&Monostablemultivibrators and Schmitt Trigger using op-amp.
8. Phase shift and Wien bridge oscillators using opamp

Lecture = 24 LAB = 24 Total =48

TEXT BOOKS

3. D. Roy Choudhury&Shail B. Jain, 'Linear Integrated Circuits', New Age International Publishers, Fourth Edition, 2010.

4. Ramakant A. Gayakwad, 'Op-Amps and Linear Integrated Circuits', Prentice Hall of India, Fourth Edition, 2009.

LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 20 STUDENTS

Sl. No.	Description	Quantity	Remarks
1	Dual ,(0-30V) variable Power Supply	10	
2	CRO	6	Minimum 20 MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC tester(analog)	1	
6	Bread board	25	
Consumables		(Minimum of 25 Nos. each)	
7	IC 741	25	
8	Diodes,IN4001,BY126	25	
9	Zener diodes	10	
10	Potentiometer	15	
11	Step-down transformer	3	230V/12-0-12V
12	Capacitor Assorted	100	
13	Resistors 1/4 Watt Assorted	100	
14	DC Voltmeter(various Ranges)	20	
15	DC Voltmeter(various Ranges)	20	

EEB332 POWER ELECTRONICS LABORATORY

L T P C
0 0 3 1

COREQUISITE

EE B 301 - Power Electronics

GOAL

To study the characteristics of switching devices and its applications in rectifier, inverter, chopper and resonant converter.

OBJECTIVES

The course will enable the students to:

(i) Obtain the characteristics of SCR, TRIAC ,MOSFET, IGBT.

(ii) Obtain the characteristics of rectifiers,choppers,invertersand resonant converters.

OUTCOME

The students should be able to:

(i) Understand the characteristics of all the power semiconductor devices.

(ii) Analyse the performance parameters of Rectifiers, choppers and Inverters.

LIST OF EXPERIMENTS

S. No.	List of Experiment	No. of Hours
1	Characteristics of SCR	3
2	Characteristics of TRIAC	3
3	Characteristics of MOSFET and IGBT	6
4	Triggering circuits for SCR	
	a. UJT Trigger circuit	
	b. R firing circuit	
	c. RC Firing circuit	6
5	Transient characteristics of SCR and MOSFET	3
6	AC to DC half and fully controlled converter	6
7	Step down and step up MOSFET based choppers	3
8	IGBT based single-phase PWM inverter	3
9	Zero voltage switching resonant dc-dc converter	3
10	Zero current switching resonant dc-to-dc converter	3
	Revision lab &Model exam	6
		P : 45 TOTAL : 45

LIST OF EQUIPMENTS

S.No.	Description of Equipment	Quantity required
1.	Static characteristic module (for SCR,MOSFET, TRIAC and IGBT) with built in power supply & meters	2each
2.	SCR firing circuit module	2
3.	Single phase SCR based half controlled converter & fully controlled converter along with built-in separate firing circuit module and meter	2 each
4.	MOSFET based step up and step down choppers	1
5.	IGBT based single phase PWM inverter module	2
6.	Resonant DC-DC converter module with built in power supply and controller	2
7.	SCR & TRIAC based 1 phase A.C. phase controller along with lamp or rheostat load	1
8.	Dual regulated DC power supply with common ground	4
9.	Cathode Ray Oscilloscope	5

10.	Single phase Autotransformer	1
11.	Components (Inductance, Capacitance)	3 sets for each
12.	Multimeter	2
13.	LCR meter	1
14.	Rheostats of various ranges	2 sets of 10 value
15.	Work tables	10

EEB333 SOLAR ENERGY SYSTEMS LAB

L T P C
2 0 2 3

Goal:
To enable the students gain a fair knowledge on the technology used and measurements on solar PV systems

Objectives:
The course should enable the students to:

1. Measure the parameters of a solar PV Module
2. Connect the PV modules in series and parallel combinations and to measure the current-voltage (I-V) characteristics
3. Calculate the energy generated when PV modules are placed at different positions to sun rays
4. Determine the efficiency of a stand alone PV System
5. Measurement by using 4 quadrant power supply and solar cell as load and under illumination
6. Measure the open circuit voltage decay of a crystalline silicon solar cell
7. Analyse using simulation tool

Outcome:

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

1. Estimate the parameters like Short Circuit Current (ISC), Open Circuit Voltage (VOC) of a solar PV module.
2. Measure I-V characteristics of PV modules connected in series and parallel.
3. Determine the energy generated when PV modules are placed at different positions to sun rays
4. Calculate the efficiency of a stand alone PV System
5. Measurement by using 4 quadrant power supply and solar cell as load and under illumination
6. Calculate the life time for a solar cell Simulate using simulator

List of Experiments

1. Identifying and measuring the parameters of a solar PV Module in the field
2. Series and Parallel connection of PV Modules
3. Dark and Illuminated Current-Voltage characteristics of solar cell
4. Estimating the effect of Sun tracking on energy generation by solar PV modules
5. Efficiency measurement of standalone solar PV system

6. Dark and Illuminated Current-Voltage characteristics of solar cell

Unit: 1 Introduction to Energy and Solar Photovoltaic Energy

Basic Concepts about Energy and its use, Estimating Energy Requirement, Energy from Solar Photovoltaic (PV) Conversion, other Renewable Energy Technologies

Unit: 2 Solar PV Modules

Ratings of PV Module, Module Parameters, Factors Affecting Electricity Generated by Solar PV Module, Measuring Module Parameters, Connection of Modules in Series, Connection of Modules in Parallel

Unit: 3 Charge Controller, MPPT and Inverters:

Power Converters and their Efficiency, AC to DC Converter, DC to AC Converter, DC to DC Converters, Charge Controllers, MPPT

Text Book:

1. “Solar Photovoltaic Technology and Systems” , by Dr.Chetan Singh Solanki,PHI Learning Private Limited, 2013
2. “ Principles of Solar Engineering” by D.Yogi Goswami,Frank Kreith, Jan F.Kreider, 2nd Edition, Taylor & Francis, 2000, Indian reprint, 2003

References:

1. “Fundamentals for solar energy conversion”, by Edward e. Anderson, Addison Wesley Publ.Co.,1983

2. “Fundamentals, Design, Modelling and Applications”, by G.N. Tiwari, Narosa Publishers,2002

SEMESTER VI

EEB304POWER SYSTEM ANALYSIS

L T P C
3 1 0 4

PREREQUISITE

EE B 302 - Transmission & Distribution

EE B 202 - Electrical Machines - I

EE B 205 - Electrical Machines - II

GOAL

To make the students to understand the different methods of power system analysis for power system planning and operation.

OBJECTIVES

The course will enable the students to:

(i) Analyze the different aspects of modeling of components of a modern power system.

(ii) Provide adequate knowledge in different power flow studies.

(iii) Give basic knowledge in different types of faults and methods to carry out the fault analysis.

(iv) Provide the concept of stability problems and the methods of determining the system stability.

OUTCOME

The students should be able to:

(i) Develop the mathematical model for carrying out the various types of power system analysis.

(ii) Understand the concept of the load flow problem formulation and the various numerical methods of solution.

(iii) Design a protective device for various faults.

(iv) Analyze unsymmetrical faults by applying symmetrical component methods.

(v) Understand the concept of system stability by applying equal area criterion and by using swing curve.

UNIT I THE POWER SYSTEM - AN OVERVIEW AND MODELLING 12

Modern Power System - Basic Components of a power system - Per Phase Analysis Generator model - Transformer model - line model.The per unit system -Change of base.-per unit impedance diagrams.

UNIT II POWER FLOW ANALYSIS 12

Introduction - Bus Classification - Bus admittance matrix - Direct inspection method-singular transformation of primitive admittance matrix. Formulation of load flow problem.Solution of load flow problem, Gauss -Seidal method, Newon-Raphson method, Fast decoupled method - Flow charts and comparison of the three methods.

UNIT III BALANCED FAULT ANALYSIS 12

Introduction - Types of faults-Balanced three phase fault - short circuit capacity - algorithm for formation of bus impedance matrix. - systematic fault analysis using bus impedance matrix.

UNIT IV UNBALANCED FAULT ANALYSIS 12

Introduction - Fundamentals of symmetrical components - sequence impedances - sequence

networks - single line to ground fault - line to line fault - Double line to ground fault - Unbalanced fault analysis using bus impedance matrix.

UNIT V POWER SYSTEM STABILITY 12

Basic concepts and definitions -Classification of stability-Steady state stability - An elementary view of transient stability - Equal area criterion - Reponses to a short circuit fault- factors influencing transient stability - Numerical integration methods - Euler method - modified Euler method - Runge - Kutta methods.

L=45, T=15, TOTAL = 60

TEXT BOOKS:

1. Hadi Saadat "Power system analysis", Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. P.Kundur, "Power System Stability and Control", Tata McGraw Hill Publishing Company, New Delhi, 2008.

REFERENCES

1. I.J.Nagrath and D.P.Kothari, 'Modern Power System Analysis', Tata McGraw-Hill publishing company, New Delhi, 2007.
2. M.A. Pai, 'Computer Techniques in power system Analysis', Tata McGraw - Hill publishing company, New Delhi, 2005.

EEB305 MICROPROCESSOR AND MICROCONTROLLER

L	P	T	C
3	0	0	3

PREREQUISITE

EE B 207 - Digital Logic Circuits

GOAL

To excel in the Architecture of 8085,8086& 8051 and to develop skill in simple program writing, to study simple applications.

OBJECTIVES

The course should enable the students to :

(i) Study the Architecture of 8085, 8086 & 8051.

(ii) Know the addressing modes & instruction set of 8086 & 8051.

(iii) Know the need & use of Interrupt structure.

(iv) Program simple coding.

(v) Understand commonly used peripheral / interfacing ICs.

OUTCOME

The students should be able to:

(i) Understand the functional block diagram, Timing Diagram, Interrupt structure and Multiprocessor configurations of 8086 Microprocessor.

(ii) Develop the Programming skills using Loop structure with counting & Indexing, Look up table, Subroutine instructions stack.

(iii) Interface ICs 8255 PPI, 8259 PIC, 8257 DMA , 8251 USART, 8279 Key board display

controller and 8253 Timer/ Counter ,A/D and D/A converter.

(iv) Comprehend the Functional block diagram ,Instruction format and addressing modes, Interrupt structure ,I/O Ports and Serial communication of 8051 Microcontroller.

(v) Develop the programming skills in PID control algorithm, square, triangular and sine wave form generation, closed loop control of servo motor and stepper motor control.

UNIT I 8085 and 8086 PROCESSOR 9

Functional block diagram - Signals - Memory interfacing - I/O ports and data transfer concepts - Timing Diagram - Interrupt structure - Multiprocessor configurations.

UNIT II PROGRAMMING OF 8086 PROCESSOR 9

Instruction format and addressing modes - Assembly language format - Data transfer, data manipulation, control and string instructions - Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions stack.

UNIT III PERIPHERAL INTERFACING 9

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8257 DMA 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter - Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT IV MICROCONTROLLER 8051 9

Functional block diagram - Instruction format and addressing modes - Interrupt structure - Timer -I/O ports - Serial communication.

UNIT V MICROCONTROLLER PROGRAMMING & APPLICATIONS 9

Data Transfer, Manipulation, Control & I/O instructions - Simple programming exercises, PID control algorithm - wave form generation:- square, triangular and sine, key board and display interface - Closed loop control of servo motor- stepper motor control.

L : 45 TOTAL :45

TEXT BOOKS

1. "Microprocessor and Microcontrollers", Krishna Kant Eastern Company Edition, Prentice - Hall of India, New Delhi , 2007.

2. A K Ray and K M Burchandi, Advanced Microprocessor and Peripherals, Tata McGraw - Hill - 2004

3. Muhammad Ali Mazidi & Janice Gilli Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. William Kleitz, Microprocessor and Microcontroller Fundamental of 8085 and 8051 Hardware and Software, Pearson Education, 1998.

2. Yu-Cheng Liu and Glenn A.Gibson, Microcomputer Systems: The 8086/8088 family, Second Edition, Prentice Hall of India.

3. The 8088 & 8086 Microprocessors , Walter A Tribal & Avtar Singh, Pearson, 2007, Fourth Edition.

EEB306DESIGN OF ELECTRICAL APPARATUS

L T P C
3 1 0 4

PREREQUISITE

EE B 202 - Electrical Machines - I

EE B 205 - Electrical Machines - II

GOAL

To provide knowledge about fundamental design processes for electrical machines such as d.c. machines, transformers, induction machines& synchronous machines

OBJECTIVES

The course should enable the students to:

(i) Get exposed to the concepts of electromagnetic fields as applied to electrical machines

(ii) Acquire basic knowledge about critical design parameters

(iii) Design various electrical machines from the performance parameters.

OUTCOME

The students should be able to:

(i) Design common DC and ACrotating machines .

(ii) Design the core, windings and cooling system for transformers

(iii) Grasp industrial design processes with a minimum learning curve.

UNIT I MAGNETIC CIRCUITS AND COOLING OF ELECTRICAL MACHINES 12

Concept of magnetic circuit - MMF calculation for various types of electrical machines - real and apparent flux density of rotating machines - leakage reactance calculation for transformers, induction and synchronous machine - thermal rating: continuous, short time and intermittent short time rating of electrical machines-direct and indirect cooling methods - cooling of turbo alternators.

UNIT II D.C. MACHINES 12

Constructional details - output equation - main dimensions - choice of specific loadings - choice of number of poles - armature design - design of field poles and field coil - design of commutator and brushes - losses and efficiency calculations.

UNIT III TRANSFORMERS 12

Constructional details of core and shell type transformers - output rating of single phase and three phase transformers - optimum design of transformers - design of core, yoke and windings for core and shell type transformers - equivalent circuit parameter from designed data - losses and efficiency calculations - design of tank and cooling tubes of transformers.

UNIT IV THREE PHASE INDUCTION MOTORS 12

Constructional details of squirrel cage and slip ring motors - output equation - main dimensions - choice of specific loadings - design of stator - design of squirrel cage and slip ring rotor - equivalent circuit parameters from designed data - losses and efficiency calculations.

UNIT V SYNCHRONOUS MACHINES 12

Constructional details of cylindrical pole and salient pole alternators - output equation - choice of specific loadings - main dimensions - short circuit ratio - design of stator and rotor of cylindrical pole and salient pole machines - design of field coil - performance calculation from

designed data - introduction to computer aided design.

L : 45 T : 15 TOTAL : 60

TEXT BOOKS

1. A.K. Sawhney, 'A Course in Electrical Machine Design', DhanpatRai and Sons, New Delhi, 2005.

2. S.K. Sen, 'Principles of Electrical Machine Design with Computer Programmes', Oxford and IBH Publishing Co.Pvt Ltd., New Delhi, 2006.

REFERENCES

1. R.K. Agarwal, 'Principles of Electrical Machine Design', S.K.Kataria and Sons, Delhi, 2010.

2. V.N. Mittle and A. Mittle, 'Design of Electrical Machines', Standard Publications and Distributors, Delhi, 2002.

EEC356 HIGH VOLTAGE ENGINEERING

L P T C
3 0 0 3

PREREQUISITE

EE B 301 - Power Electronics

COREQUISITE

EE C 359 - Solid State Drives

GOAL

To provide knowledge about the testing of apparatus and measurements of overvoltages.

OBJECTIVES

The course will enable the students to:

(i) Give exposure on various types of over voltage transient in power system and its effect

(ii) Study about generation of overvoltages.

(iii) Provide knowledge on the measurement of electrical breakdown in various medium

(iv) Give basic knowledge in testing of power apparatus.

OUTCOME

The students should be able to:

(i) Understand the types of overvoltage transients on power system

(ii) Gain knowledge about the testing of power apparatus and generation of over voltages

(iii) Comprehend about the measurement of electrical breakdown in various medium

(iv) Understand the concept of insulation coordination.

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 6

Causes of over voltages and its effects on power system - Lightning, switching surges and temporary over voltages - protection against over voltages - Bewley's lattice diagram.

10

UNIT II ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS

Gaseous breakdown in uniform and non-uniform fields - Corona discharges - Vacuum breakdown - Conduction and breakdown in pure and commercial liquids - Breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 10

Generation of High DC, AC, impulse voltages and currents.Tripping and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 10

Measurement of High voltages and High currents - Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9

High voltage testing of electrical power apparatus - Power frequency, impulse voltage and DC testing - International and Indian standards - Insulation Coordination.

L : 45 TOTAL : 45

TEXT BOOKS

1. M. S. Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, 3rd Edition, 2004.
2. E. Kuffel and W. S. Zaengel, 'High Voltage Engineering Fundamentals', Pergamon Press, Oxford, London, 1986.

REFERENCES

1. E. Kuffel and M. Abdullah, 'High Voltage Engineering', Pergamon Press, Oxford, 1970.
2. L. L. Alston, Oxford University Press, New Delhi, First Indian Edition, 2006.

EEC357RENEWABLE ENERGY SYSTEMS

L	P	T	C
3	0	0	3

PREREQUISITE

EE B 302 - Transmission &

Distribution

EE B 304 - Power System Analysis

GOAL

To provide the knowledge about renewable energy systems

OBJECTIVES

The course will enable the students:

(i) To learn the types of renewable energy sources

(ii) To study the application of electrical machines in renewable energy conversion

(iii) To study the application of semi conductor devices in renewable energy conversion

(iv) To analyze the grid integrated renewable energy.

(v) To introduce the hybrid renewable energy systems

OUTCOME

The students should be able to:

(i) Understand the behavior of different renewable energy sources.

(ii) Study the Roll of electrical machines in renewable energy conversion.

(iii) Design the converters for renewable energy conversion.

(iv) Estimate the various parameters in the grid integrated system.

(v) Understand the application of hybrid renewable energy systems.

UNIT I INTRODUCTION 9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9

Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT III POWER CONVERTERS 9

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection Of inverter, battery sizing, array sizing Wind: three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS 9

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG and SCIG Based WECS-Grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS 9

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV-Maximum Power Point Tracking (MPPT).

TOTAL : 45

TEXT BOOKS

1. M. Godoy Simões, Felix A. Farret, 'Renewable Energy Systems: Design and Analysis With Induction Generators' - 2004

2. William H. Kemp, 'The renewable energy handbook: a guide to rural independence, off-grid and sustainable living' - 2005.

3. Renewable Energy Systems, 1st Edition, H Lund , 5 Sep 2009Academic Press

REFERENCES

1. Rashid .M. H "power electronics Hand book", Academic press, Nov 8, 2006.

2. Rai, G. D., Solar Energy Utilization, Delhi, India: Khanna Publishers, 2005

3. Gary L. Johnson. WIND ENERGY SYSTEMS. book, Prentice Hall Inc., ENGLAND cliffs, 2001.

EEC358MICRO-CONTROLLER AND DSP BASED SYSTEM DESIGN

L	P	T	C
3	0	0	3

Prerequisite:

EE B 305 – Microprocessor &Microcontroller

Goal:
To provide knowledge of control of electrical drives employing embedded controllers

Objectives:

The course will enable the students to:

(i) Know the basic of PIC16C7X microcontroller
(ii) Know the basic of various peripherals connected to PIC16C7X.
(iii) Know the basics of Digital Signal Processors
(iv) Know the basic of various peripherals connected to Signal Processors.
(v) Give basic of designing a microcontroller based system

Outcome:

At the end of the course the students should be able to

(i) Understand the architecture, instruction set , various peripherals of PIC16C7X
(ii) Program in PIC16C7X for simple arithmetic operation.
(iii) To understand the basic architecture of digital signal processors and writing simple application programs for signal processors.
(iv) To understand Peripherals of Signal processors and developing application using peripherals .

Design a microcontroller based system

1. PIC 16C7X MICROCONTROLLER 9

Architecture memory organization – Addressing modes – Instruction set – Programming techniques – simple programs

2. PERIPHERALS OF PIC 16C7X 9

Timers – interrupts – I/O ports – I2C bus for peripheral chip access – A/D converter – UART

3. MOTOR CONTROL SIGNAL PROCESSORS 9

Introduction- System configuration registers - Memory Addressing modes - Instruction set – Programming techniques – simple programs

4. PERIPHERALS OF SIGNAL PROCESSORS 9

General purpose Input/output (GPIO) Functionality- Interrupts - A/D converter-Event Managers (EVA, EVB)- PWM signal generation

5. APPLICATIONS OF PIC AND SIGNAL PROCESSORS 9

Voltage regulation of DC-DC converters- Stepper motor and DC motor control- Clarke's and parks transformation-Space vector PWM- Control of Induction Motors and PMSM.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. John B.Peatman , 'Design with PIC Microcontrollers,' Pearson Education, Asia 2004

2. Hamid A.Toliyat, Steven Campbell, 'DSP based electromechanical motion control', 23 CRC Press

EEC359SOLID STATE DRIVES

L P T C
3 0 0 3

PREREQUISITE

EE B 301 – Power Electronics

GOAL

To provide knowledge about the operation of electric drives controlled from a power electronic converter and to introduce the design concept of controllers.

OBJECTIVES

The course will enable the students to:

(vi) Provide the concept of drive characteristics, four quadrant operation and different modes of operation of electric drives and regenerative braking.
(vii) Give basic knowledge in analysis of single and three phase fully controlled converter fed DC motor drive and chopper fed DC drive
(viii) Provide the concept of induction motor control and induction motor drives.
(ix) Give adequate knowledge about various types of control in synchronous motor and types of permanent magnet synchronous motor.

OUTCOME

At the end of the course the students should be able to

(v) Select the suitable drive for the required load characteristics..
(vi) Understand the concept of Converter / Chopper control of Dc motor drive.
(vii) Gain adequate knowledge about induction motor and synchronous motor drive and various speed control methods.
(viii) Design controllers for drives.

UNIT I DRIVE CHARACTERISTICS **9**

Equations governing motor load dynamics - Equilibrium operating point and its steady state stability - Mathematical condition for steady state stability and problems - Multi quadrant dynamics in the speed torque plane - Basics of regenerative braking - Typical load torque characteristics - Acceleration, deceleration, starting and stopping.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE **9**

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive: Continuous and discontinuous conduction mode - Chopper fed D.C drive: Time ratio control and current limit control - Operation of four quadrant chopper.

UNIT III INDUCTION MOTOR DRIVES **9**

Stator voltage control - Slip-power recovery drives - Adjustable frequency drives: v/f control, constant slip-speed control and constant air-gap flux control – Basics of voltage/current fed inverters - Block diagram of closed loop drive.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

Open loop volts/hertz control and self-control of synchronous motor: Marginal angle control and power factor control - Permanent magnet synchronous motor.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES **9**

Transfer function for dc motor, load and converter – Closed loop control with current and speed feedback - Armature voltage control and field weakening mode control - Design of controllers: Current controller and speed controller - Converter selection and characteristics**.**

L = 45 TOTAL = 45

TEXT BOOKS

1. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2003.

2. G.K. Dubey, 'Fundamentals of Electrical Drives ' Narosa Publishing House , New Delhi 2nd Edition 2001,

REFERENCES

1. G.K. Dubey, 'Power Semi-conductor Controlled Drives', Prentice Hall of India, 1989.

2. S.K. Pillai, 'A First Course on Electrical Drives', Wiley Eastern Limited, 1993.

3. Bimal K. Bose. 'Modern Power Electronics and AC Drives', Pearson Education, 2002.

EEC360REAL TIME SYSTEMS

L P T C
3 0 0 3

GOAL

To develop in-depth skills in Real Time Operating Systems.

OBJECTIVES

The course will enable the students to:

(i) Review Operating Systems.

(ii) Understand about Distributed Operating Systems.

(iii) Learn Real Time Models and Languages.

(iv) Understand about introduction toRealTimeKernels.

(v) Understand about RTOS andApplicationDomains.

OUTCOME

The students should be able to:

(i) Explain various operating systems

(ii) Explain Basic building blocks of Real time Systems.

(iii) Interface various peripherals to RTOS.

(iv) Program Real time Systems.

(v) Develop Real time Systems.

UNIT I REVIEW OF OPERATING SYSTEMS 9

Basic Principles – system calls-Files-Processes-Design and implementation of processes – Communication between processes operating system structures.

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Topology-Network Types-Communication-RPC-Client server model- Distributed file systems.

UNIT III REAL TIME MODELS AND LANGUAGES 9

Event based – Process based – Graph models – Petrinet models - RTOS tasks – RT scheduling- Interrupt processing-Synchronization-Control blocks-Memory requirements.

UNIT IV REAL TIME KERNEL 9

Principles – Polled loop systems - RTO Sporting to a target - Comparison and Study of RTOS-VX Works and µCoS, Introduction to POSIX and OSEK standards.

UNIT V RTOS AND APPLICATION DOMAINS 9

RTOS for Control-Embedded RTOS for Control over IP - RTOS for fault tolerant applications - RTOS for control systems.

L : 45 TOTAL : 45

TEXTBOOKS

1. HermannK, 'Realtimesystems-designprinciplesfordistributedembeddedApplications', Kluweracademic, 1997.

2. CharlesCrowley'operatingsystems-Adesignorientedapproach'McGrawHill, 1998

REFERENCES

1. Rajbuhr, DLBeily, 'An introduction torealtimesystems 'PHI, 1999

2. C MKrishna,Kang G. Shin, 'Real time Systems', Mc GrawHill, 1997

3. RaymondJ.A.,Donald LBaily, 'An introduction to real timeoperatingsystems'PHI, 1999.

EEC361ADVANCED CONTROL THEORY

L	P	T	C
3	0	0	3

Goal:

To gain knowledge in state variable analysis, non-linear systems and optimal

Objectives:

The course will enable the students to:

(i) study the basics state variable analysis
(ii) provide adequate knowledge in the phase plane analysis.
(iii) To give a basic knowledge in describing function analysis.
(iv) analyze the stability of the systems using different techniques.
(v) Study the design of optimal controller.

Outcome:
At the end of this course students should have knowledge in the following:

(i) State variable analysis and its application
(ii) Phase plane analysis and application
(iii) Describing function and its analysis for common non-linearities
(iv)Various stability analysis techniques
(v) Various optimal control methods

UNIT I STATE VARIABLE ANALYSIS **9**

Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and observability - Pole Placement –State observer Design of Control Systems with observers.

UNIT II PHASE PLANE ANALYSIS **9**

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

UNIT III DESCRIBING FUNCTION ANALYSIS **9**

Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability of oscillations.

UNIT IV STABILITY ANALYSIS **9**

Introduction – Liapunov's stability concept – Liapunov's direct method – Lure's transformation –Aizerman's and Kalman's conjecture – Popov's criterion – Circle criterion.

UNIT V OPTIMAL CONTROL **9**

Introduction -Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design.

L = 45 TOTAL = 45 PERIODS

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. AshishTewari, 'Modern control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
3. M.Gopal, Modern control system theory, New Age International Publishers, 2002.

REFERENCES

1. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.
2. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, " Feedback Control of Dynamic Systems", Fourth edition, Pearson Education, Low price edition. 2002.

EEC362 NUCLEAR SCIENCE AND ENGINEERING L T P C

(Common to Mechanical) **3 0 0 3**

OBJECTIVE

To provide an insight into the basic concepts of Nuclear Science and principles of Nuclear Reactors including fast breeder reactors.

OUTCOME:-

1. To understand the nuclear energy generation
2. To understand the nuclear plant structures

UNIT IINTRODUCTION 9

Nuclear energy fundamentals- atomic structureand isotopes-Nuclear Binding energy – Neutron reactions _ Radio activity.

UNIT IITHE FISSION PROCESS 9

Mechanism of nuclear fission-Chain reaction – Fission energy – Fission rate and reactor power – Fission neutrons– Fission gamma rays – Fission products - Activity of fission products – Nuclear fuels.

UNIT IIINUCLEAR REACTORS 9

Reactor kinetics – Types of reactors – Thermal reactors - Pressurized water reactors - Boiling water reactor - Pressurized heavy water reactor - Fast reactors - Sodium cooled

reactors-Gas cooled reactors - Pb Bi cooled reactors - General features of reactor control – Nuclear fuel utilization – Fast breeder reactors.

UNIT IVNUCLEAR POWER PLANTS 9

Site selection – layout of nuclear power plants reactor building – Reactor components/systems – Cooling systems – Reactivity control mechanisms – Moderators –Reactor shutdown mechanisms.

UNIT VENVIRONMENTAL EFFECTS AND WASTE MANAGEMENT 9

Environmental concerns – Radiation exposure pathways – Effects of different types of radiation – Radiation levels – spent fuel storage and disposal options – Reprocessing option – Nuclear reactor safety – Accident prevention – Engineering safety features.

Reactor design basics 4^{th} Edition Volume.1
Reactor design Engg 4^{th} Edition Volume.2 CBS publishers

REFERENCES

1. S Glasstone and M C Edlund, "Elements of Nuclear Reactor Theory",strand, 1952.

2. K S Ram, "Basic Nuclear Engineering", Wiley Eastern, 1977.

3. J R Lamarsh, "Introduction to Nuclear Reactor Theory", Addison Wesley, 1960.

4. S Glasstone and S Sesonske, "Nuclear Reactor Engineering – Reactor Design Basics",4^{th} Edition Volume 1 Van Nostrand, 1963.

5. S Glasstone and S Sesonske, "Nuclear Reactor Engineering – Reactor System Engineering ",4^{th} Edition Volume 2 Van Nostrand, 1963.

6. A M Weinberg and E P Wigner, "Physical Theory of Neutron Chain Reactors", ChicagoUniversity Press, 1958.

7. H S Isbin, "Introductory Nuclear Reactor Theory", Reinhold Publishing Corp., NY, 1963.

8. P PZweifel, "Reactor Physics", McGraw Hill, NY, 1973.

9. R V Meghreblian and D K Holmes, "Reactor Analysis", McGraw Hill, 1960

10. Suresh Garg, Feroz Ahmed & L. S. Kothari, “Physics of Nuclear Reactors”,Tata McGraw-Hill,1986.

11. Weston M. Stacy, “Nuclear Reactor Physics”, John Wiley & Sons, Inc.

12. Ronald Allen Knife, "Nuclear Energy Technology – Theory and Practice of commercial Nuclear Power", Hemisphere Publishing Corporation.

13. "Nuclear Power Engineering" - M. EI-Wakil, McGraw Hill Book Co., New York

14. "Steam Power Station" - G.A.Gassort.

15. "Power Plant Engineering & Economics" - Strosal&Vapet

16. "IAEA Directory of Nuclear Reactors" Vol. IV, Power Reactors, Vienna

EEC363 POWER PLANT ENGINEERING

3 CREDITS

PREREQUISITE

EE B 202 - Electrical Machines - I

GOAL

To provide knowledge about various power plant and its operation

OBJECTIVES

The course will enable the students to:

(i) Learn the basics of thermal energy conversion to electrical energy

(ii) Learn the layout and components of hydro electric power plant

(iii) Learn the principle of fission reaction and nuclear power generation

(iv) Learn the basics of gas and diesel power plant

(v) Learn the basics of non conventional power generation

OUTCOME

The students should be able to:

(i) Understand Thermal power plant operation.

(ii) Understand Hydro electric power plant operation

(iii) Understand Principle of nuclear power generation

(iv) Understand Basics of gas and diesel power generation, inter-cooling and various layout

(v) Understand Principle and layout of various non conventional power generation

UNIT I THERMAL POWER PLANTS 9

Basic thermodynamic cycles, various components of steam power plant-layout-pulverized coal burners-Fluidized bed combustion-coal handling systems-ash handling systems- Forced draft and induced draft fans- Boilers-feed pumps-super heater- regenerator-condenser- dearearators-cooling tower

UNIT II HYDRO ELECTRIC POWER PLANTS 9

Layout-dams-selection of water turbines-types-pumped storage hydel plants

UNIT III NUCLEAR POWER PLANTS **9**

Principles of nuclear energy- Fission reactions-nuclear reactor-nuclear power plants

UNIT IV GAS AND DIESEL POWER PLANTS 9

Types, open and closed cycle gas turbine, work output & thermal efficiency, methods to improve performance-reheating, intercoolings, regeneration-advantage and disadvantages- Diesel engine power plant-component and layout

UNIT V NON-CONVENTIONAL POWER GENERATION 9

Solar energy collectors, OTEC, wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation-principle, thermoelectric power generation, thermionic power generation.

L = 45 TOTAL = 45

TEXT BOOKS

1. Arora and Domkundwar , 'A Course in Power Plant Engineering', Dhanpat Rai and Co.Pvt.Ltd., New Delhi.
2. P.K. Nag ,'Power Plant Engineering' , Tata McGraw Hill, Second Edition , Fourth reprint 2003.

REFERENCES

1. Bernhardt G.A.Skrotzki and William A. Vopat ,'Power station Engineering and Economy', Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002.
2. G.D. Rai ,'An introduction to power plant technology', Khanna Publishers, New Delhi-110 005.
3. M.M. El-Wakil , 'Power Plant Technology', McGraw Hill 1984.

EED352 ENERGY AUDIT AND ENERGY REGULATION

L	P	T	C
3	0	0	3

Goal:

To give basic concepts of Energy Audit, Different Energy management techniques and Energy policies.

Objectives:

The course will enable the students to:

(i) Adopt Conservation methods in various systems.
(ii) Learn various technically proven ways to conserve Energy and then prioritize them based on the cost benefit analysis.
(iii) Select appropriate tariff system and methods for reducing electricity consumption and promote energy saving.

Apply Tools for energy audit and recommend measures for energy

Outcome:

At the end of this course students will be able to

(i) work as supervisor /Energy Auditor/Cost Analyzer in industry/Power utility/Public sector
(ii) Assess energy conservation potential in various systems

UNIT I INTRODUCTION **9**

Energy Management (Audit):-

Energy Scenario, Role of Energy managers in Industries, Energy monitoring and auditing, objectives of Energy Audit, Principles of energy management ,Strategy of Energy Audit, Instruments for energy audit, Energy audit of Electrical System, HVAC, Buildings, Economic analysis.

UNIT II ELECTRICAL ENERGY SYSTEMS **9**

Overall structure of electrical systems-Supply and demand side-Economic operation-Input-output curves-Load sharing-Industrial Distribution-Load profiling-Electricity tariff types and calculation-Reactive Power-Power factor-Capacitor sizing-Capacitor losses, location, placement and maintenance-Case studies.

UNIT III EFFICIENCY IN MOTOR AND LIGHTING SYSTEM **9**

Load scheduling/shifting, Motor drives- motor efficiency testing, energy efficient motors, and motor speed control. Energy conservation equipments: Soft starters, Power factor controller, Automatic star-delta converter, Variable Frequency Drives.

Lighting- Basic terms used in Lighting System(Illumination),Energy conservation techniques in Lighting system: Replacing lamp sources, Energy efficient luminaries, Light control gears/circuits, Installation of exclusive transformer/servo stabilizer for lighting.

UNIT IV ENERGY POLICIES **9**

Energy policies of India-Supply focus approach and its limitations-Energy policies of India – Supply focus approach and its limitations – Energy paradigms –DEFENDUS approach – End use orientation – Energy policies and development – Case studies on the effect of Central and State policies on the consumption and wastage of energy – Critical analysis – Need for renewable energy policies in India.

UNIT V ENERGY AND ENVIRONMENT **9**

Green house effect – Global warming – Global scenario – Indian environmental degradation – environmental laws – Water (prevention & control of pollution)act 1974 – The environmental protection act 1986 – Effluent standards and ambient air quality standards – Latest development in climate change policies & CDM.

L = 45 TOTAL : 45

Text / Reference Books

1. J.Goldemberg, T.B.Johansson,A.K.N. Reddy and R.H.Williams:Energy for Sustainable World,Wiley Eastern,1990.

2. IEEE Bronze Book: EneryAuditing,IEEE Publications,1996
3. Annual Energy Planning Reports of CMIE, Govt.of.India.
4. Amlan Chakra barti: Energy Engineering and Management,PHI,Eastern Economy Edition,2012.
5. P.Meier and M.Munasinghe: Energy policy Analysis &modeling,Cambridge University Press,1993.
6. Tripathy S. C., "Electric Energy Utilization and conservation", Tata McGraw Hill.
7. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982.
8. "The Efficient Use of Energy", Edited by I.G.C.Dryden, Butterworths, London, 1982.
9. Energy Management Handbook, Edited by W.C.Turner, Wiley, New York, 1982.
10. L.C.Witte, "P.S.Schmidt, D.R. Brown, Industrial Energy Management and Utilization", HemispherePubl, Washington, 1988

Energy Efficiency Websites:

www.altenergy.com
www.bee-india.nic.in
www.greenbusiness.com
www.worldenergy.org

EEB334MICROPROCESSOR AND MICROCONTROLLER LABORATORY

L	T	P	C
0	0	3	1

PREREQUISITE / CO REQUISITE

EE B 207 - Digital Logic Circuits

EE B 305 - Microprocessor and Microcontroller

GOAL

To understand programming using instruction sets of processors and controllers.

OBJECTIVES

The course should enable the students to :

(i) Develop skill in simple program writing for 8086 Microprocessors and Microcontrollers.

(ii) Introduce commonly used peripheral / interfacing ICs

(iii) Study simple applications like D / A converter and A/D Converter.

(iv) Understand about assembler and simulator tools

OUTCOME

The students should be able to:

(i) Develop skill in simple program writing for 8086 Microprocessors Simple arithmetic operations, Programming with control instructions.

(ii) Interface Analog to Digital Converter, Digital to Analog Converter, experiments using 8251, 8279, 8254

(iii) Program on assembler and simulator tools.

(iv) Perform Parallel port programming with 8051 with Stepper motor and D / A converter.

LIST OF EXPERIMENTS 16-BIT MICROPROCESSOR

S.No.	List of Experiment	No. of Hours
1	8-bit arithmetic operations	3
2	16-bit arithmetic operations	3
3	Double Precision Arithmetic operations	3
4	8-bit multiplication using rotate instruction & Sorting of N numbers	3
5	Greatest & Smallest of N numbers in a given array	3
6	Code Conversions	3
7	Square & Square root of a given number using Look-up Table method	3
8	Interfacing ADC & DAC with 8086	3
9	Traffic Light Control & Keyboard Display Interfacing using 8086	3
10	Interfacing 8086 with 8254 & 8251	3
11	Programming practice on assembler & simulation tools	3
12	8-bit arithmetic operations using 8051 microcontroller	3
13	RAM direct addressing & bit addressing	2
14	Stepper Motor Interfacing using 8051	3
15	Programming practice using simulation tools & C-compiler	3
16	Study of Microcontrollers with flash memory	1
		P : 45 TOTAL : 45

LIST OF EQUIPMENTS

S.No.	Description of Equipment	Quantity required
1.	8086 Microprocessor Trainer with Power supply	15
2.	8051 Micro controller Trainer Kit with power supply	15
3.	8255 Interface board	5
4.	8251 Interface board	5
5.	8259 Interface board	5
6.	8279 Keyboard/Display Interface Board	5
7.	8254 timer counter	5
8.	ADC card	5
9.	DAC card	5
10.	Stepper motor with Controller	5
11.	Traffic Light Control System	5
12.	Regulated power supply	10

13.	Universal ADD-ON modules	5
14.	8 Digit Multiplexed Display Card	5
15.	Multimeter	5
16.	C R O	2

EEB335 POWER SYSTEM SIMULATION LABORATORY

L T P C
0 0 3 1

PREREQUISITE / CO REQUISITE

EE B 304 - Power System Analysis

EE B 302 - Transmission and Distribution

GOAL

To expose the various power system parameters through computational procedures using software languages and MATLAB/simulink.

OBJECTIVES

The course should enable the students to :

(i) Modeling of transmission line

(ii) Electromagnetic transients in travelling waves

(iii) Formation of bus admittance matrix

(iv) Different methods of power flow analysis

(v) Formation of bus impedance matrix using building algorithm.

(vi) Short circuit analysis of transmission line

(vii) Stability analysis of power system

(viii) Analysis of switching surge using ETAP

OUTCOME

The students should be able to:

(i) Determine the various line parameters of a transmission line

(ii) Identify the types of transients in travelling waves.

(iii) Form the bus admittance matrix for the given power system network by Step by step method or singular transformation method.

(iv) Carry out load flow analysis for the given power system network by using Gauss-seidel method and determine line losses.

(v) Determine the bus parameters and line flows using Newton-Raphson load flow analysis.

(vi) Analyze fault in the transmission line using bus impedance matrix.

(vii) Analyze fault in the transmission line using short circuit capacity.

(viii) Analyze the stability of the given power system network using swing curve.

(ix) Analyze of Energization and De-Energisation of transmission line

(x) Determine the bus parameters and line flows using Fast decoupled method

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
1	Modeling of transmission line	5
2	Electromagnetic transients in travelling waves	4
3	Formation of bus admittance matrix	4
4	Power flow analysis by Gauss-seidel method	5
5	Power flow analysis using Newton-Raphson method	6
6	Formation of bus impedance matrix using building algorithm	4
7	Short circuit analysis of transmission line	4
8	Stability analysis of power system	5
9	Analysis of switching surge using ETAP	4
10	Power flow analysis by Fast decoupled method	4
		P : 45 Total : 45

LIST OF EQUIPMENTS

Sl. No.	Description	Specification	Quantity
1	Computer	Pentium 4	30
2	ETAP software	ETAP Ver 12.1	10 licence user
3	MATLAB	MATLAB Ver 7.1	10 licence user
4	Turbo C	C & C++	30 user

ELA331COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

L T P C
2 0 2 3

GOAL

The goal of the programme is to provide the learners with the methods and materials required for becoming accomplished personalities through the medium of English.

OBJECTIVES

The course should enable the students to :

1. Be aware of self-knowledge by exposure to soft skills, values, behaviour, attitudes, temperamental changes, and a positive attitude to life.
2. Learn personality traits and undergo personality tests to determine their own personality characteristics and the scope for improvement.
3. Cultivate the art of speaking fluently making use of proper gestures, tone and voice modulation, adding humour to the speech.
4. Figure out the need to work in teams, adorn or accept team leadership, and make use of body language to enhance team spirit.
5. Be familiar with the art of managing self, people, work and time, keeping in mind problems like time-wasters and stress-builders.

OUTCOME

The students should be able to:

1. Apply the knowledge gained to improve upon their values, behaviour, attitude, and develop the soft skills required for home, workplace and the society.
2. Employ the concept of personality traits and build up an accomplished personality that would be pleasing to people around so as to influence them positively.
3. Develop a personal style and communicate fearlessly and effectively in a convincing manner so as to impress listeners or the audience.
4. Participate in presentations, group discussions, debates and mock interviews making good use of language skills and interpersonal relationships.
5. Comprehend stress-management tips to overcome stress-prone habits and develop a career plan with personal, familial and societal goals for success.

UNIT I 12

Values and attitudes - Value-formation - Values & education - Terminal & Instrumental values - Civic responsibilities - The power of Personal/ Cultural/ Social valves -- Behaviour and attitudes -- Features of attitudes - Developing positive attitude - Overcoming negative attitude -- People skills - Soft skills as per the Work Force Profile - The four temperaments - Sanguine - Choleric - Melancholic - Phlegmatic -- Tests for Personal Chemistry.

UNIT II 12

What is personality development? - Types of personalities as per (i) Heredity (ii) Environment (iii) Situation - the 16 personality factors - MBTI Tests - Personality types - Increasing self awareness: Assessing one's locus of control, Machiavellianism, self-esteem, self-monitoring, risk-taking, Type A, Type B personality elements - Intellectual and physical abilities for jobs -- Personality tests.

UNIT III **12**

Developing the art of speaking - How to get rid of stage fright? - Enhancing fluency - Modulating voice

- Enunciation - Positive and negative gestures - Preparation - How to begin? - How to convince the listeners? - How to wind up the speech? - Adding humour and illustration - Developing one's own style

- Types of style - How to influence the audience? - How to become an effective speaker? -- Tests for effective speaking.

UNIT IV **12**

Team work - Team building - Team leadership -- How to face an interview? -- How to participate in a group discussion? - How to argue for or against in a debate? - Body language - non-verbal communication - personal appearance - facial expression - posture - gestures - eye contact - Etiquette - Voluntary and involuntary body language -Gender implications -- Tests.

UNIT V **12**

Managing self, people, work, situations - Time-management - Secrets of time-management - Time-wasters - Stress -- Kinds of stress - Spotting stress - Stress-builders - Stress - management tips - Stress-prone habits -- Goals - Career planning - Interpersonal interaction - Interpersonal relationships -- Tests.

Study material will be prepared by the Department of Languages. Tests

suggested will be prepared by a senior faculty of the department.

Movies will be screened to discuss and debate on the topics introduced in each unit. LABORATORY REQUIREMENTS

1. Career Lab:1 room
2. 2 Computers as a Server for Labs (with High Configuration)
3. Headphones with Mic (i-ball) - 100 Nos
4. Speakers with Amplifiers, Wireless Mic and Collar Mic - 2 Sets
5. Teacher table, Teacher Chair - 1 + 1
6. Plastic Chairs - 75 Nos

SEMESTER-VII

EEB401POWER SYSTEM OPERATION AND CONTROL

L T P C
3 1 0 4

PREREQUISITE

EE B 302 - Transmission &

Distribution

EE B 304 - Power System Analysis

EE B 206 - Control Systems

GOAL

To become familiar with the preparatory work necessary for understanding the operation and the various control actions to be implemented on the power system to meet the minute-to-minute variation of system load.

OBJECTIVES

The course will enable the students to:

(i) Have an overview of system load variation, reserve requirements, operation and control of power system.

(ii) Give an insight into the role of speed governing mechanism in load frequency control, concept of control area, modeling and analysis of load frequency control loop.

(iii) Give knowledge of excitation systems and the methods of voltage control.

(iv) Study the economic dispatch of generated power.

(v) Provide adequate knowledge of the functions of energy control centre , SCADA system and the security control.

OUTCOME

The students should be able to:

(i) Understand the need for power system operation and control .

(ii) Get knowledge of the mechanism involved in maintaining the frequency constant by controlling the real power, when there is a system load variation.

(iii) Understand voltage constancy and the methods of voltage control.

(iv) Learn economic scheduling of load among the generators and the concept of economic dispatch.

(v) Understand the methods of computer control using energy control centre and SCADA.

UNIT I INTRODUCTION 12

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor, . Reserve requirements: spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control:Governor control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER-FREQUENCY CONTROL 12

Fundamentals of speed governing mechanism and modeling: Speed-load characteristics - Load sharing between two synchronous machines in parallel; concept of control area, LFC

control of a single-area system: Static and dynamic analysis of uncontrolled and controlled cases. Multi-area systems: Two-area system modeling; static analysis, uncontrolled case; tie line with frequency bias control of two-area system. Derivation of state variable model.

UNIT III REACTIVE POWER-VOLTAGE CONTROL 12

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; method of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 12

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost.

Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. (No derivation of loss coefficients) Base point and participation factors. Economic dispatch controller added to LFC control

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 12

Energy control centre: Functions - Monitoring, data acquisition and control. System hardware configuration - SCADA and EMS functions, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in extremis and restorative. State transition diagram showing various state transitions and control strategies.

L : 45 T : 15 TOTAL : 60

TEXT BOOKS

1. Olle. I. Elgerd, "Electric Energy Systems Theory - An Introduction", Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2008.
2. Allen.J.Wood and Bruce F.Wollenberg, "Power Generation, Operation and Control", John Wiley & Sons, Inc., 2003.
3. P. Kundur, "Power System Stability & Control", McGraw Hill Publications, USA, 2008.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2004.
2. L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2012.

CSB411 DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING IN C++

L	P	T	C
3	0	0	3

GOAL

To provide a knowledge in data structures and Object oriented programming.

OBJECTIVES

The course should enable the student :

(i) To learn the systematic way of solving problems.

(ii) To understand the different methods of organizing large amounts of data.

(iii) To efficiently implement the different data structures.

(iv) To efficiently implement solutions for specific problems

(v) To give an In depth Knowledge in object oriented Programming

OUTCOME

The students should be able to:

(i) Have gained knowledge in problem solving techniques.

(ii) Be capable of writing programs using list, stack and queue.

(iii) Have obtained confidence in storing data in tree and other related data structures.

(iv) Have grasped knowledge in various sorting techniques.

(v) Have learnt the concepts in Inheritance, Abstract classes and virtual functions

UNIT I LISTS, STACKS AND QUEUES **9**

Abstract Data Type (ADT) - The List ADT - The Stack ADT - The Queue ADT

UNIT II TREES AND SORTING **9**

Preliminaries - Binary Trees - The Search Tree ADT - Binary Search Trees - AVL Trees - Tree Traversals - Binary Heap- Insertion Sort - Shellsort - Heapsort - Mergesort - Quicksort

UNIT III GRAPHS **9**

Definitions - Topological Sort - Shortest-Path Algorithms - Unweighted Shortest Paths - Dijkstra's Algorithm - Minimum Spanning Tree - Prim's Algorithm - Applications of Depth-First Search - Undirected Graphs - Biconnectivity

UNIT IV OBJECT ORIENTED PROGRAMMING AND C++ **9**

Basic concepts of object oriented programming - Benefits of OOP - Applications of OOP - Basics of C++ - Data types-Operators-Statements-Functions-Classes and Objects - Constructors -Destructors - Overloading

UNIT V INHERITANCE,ABSTRACT CLASSES,VIRTUAL FUNCTIONS **9**

Defining derived classes - Single inheritance - Multilevel inheritance - Multiple inheritance - Hierarchical inheritance - Hybrid inheritance - Virtual base classes - Abstract classes-Virtual functions

TOTAL : 45

TEXT BOOKS

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C++", 3rd ed, Pearson Education Asia, 2009.

2. Bjarne Stroustrup, 'The C++ Programming Language', 3rd edition,Addison Wesley

REFERENCES

1. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C++", Pearson Education Asia, 2009

2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures - A Pseudocode Approach with C++", Thomson Brooks / COLE, 2009.

3. Herbert Schildt, 'C++ - The Complete Reference', 4th edition,Tata McGraw Hill.

EEC451POWER QUALITY

L P T C
3 0 0 3

Prerequisite

EE B 304 - Power System Analysis,

EE B 401 -Power System Operation & Control,

MA A 201 – Engineering Maths – III

Goal

To study the various issues affecting Power Quality, their production, monitoring and suppression. This includes studying the production of voltages sags, over voltages and harmonics and methods of control and to various methods of power quality monitoring.

Objectives:

The course will enable the students to:

(i)Understand the concept of power quality involved terms and definitions

(ii)To study and understand the concept of over voltages and the mitigation methods along with PSCAD and EMTP

(iii)Understandvarious types of sources and control techniques of voltage sags.

(iv)Understandvarious types of sources and control techniques of harmonics.

(v)Acquire knowledge power quality monitoring.

Outcome:

After completion of the course the students are expected to be able to:

(i)Gain knowledge about over voltages and the mitigation methods using PSCAD and EMTP

(ii)Gain knowledge about various types of sources and control techniques of harmonics.

(iii) Gain knowledge about power quality monitoring

(iv) Gain knowledge aboutvarious types of sources and control techniques of harmonics.

UNIT I INTRODUCTION TO POWER QUALITY **3**

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS **7**

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III OVERVOLTAGES **10**

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables, computer analysis tools for transients, PSCAD and EMTP.

UNIT IV HARMONICS **12**

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING **13**

Monitoring considerations: Power line disturbance analyzer, per quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

L = 45 TOTAL = 45

REFERENCES

1. Roger.C.Dugan, Mark.F.McGranagham, Surya Santoso, H.WayneBeaty, 'Electrical Power Systems Quality' McGraw Hill, 2003.
2. PSCAD User Manual.

EIC451FIBER OPTICS & LASER INSTRUMENTS

L	P	T	C
3	0	0	3

GOAL

To provide knowledge about the Industrial applications of optical fibers and laser instruments.

OBJECTIVES

The course will enable the students to:

(i) Get exposed to the basic concepts of optical fibers and their properties.

(ii) Acquire adequate knowledge about the Industrial applications of optical fibers.

(iii) Acquire knowledge about Laser fundamentals and Industrial application of lasers.

(iv) Get adequate knowledge about holography & Medical applications of Lasers.

OUTCOME

The students should be able to:

(i) Specify and operate optical test instrumentation, for example, optical spectrum analyzers and laser beam profilers.

(ii) Align, maintain and operate optical components and support and positioning equipment.

(iii) Survey a laser work area, citing unsafe conditions present.

(iv) Gain knowledge about Holographic techniques and medical applications of laser.

UNIT I OPTICAL FIBERS AND THEIR PROPERTIES 9

Principles of light propagation through a fiber - Different types of fibers and their properties, fiber characteristics - Absorption losses - Scattering losses - Dispersion - Connectors & splicers - Fiber termination - Optical sources - Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBERS 9

Fiber optic sensors - Fiber optic instrumentation system - Different types of modulators - Interferometric method of measurement of length - Moire fringes - Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers - Three level and four level lasers - Properties of laser - Laser modes - Resonator configuration - Q-switching and mode locking -Types of lasers - Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS 9

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect - Material processing - Laser heating, welding, melting and trimming of material - Removal and vaporization.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography - Basic principle - Methods - Holographic interferometry and application,- Holographic components - Medical applications of lasers, laser and tissue interactive - Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, rigid and flexible endoscopes, gynecology and oncology.

L : 45 TOTAL : 45

TEXT BOOKS

1. J.M. Senior, 'Optical Fiber Communication - Principles and Practice', Prentice Hall of India, 2005.

2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCES

1. Donald J.Sterling Jr, 'Technicians Guide to Fiber Optics', 3rd Edition, Vikas Publishing House, 2000.

2. M. Arumugam, 'Optical Fiber Communication and Sensors', Anuradha Agencies, 2002.

3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 2004.

4. Monte Ross, 'Laser Applications', McGraw Hill, 2004.

EEB452SPECIAL ELECTRICAL MACHINES

L P T C
3 0 0 3

Prerequisite

EE B202 – Electrical Machines - I

EE B 205 – Electrical Machines – II

Goal
To expose the students to the construction, principle of operation and performance of special electrical machines such as synchronous reluctance motor, switched reluctance motor, stepper motor, permanent magnet synchronous motor etc..

Objectives
The course will enable the students to:

(i) Provide the concept of construction, operating principle and characteristics of synchronous reluctance motor, stepper motor and switched reluctance motor..

Give basic knowledge about the principle of operation, analysis, emf and torque equation, and control of permanent magnet synchronous motors and brushless DC motors

Outcome
At the end of the course the students should be able to

(i) Gain knowledge about construction, operating principle and characteristics of synchronous reluctance motor, stepper motor and switched reluctance motor..

(ii)Comprehend about permanent magnet synchronous motors and brushless DC motor and its applications.

UNIT I. STEPPING MOTORS **9**

Constructional features, principle of operation, modes of excitation ,torque production in Variable Reluctance (VR) stepping motor, Dynamic characteristics, Drive systems and circuit for open loop control, Closed loop control of stepping motor

UNIT II SWITCHED RELUCTANCE MOTORS **9**

Constructional features, principle of operation. Torque equation, Power controllers, Characteristics and control Microprocessor based controller.

UNIT III PERMANENT MAGNET BRUSHLESS DC MOTORS **9**

Commutation in DC motors, Difference between mechanical and electronic commutators, Hall sensors, Optical sensors, Multiphase Brushless motor, Square wave permanent magnet brushless motor drives, Torque and emf equations, Torque-speed characteristics, Controllers-Microprocessor based controller.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS **9**

Principle of operation, EMF, power input and torque expressions, Phasor diagram, Power controllers, Torque speed characteristics, Self control, Vector control, Current control schemes.

UNIT V SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features: axial and radial air gap Motors. Operating principle, reluctance torque – phasor diagram, motor characteristics.

L = 45TOTAL=45

TEXT BOOKS

1. K.Venkataratnam 'Special Electrical Machines' University Press, Hyderabad, 2008.

REFERENCES

1.T.J.EMiller,'Brushless Permanent Magnet and Reluctance Motor Drives'. Clarendon Press, Oxford, 1989.

2. Kenjo, T and Naganori, S " Permanent Magnet and brushless DC motors ", Clarendon Press, Oxford, 1989.

3. B.K. Bose, "Modern Power Electronics & AC drives" Pearson Education, 2002.

4. R.Krishnan, " Electric Motor Drives – Modeling, Analysis and Control", Prentice-Hall of India Pvt. Ltd., New Delhi, 2003.

EIC452 BIOMEDICAL INSTRUMENTATION

L P T C
3 0 0 3

PREREQUISITE

EE B 204 - Measurement & Instrumentation

GOAL

To provide knowledge about the concept of different biomedical instruments & application

OBJECTIVES

The course will enable the students to:

(i) Acquire knowledge about physiology and transducer

(ii) Acquire knowledge about electro physiological measurements.

(iii) Acquire knowledge of non-electrical parameter measurement

(iv) Get knowledge of medical imaging and PMS

(v) Know about assisting & therapeutic equipment.

OUTCOME

The students should be able to:

(i) Gain knowledge about human nervous system, cardio pulmonary system..

(ii) Acquire knowledge about transducer & components of biomedical system

(iii) Gain knowledge about EEG, ECG, EMG etc.

(iv) Gain knowledge about parameter.

(v) Gain knowledge about diff.imaging techniques.

(vi) Gain knowledge about the equipment.

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Cell and its structure - Action and resting - Potential propagation of action potential - Sodium pump - Nervous system - CNS - PNS - Nerve cell - Synapse - Cardio pulmonary system - Physiology of heart and lungs - Circulation and respiration - Transducers - Different types - Piezo-electric, ultrasonic, resistive, capacitive, inductive transducers - Selection criteria.
Basic components of a biomedical system - Electrodes - Micro, needle and surface electrodes - Amplifiers - Preamplifiers, differential amplifiers, chopper amplifiers - Isolation amplifier.

UNIT II ELECTRO-PHYSIOLOGICAL MEASUREMENTS 9

ECG - EEG - EMG - ERG - Lead systems and recording methods - Typical waveforms.

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure - Cardiac output - Cardiac rate - Heart sound - Respiratory rate - Gas volume - Flow rate of Co2, O2 in exhaust air - pH of blood, ESR, GSR measurements - Plethysmography.

UNIT IV MEDICAL IMAGING AND PMS 9

X-ray machine - Radio graphic and fluoroscopic techniques - Computer tomography - MRI - Ultrasonography - Endoscopy - Thermography - Different types of biotelemetry systems and patient monitoring - Electrical safety.

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

Pacemakers - Defibrillators - Ventilators - Nerve and muscle stimulators - Diathermy - Heart - Lung machine - Audio meters - Dializers.

L : 45 TOTAL : 45

TEXT BOOKS

1. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.

2. R.S.Khandpur, 'Hand book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.

REFERENCES

1. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

2. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.

3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.

4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

5. S.K. Gupta, 'Introduction to Medical Electronics', Bharathi Bhavan, Patna, 1969.

EEC453EMBEDDED SYSTEM DESIGN

L P T C
3 0 0 3

PREREQUISITE

EE B 207 - Digital Logic Circuits

EE B 305 - Microprocessor & Microcontroller

GOAL

To provide the functional building blocks of an embedded for developing a real time system application.

OBJECTIVES

The course will enable the students to:

(i) Know the features that build an embedded system.

(ii) Get adequate knowledge about the interaction of various components within an embedded system

(iii) Get adequate knowledge about interfacing process

(iv) Get adequate knowledge of writing efficient programs on processor

(v) Acquire knowledge about RTOS.

OUTCOME

The students should be able to:

(i) Solve and design the real time embedded products

(ii) Solve the embedded products by using various parameters

(iii) Gain knowledge about various port devices

(iv) Solve competitive embedded programs using C

(v) Gain knowledge about the software in embedded system

UNIT I INTRODUCTION TO EMBEDDED SYSTEM 9

Introduction to functional building blocks of embedded systems - Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

UNIT II PROCESSOR AND MEMORY ORGANIZATION 6

Structural units in a processor; selection of processor & memory devices; shared memory; DMA; interfacing processor, memory and I/O units; memory management - Cache mapping techniques, dynamic allocation - Fragmentation.

UNIT III DEVICES & BUSES FOR DEVICES NETWORK 9

Timer and counting devices, I/O Types, Serial communication devices – RS 232C/RS485 communication, UART, HDLC, Serial data device ports, Parallel device ports. Network embedded systems – Serial bus communication protocol: I^2c, CAN, USB, Parallel bus device protocol: ISA, PCI, PCI/X, ARM. Network protocols – HTTP, TCP, IP. Wireless protocols – IrDA, Blue tooth.

UNIT IV I/O PROGRAMMING SCHEDULE MECHANISM 12

Intel I/O instruction - Transfer rate, latency; interrupt driven I/O - Non-maskable interrupts; software interrupts, writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts.

Multi threaded programming - Context switching, premature & non-premature multitasking,

semaphores.

Scheduling - Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, watch dog timers.

UNIT V REAL TIME OPERATING SYSTEM (RTOS) 9

Introduction to basic concepts of RTOS, Basics of real time & embedded system operating systems, RTOS - Interrupt handling, task scheduling; embedded system design issues in system development process - Action plan, use of target system, emulator, use of software tools.

L : 45 TOTAL : 45

TEXT BOOKS

1. Rajkamal, 'Embedded System - Architecture, Programming, Design', Tata McGraw Hill, 2003.

2. Daniel W. Lewis 'Fundamentals of Embedded Software', Prentice Hall of India, 2004.

EEC454POWER SYTEMS AND SMART GRID

L P T C
3 0 0 3

Prerequisites
EE B 304 - Power System Analysis
EE B 302 - Transmission and Distribution
EE C455 - Electrical Energy Generation Utilization and Conservation
EE B 401 - Power System Operation and Control

Goal
The first objective is to provide the students a systems perspective of modern electricity markets and a systems approach to address various issues faced by the electricity sector. The second objective is to present the student a vision of how Smart Grid will transform the current electricity grid to a reliable and sustainable modern energy system.

Objectives
The course will enable the students to:

(i) Understand the structure of an electricity market in either regulated or deregulated market conditions.
(ii) Understand the impacts of renewable resources to the grid and the various issues associated with integrating such resources to the grid.
(iii) Evaluate various investment options (e.g. generation capacities ,transmission, renewable , demand-side resources, etc) in electricity markets.

Understand the concepts and principles of Smart Grid, technology enabling ,and demand participation.

Outcome
After completion of the course the students are expected to be able to:

(i) Gain knowledge about the economic fundamentals of power systems and electricity markets.
(ii) Understand the concepts of various components of Smart Grid, and their impacts on the energy industry, including renewable integration, demand side management, and greenhouse gas (GHG) emissions reductions.
(iii) Gain knowledge about the characteristics of smart grids
(iv) Gain knowledge about the basic elements and desirable traits of power grid

Gain adequate knowledge about desirable features of smart grid

UNIT I SUPPLY SIDE AND DEMAND SIDE OF ELECTRICITY 10

Basics of electricity- Fossil fuel and hydro power plants- Renewable and alternative energy- Supply curve- Load characteristics- Load curve and load duration curve- Demand side management- Plug-in hybrid vehicles and smart appliances

UNIT II TRANSMISSION AND DISTRIBUTION NETWORKS 8

Physical laws of electricity; AC vs. DC Powerflow- Optimal power flow and unit commitment models- Distribution network basics

UNIT III BASIC ELEMENTS AND DESIRABLE TRAITS OF SMART GRID 9

The origin of power grid - dependency on power grid - desirable features of power grid- reliability – security –economic –efficiency -environmental friendly – safety.

UNIT IV KEY CHARACTERISTICS OF SMART GRID **9** Demand-side participation- Impacts of Smart Grid on reliability- Impacts of Smart Grid on air pollutant emissions reduction.

UNIT V ISSUES RELATED TO SMART GRID **9**

Communication and sensing in a smart grid- smart grid threats-vulnerabilities-cyber security strategies.

L = 45 TOTAL = 45

TEXT BOOKS :

1. D. S. Kirschen and G Strbac, 'Fundamentals of Power System Economics'.Reprinted edition.
2. John Wiley & Sons Ltd. 2009
3. G. M. Masters ,'Renewable and Efficient Electric Power Systems' John Wiley & Sons, Inc. 2004.

REFERENCE:

1.S.Stoft, 'Power System Economics: Designing Markets for Electricity', Wiley-Interscience, 2002.

2. A.Mazer, 'Electric Power Planning for Regulated and Deregulated Markets', John Wiley & Sons, Inc, 2007.

EEC455ELECTRICAL ENERGY GENERATION UTILIZATION &CONSERVATION

L P T C
3 0 0 3

PREREQUISITE

EE B 202 - Electrical Machines I

E B 205 - Electrical Machines - II

EE C 353 - Solid State Drives

GOAL

To provide knowledge about the Industrial applications of generation, utilization &conservation.

OBJECTIVES

The course will enable the students to :

(i) Give exposure to the various sources of electric power generation.

(ii) Study the different methods of conservation of electric power.

(iii) Impart knowledge on the Lighting, Heating and welding methods.

(iv) Give adequate knowledge about electric traction system and their controls.

(v) Give exposure on the Industrial drives and load characteristics

OUTCOME

The students should be able to:

(i) Gain knowledge in different methods of electric power generation equipment.

(i) Comprehend about Energy conservation and energy management system.

(ii) Understand the concept of Industrial Heating, Welding and able to design lighting system for different applications.

(iii) Get knowledge on the latest trends of Electric drive system

UNIT I CONSERVATION 9

Economics of Generation-Definitions -Load curves, Number &size of units-Cost of electrical energy-Tariff-Need for conservation-Conservation methods-Energy efficient equipment-

Energy Management and Auditing-Economics of power factor improvement-Design for improvement of power factor using power capacitors-Power Quality, Effect on conservation

UNIT II ILLUMINATION, HEATING AND WELDING 9

Nature of radiation, Definition-Laws, Photometry-Lighting calculations-Design of illumination systems-Types of lamps, Energy efficient lamps

UNIT III HEATING AND WELDING 9

Methods of heating, Requirement of heating material-Design of heating element, Furnaces-Welding generator, Welding transformer and its characteristics

UNIT IV ELECTRIC TRACTION **9**

Requirement of Ideal traction system-Supply Systems-Mechanics of train movement-Traction motors and control-Multiple units , Braking-Current collection systems-Recent trends in electric traction.

UNIT V DRIVES &THEIR INDUSTRIAL APPLICATIONS 9

Motor selection and related factors-Loads-Types-Characteristics-Steady and Transient-Load Equalization-Industrial application-Modern methods of speed control of industrial drives.

L : 45 TOTAL : 45

TEXT BOOKS

1. C.L.WADHWA, "Generation Distribution and Utilization of Electrical Energy", New Age International (P) Ltd, 2003

2. B.R.Gupta, "Generation of electrical energy", Eurasia Publishing House (P) Ltd, New Delhi, 2003

REFERENCES

1. J.B.Gupta, "Utilization of electric power and Electric Traction", S.K.Kataria &Sons,2002.

2. Gopal K Dubey "Fundamentals of Electrical Drives", Narosa Publishing House (P) Ltd, new Delhi, 2002.

EED451 BUILDING SERVICES

L T P C
3 0 0 3

PREREQUISITES

GOAL

To impart the students with the various aspects of pumps and machinery involved in Civil Engineering practice and the principles of electrical and air conditioning facilities involved.

OBJECTIVES

The course should enable the students to :

- Study about machineries used in the Civil Engineering field.
- Acquire knowledge about electrical systems in the buildings.
- Impart knowledge on the principles of Lighting and Illumination in the buildings.
- Familiarize with refrigeration principles and its applications.
- Create an awareness of the fire safety aspects in the buildings.

OUTCOME

The students should be able to:

- Describe the different machineries used in the construction.
- Plan the electrical wiring for the buildings.
- Design the lighting system required for different types buildings.
- Choose suitable refrigeration and air conditioning systems for different types of buildings.
- Describe the fire safety aspects of building services.

UNIT I MACHINERIES **8**

Hot Water Boilers - Lifts and Escalators - Special features required for physically handicapped and elderly - Conveyors - Vibrators - Concrete mixers - DC/AC motors - Generators - Laboratory services - Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS **10**

Basics of electricity - Single / Three phase supply - Protective devices in electrical installations - Earthing for safety - Types of earthing - ISI specifications - Types of wires, wiring systems and their choice - Planning electrical wiring for building - Main and distribution boards - Transformers and switch gears - Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN **8**

Visual tasks - Factors affecting visual tasks - Modern theory of light and colour - Synthesis of light - Additive and subtractive synthesis of colour - Luminous flux - Candela - Solid angle illumination -

Utilisation factor - Depreciation factor - MSCP - MHCP - Laws of illumination - Classification of lighting - Artificial light sources - Spectral energy distribution - Luminous efficiency - Colour temperature - Colour rendering.

Design of modern lighting - Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS **10**

Thermodynamics - Heat - Temperature, measurement transfer - Change of state - Sensible heat - Latent heat of fusion, evaporation, sublimation - saturation temperature - Super heated vapour - Subcooled liquid - Pressure temperature relationship for liquids - Refrigerants - Vapour compression cycle - Compressors - Evaporators - Refrigerant control devices - Electric motors - Starters - Air handling units - Cooling towers - Window type and packaged air-conditioners - Chilled water plant - Fan coil systems - Water piping - Cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION **9**

Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types - Heat and smoke detectors - Fire alarm system, snorkel ladder - Fire lighting pump and water storage - Dry and wet risers - Automatic sprinklers.

TOTAL = 45

TEXT BOOKS:

1. Udayakumar, R, "A Text Book of Building Services", Eswar Press (2007 R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1969.
2. William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 1988.

REFERENCES:

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 1968.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968.
3. Philips Lighting in Architectural Design, McGraw-Hill, New York, 1964.
4. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 1980.

National Building Code.

CSB435DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING IN C++

L P T C
3 0 0 1

GOAL

To teach the principles of good programming practice and to give a practical training in writing efficient programs in C++

OBJECTIVES

The course should enable the student to:

(i) Write programs in C++

(ii) Implement the various data structures as Abstract Data Types

(iii) Write programs to solve problems using the ADTs

(iv) Introduce constants, variables, data types, operators, classes, objects, methods

(v) Introduce inheritance,Abstract classes,Virtual functions

OUTCOME

The students should be able to:

(i) Have gained knowledge in problem solving techniques.

(ii) Be capable of writing programs using list, stack and queue.

(iii) Have obtained confidence in storing data in tree and other related data structures.

(iv) Have grasped knowledge in various sorting techniques.

(v) Have learnt the concepts in Inheritance,Abstract classes and virtual functions.

LIST OF EXPERIMENTS

Implement the following exercises using C++

S.No	List of Experiments	No. of Hours
1	Array implementation of List Abstract Data Type (ADT)	5
2	Array implementations of Stack ADT	4
3	Linked list implementations of Stack ADT	4
4	Array implementation of Queue ADT	4
5	Linked list implementation of Queue ADT	4
6	Balanced Paranthesis' using array implementation of Stack ADT	4
7	Balanced Paranthesis' using linked list implementation of Stack ADT	4
8	Evaluating Postfix Expressions' using array implementations of Stack ADT	4
9	Quick Sort	4
10	Compile time Polymorphism	
	a.Operator Overloading including Unary and Binary Operators.	
	b.Function Overloading	4

11	Runtime Polymorphism a. Inheritance b. Virtual functions c. Virtual Base Classes	4

P : 45 TOTAL : 45

HARDWARE/SOFTWARE REQUIRED FOR BATCH OF 30

STUDENTS HARDWARE

LAN system with 30 nodes (OR) Standalone PCs - 30 Nos

Printers - 3 Nos

SOFTWARE

OS - Windows / UNIX

Software - C++ language

EEB431 ELECTRICAL DRIVES AND CONTROL LABORATORY

L P T C
3 1 0 1

Prerequisite

EE B 301 – Power Electronics

Goal

To expose the students to the various control techniques of electrical machines and help them to extract their practical knowledge.

Objectives

The course will enable the students to *do experiments on*

(i) Speed control of Induction Motor using V/f method and 3 ø Voltage Source Inverter.
(ii) Speed control and braking of DC shunt motor using 3 ø converter.
(iii) Voltage & current control of DC motor using PLC.
(iv) Conventional and vector control of PMSM motor by using DSP.
(v) Two and four quadrant operation of a DC motor.
(vi) Open loop & Closed loop speed control of PMBLDC using PIC controller
(vii) Forward and Reverse operation of stepper motor by micro controller.
(viii) Speed control of universal motor using controlled rectifier.

Outcome

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

(i) Understand the various methods of speed control of induction motor.
(ii) Understand the methods of speed control and braking methods of dc motor using power electronics devices.

(iii) Analyze the current and voltage control of dc motor using the new technology PLCs,will help them to get industrial job opportunities.
(iv) PMSM motor control using vector control will enable them to go for higher studies.
(v) Analyze the dc motor operation in four quadrant using power electronics devices.
(vi) Get knowledge in control techniques of special electrical machines like BLDC, PMSM and Stepper motor.
(vii) Get knowledge in universal motor control techniques for different applications.

Sl. No.	Experiment	Hours
1	Speed control of Induction Motor using V/f method and 3 Ø Voltage Source Inverter	4
2	Open loop & Closed loop speed control of BLDC using PIC controller	4
3	Speed control of universal motor using controller rectifier.	4
4	Two and four quadrant operation of a DC motor.	4
5	Conventional control of PMSM motor by using DSP/PIC	4
6	Vector control of PMSM motor by using DSP/PIC	4
7	Forward and Reverse operation of stepper motor by micro controller.	5
8	Braking methods of a DC motor. a) Dynamic Braking b) Regenerative Braking c) Plugging	5
9	Speed control of DC shunt motor using 3 ø converter.	4
10	Voltage & current control of DC motor using PLC.	4
11	Model Exam	3
Total Hours		**45**

List of equipments

Sl. No.	Description	Quantity
1	3Ø Induction motor	2
2	Permanent Magnet Stepper Motor (PMSM)	2
3	Brushless DC motor	2
4	Universal Motor	1
5	DC Shunt Motor	4
6	Stepper motor with 8051 interfacing card	1 set
7	BLDC interface kit with PIC	2 set
8	PMSM interface kit with PIC	2 set

9	Microcontroller motor interface kit(stepper motor, DC motor & Universal motor)	4 set
10	SCR, TRIAC,MOSFET & IGBT firing Module (6 pulse set)	5 set
11	PIC module training kit with interface card	4 set
12	DSP module training kit with interface card	3 set
13	Rectifier Unit	1
14	Fixed DC power supply	8
15	CathodeRay Oscilloscope	6
16	SinglephaseAutotransformer	2
17	Three phase Autotransformer	2
19	Multi meter	3
20	LCRmeter	1
21	Rheostatsofvariousranges	2setsof4 value
22	Worktables	10
23	DCandACmetersofrequiredranges	20

EEB432 COMPREHENSION AND VIVA - VOCE

L T P C

0 0 3 1

EEB 433 DESIGN PROJECT

L T P C
0 0 9 3

SEMESTER VIII

EEB441PROJECT & VIVA-VOCE

L	T	P	C
0	0	24	6

Objective : To develop the objective

with creative and analytical skills

OUTCOME

1. **To develop the design skills**
2. **To develop the analytical and innovative skills**

Evaluation Procedure

Review	Requirement	Weightage in Internal	Weightage in External	Duration
Zeroth Review	Title selection	-		At the end of 2 week from the start of semester
First Review	Literature review, Proposal for the project	10 %		At the end of 5 week from the start of semester
Second Review	Mathematical Analysis, Simulation output Circuit Working	20 %		At the end of 8 week from the start of semester
Model Review	Final Hardware kit	20%		At the end of 11 week From the start of semester
University Exam	Final Viva Voce		50%	At the end of 12 week From the start of semester