JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

JALPAIGURI- 735 102

(AN AUTONOMOUS GOVERNMENT COLLEGE)

COURSE STRUCTURE AND SYLLABUS
FOR
B.TECH. IN ELECTRICAL ENGINEERING

(Implemented from the Academic Year 2013-14 -for the new batch only)

www.jgec.org

Phone: 03561 – 255131 (Principal), Fax: 03561 – 256143
255465 (EPABX)- 105(EE)

First Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credits
			L	T	P	Total	
01	HU-101	English Language & Technical Communication	2	0	0	2	02
02	PH-101	Physics – 1	3	1	0	4	04
03	M-101	Mathematics-1	3	1	0	4	04
04	CS-101	Principles of Computer Programming	3	1	0	4	04
05	ME-101	Engineering Mechanics	3	1	0	4	04
Total of Theory			14	04	00	18	18
B. PRACTICAL							
01	PH-191	Physics – 1 Lab.	0	0	3	3	02
02	CS-191	Principles of Computer Programming Lab.	0	0	3	3	02
03	ME-191	Engineering Drawing &Graphics	0	0	3	3	02
Total of Practical			00	00	09	09	06
C. SESSIONAL							
01	HU-181	English Language & Technical Communication Lab.	0	0	3	3	02
02	XC-181	Extra Curricular Activities(NSS/NCC/NSO etc)	0	0	2	2	01
Total of Sessional			00	00	05	04	03
Total of Semester			14	04	14	32	27

Second Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credits
			L	T	P	Total	
01	HU-202	Economics for Engineers	3	0	0	3	03
02	EE-201	Basic Electrical Engineering	3	1	0	4	04
03	CH-201	Chemistry-I	3	1	0	4	04
04	M-201	Mathematics-II	3	1	0	4	04
05	EC-201	Basic Electronics Engineering	3	1	0	4	04
Total of Theory			15	04	00	19	19
B. PRACTICAL							
01	EE-291	Basic Electrical Engineering Lab.	0	0	3	3	02
02	CH-291	Chemistry-I Lab.	0	0	3	3	02
03	EC-291	Basic Electronics Engineering Lab.	0	0	3	3	02
04	ME-292	Workshop Practice	0	0	3	3	02
Total of Practical			00	00	12	12	08
C. SESSIONAL							
Total of Sessional			00	00	00	00	00
Total of Semester			15	04	12	31	27

Third Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credits
			L	T	P	Total	
01	HU-301	Values and Ethics in Profession	3	0	0	3	03
02	PH(EE)-301	Physics-II	3	1	0	4	04
03	M-302	Mathematics-III	3	1	0	4	04
04	ME(EE)-301	Elements of Mechanical Engineering	3	0	0	3	03
05	EC(EE)-301	Analog and Digital Electronic circuits	3	0	0	3	03
06	EE-301	Electric Circuit theory	3	1	0	4	04
Total of Theory			18	03	00	21	21
B. PRACTICAL							
01	EC(EE)-391	Analog & Digital Electronic Circuit Lab.	0	0	3	3	02
02	PH(EE)-391	Physics-II Lab.	0	0	3	3	02
03	EE-391	Electric Circuit Theory Lab.	0	0	3	3	02
Total of Practical			00	00	09	09	06
C. SESSIONAL							
01	HU-381	Technical Report Writing Practice	0	0	2	02	01
Total of Sessional			00	00	02	00	00
Total of Semester			18	03	11	32	28

Fourth Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credits
			L	T	P	Total	
01	M (CS) -401	Numerical Methods	3	0	0	3	03
02	EE-403	Field theory	3	1	0	4	04
03	ME(EE)-401	Thermal Power Engineering	3	0	0	3	03
04	CH-401	Basic Environmental Engg. & Elementary Biology	3	0	0	3	03
05	EE-401	Electric Machine-I	3	1	0	4	04
06	EE-402	Electrical & Electronic Measurements	3	0	0	3	03
Total of Theory			18	02	00	20	20
B. PRACTICAL							
01	ME(EE)-491	Thermal Power Engineering Lab.	0	0	3	3	02
02	EE-491	Electric Machine -I Lab.	0	0	3	3	02
03	EE-492	Electrical & Electronic Measurements Lab.	0	0	3	3	02
04	M (CS)-491	Numerical Methods Lab.	0	0	3	3	02
Total of Practical			00	00	12	12	08
C. SESSIONAL							
Total of Sessional			00	00	00	00	00
Total of Semester			18	02	12	32	28

Fifth Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credits
			L	T	P	Total	
01	HU-501	Principle of Management	3	0	0	3	03
02	EE-501	Electric Machine-II	3	1	0	4	04
03	EE-502	Power System-I	3	1	0	4	04
04	EE-503	Control System-I	3	1	0	4	04
05	CS(EE)-501	Elective-I	3	0	0	3	03
Total of Theory			15	03	00	18	18
B. PRACTICAL							
01	EE-591	Electric Machine -II Lab	0	0	3	3	02
02	EE-592	Power System-I Lab.	0	0	3	3	02
03	EE-593	Control System -I Lab.	0	0	3	3	02
04	CS(EE)-591	Elective –I Lab.	0	0	3	3	02
Total of Practical			00	00	12	12	08
C. SESSIONAL							
01	EE-581	Seminar	0	0	3	3	02
Total of Sessional			0	0	3	3	02
Total of Semester			15	03	15	33	28

Sixth Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credits
			L	T	P	Total	
01	EE-601	Control System-II	3	1	0	4	04
02	EE-602	Power System-II	3	1	0	4	04
03	EE-603	Power Electronics	3	1	0	4	04
04	CS(EE)-601	Elective-II	3	1	0	4	04
05	EE-604	Elective-III	4	0	0	4	04
Total of Theory			16	04	00	19	20
B. PRACTICAL							
01	EE-691	Control System –II Lab.	0	0	3	3	02
02	EE-692	Power System -II Lab.	0	0	3	3	02
03	EE-693	Power Electronics Lab.	0	0	3	3	02
04	CS(EE)-691	Elective -II Lab.	0	0	3	3	02
Total of Practical			00	00	12	12	08
C. SESSIONAL							
Total of Sessional			00	00	00	00	00
Total of Semester			16	04	12	32	28

Industrial training to be conducted after 6th semester

Seventh Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credits
			L	T	P	Total	
01	EE-701	Electric Drive	4	0	0	4	04
02	HU-701	Financial Management & Accounts	3	0	0	3	03
03	EE-702	Elective-IV	3	0	0	3	03
04	EE-703	Elective-V	3	0	0	3	03
05	EC(EE)-701	Elective-VI	4	0	0	4	04
Total of Theory			17	00	00	17	17
B. PRACTICAL							
01	EE-791	Electric Drive Lab.	0	0	3	3	02
02	EC(EE)-791	Elective-VI Lab.	0	0	3	3	02
Total of Practical			0	0	6	6	04
C. SESSIONAL							
01	EE-781	Industrial Training Evaluation	0	0	3	3	02
02	EE-782	Electrical Design Sessional –I	1	0	3	4	03
03	EE-783	Project-I	0	0	3	3	02
Total of Sessional			00	00	9	10	07
Total of Semester			18	00	15	33	28

Eight Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credits
			L	T	P	Total	
01	EE-801	Utilization of Electric power	4	0	0	4	04
02	EE-802	Elective-VII	4	0	0	4	04
03	EC(EE)-801	Elective-VIII	4	0	0	4	04
Total of Theory			12	00	00	12	12
B. PRACTICAL							
Total of Practical			00	00	00	00	00
C. SESSIONAL							
01	EE-881	Project-II	0	0	6	6	04
02	EE-882	Electrical Design Sessional –II	0	0	6	6	04
03	EE-883	Grand Viva	0	0	0	0	04
Total of Sessional			00	00	12	10	12
Total of Semester			12	00	12	24	24

List of Elective Subjects:

CS(EE)-501- Elective-I:

(a) Data structure & algorithm
(b) Computer Organization
(c) Micro Processor & Micro controller
(d) Computer Architecture

CS(EE)-601 - Elective-II:

(a) Software Engineering
(b) DBMS
(c) Object oriented programming
(d) Computer Network

EE-604-Elective-III:

(a) High voltage Engineering
(b) Illumination Engineering
(c) Energy management & audit
(d) Renewable & Non Conventional Energy

EE-702- Elective-IV:

(a) Power system-III
(b) Control system-III
(c) Electric Machine-III
(d) Advanced Power Electronics

EE-703-Elective- V:

(a) Power plant instrumentation & Control
(b) Sensors & Transducers
(c) Biomedical Instrumentation
(d) Process control

EC(EE)-701-Elective-VI:

(a) RF & Microwave Engg
(b) Digital Signal Processing
(c) Optical Communication & N/W
(d) Digital Communication

EE-802-Elective-VII :

(a) FACTs & HVDC transmission
(b) Power Plant Engineering
(c) Power Generation and Economics
(d) Power System Dynamics & Control
(e) AI & Soft Computing
(f) Advanced Electric Drives

EC(EE)-801- Elective-VIII:

(a) Digital Image Processing
(b) Communication Engg.
(c) VLSI & Microelectronics
(d) Embedded system
(e) Satellite Communication & Remote Sensing

Code	Sub.	Contact Hrs./Week		Code	Sub.	Contact Hrs./Week	
		L –T-P-TO	Cr.			L –T-P-TO	Cr.
HU-101	English Language & Tech. Communication	2-0-0-2	2	HU-202	Economics for Engineers	3-0-0-3	3
PH-101	Physics – 1	3-1-0-4	4	EE-201	Basic Electrical Engineering	3-1-0-4	4
CS-101	Principles of Computer Programming .	3-1-0-4	4	CH-201	Chemistry-I	3-1-0-4	4
M-101	Mathematics-1	3-1-0-4	4	M-201	Mathematics-II	3-1-0-4	4
ME-101	Engineering Mechanics	3-1-0-4	4	EC-201	Basic Electronics Engineering	3-1-0-4	4
PH-191	Physics-I Lab.	0-0-3-3	2	EE-291	Basic Electrical Engg. Lab.	0-0-3-3	2
CS-191	Principles of Computer ProgrammingLab.	0-0-3-3	2	CH-291	Chemistry-I Lab.	0-0-3-3	2
ME-191	EngineeringDrawing. & Graphics	0-0-3-3	2	EC-291	Basic Electronics Engineering Lab.	0-0-3-3	2
HU-181	English Language & Technical CommunicationLab	0-0-3-3	2	ME-292	Workshop Practice	0-0-3-3	2
XC-181	Extra Curricular Activities(NSS/NSO/NSO ETC)	0-0-2-2	1				
		14-4-14-32	27			15-4-12-31	27
HU-301	Value & Ethics in Profession	3-0-0-3	3	M (CS) 401	Numerical Methods	3-0-0-3	3
PH(EE)-301	Physics-II	3-1-0-4	4	EE-403	Field theory	3-1-0-4	4
M-302	Mathematics-III	3-1-0-4	4	ME(EE)-401	Thermal Power Engineering	3-0-0-3	3
ME(EE)-301	Elements of Mech. Engg.	3-0-0-3	3	CH-401	Basic Environmental Engineering & Elementary Biology	3-0-0-3	3
EC(EE)301	Ana.& Dig. Etr. Ckt.	3-0-0-3	3	EE-401	Electric Machine-I	3-1-0-4	4
EE-301	Electric Circuit theory	3-1-0-4	4	EE-402	Electrical & Electronic Measurement	3-0-0-3	3
EC(EE)391	Ana.& Dig. Etr. Ckt. Lab.	0-0-3-3	2	ME(EE)-491	Thermal power Engineering Lab.	0-0-3-3	2
PH(EE)- 391	Physics-II Lab.	0-0-3-3	2	EE-491	Electric Machine-I Lab.	0-0-3-3	2
EE-391	Electric Circuit Theory Lab.	0-0-3-3	2	EE-492	Electrical &Etr. Measurement Lab.	0-0-3-3	2
HU-381	Technical Report Writing Practice	0-0-2-2	1	M (CS)-491	Numerical Methods Lab.	0-0-3-3	2
		18-3-11-32	28			18-2-12-32	28
HU-501	Principle of Management	3-0-0-3	3	EE-601	Control System-II	3-1-0-4	4
EE-501	Electric Machine-II	3-1-0-4	4	EE-602	Power System-II	3-1-0-4	4
EE-502	Power System-I	3-1-0-4	4	EE-603	Power Electronics	3-1-0-4	4
EE-503	Control System-I	3-1-0-4	4	CS(EE)-601	Elective-II	3-1-0-4	4
CS(EE)-501	Elective-I	3-0-0-3	3	EE-604	Elective-III	4-0-0-4	4
EE-591	Electric Machine -II Lab.	0-0-3-3	2	EE-691	Control System -II Lab.	0-0-3-3	2
EE-592	Power System-I Lab	0-0-3-3	2	EE-692	Power System-II Lab	0-0-3-3	2
EE-593	Control System -I Lab.	0-0-3-3	2	EE-693	Power Electronics Lab.	0-0-3-3	2
CS(EE)-591	Elective-I Lab.	0-0-3-3	2	CS(EE)-691	Elective-II Lab.	0-0-3-3	2
EE-581	Seminar	0-0-3-3	2				
		15-3-15-33	28			16-4-12-32	28
EE-701	Electric Drive	4-0-0-4	4	EE-801	Utilization of Electric power	4-0-0-4	4
HU-701	Financial Management & Accounts	3-0-0-3	3	EE-802	Elective-VII	4-0-0-4	4
EE-702	Elective-IV	3-0-0-3	3	EC(EE)-801	Elective-VIII	4-0-0-4	4
EE-703	Elective-V	3-0-0-3	3	EE-881	Project-II	0-0-6-6	4
EC(EE)-701	Elective-VI	4-0-0-4	4	EE-882	Electrical Design Sessional -II	0-0-6-6	4
EE-791	Electric Drive Lab.	0-0-3-3	2	EE-883	Grand Viva	0-0-0-0	4
EC(EE)-791	Elective-VI Lab.	0-0-3-3	2				
EE-781	Electrical Design Sessional -I	1-0-3-4	3				
EE-782	Industrial Training Evaluation.	0-0-3-3	2				
EE-783	Project-I	0-0-3-3	2				
		18-0-15-33	28			12-0-12-24	24

CS(EE)-501- Elective-I: (a) Data Structure & Algorithm (b) Computer Organization (c) Micro Processor & Micro controller (d) Computer Architecture
CS(EE)-591- Elec-I: (a) Data Structure & Algorithm Lab (b) Computer Organization Lab (c) µ- Processor & µ- Controller Lab (d) Computer Architecture Lab
CS(EE)-601 - Elective-II: (a) Software Engineering (b) DBMS (c) Object oriented programming (d) Computer Network
EE-604-Elective-III: (a) High voltage Engineering(b) Illumination Engineering (c) Energy Management & audit (d) Renewable and Non conventional Energy
CS(EE)-691 - Elective-II: (a) Software Engineering Lab (b) DBMS Lab (c) Object oriented programming Lab (d) Computer Network Lab
EE-702- Elective-IV:(a) Power system-III (b) Control system-III (c) Electric Machine-III (d) Advanced Power Electronics
EE-703-Elective- V:(a) Power plant Instrumentation & Control (b) Sensors & Transducers (c) Biomedical Instrumentation (d) Process control
EC(EE)-701-Elective-VI:(a) RF & Microwave Engg.(b) Digital Signal Processing (c) Optical Communication & N/W (d) Digital Communication
EC(EE)-791-Elective-VI: (a) RF & Microwave Engg. Lab(b) Digital Signal Processing Lab(c) Optical Communication & N/WLab(d) Digital Communication Lab.
EE-802-Elective-VII: (a) FACTs & HVDC Transmission (b) Power Plant Engineering (c) Power Generation and economics (d) Power System Dynamics & Control (e) AI & Soft Computing (f) Advanced Electric Drives
EC(EE)-801- Elective-VIII:(a) Digital Image Processing, (b)Communication Engg. (c) VLSI & Microelectronics (d) Embedded system
(e**) Satellite** Communication & Remote Sensing..

Detailed Syllabus:

1st semester:

HU-101 English Language & Technical Communication 2-0-0-2-2:

Guidelines for Course Execution:

Objectives of the Course: This Course has been designed

1. To impart advanced skills of Technical Communication in English through Language Lab. PracticeSessions to 1st Semester UG students of Engineering &Technology.
2. To enable them to communicate confidently and competently in English Language in all spheres.

Desired Entry Behaviour:

The students must have basic command of English to Talk about day-to-day events and experiences of life. Comprehend Lectures delivered in English. Read and understand relevant materials written in English. Write grammatically correct English. Strategies for Course Execution:

1. It is a Course that aims to develop Technical Communication Skills. It is, therefore, *Lab*- based and practical in orientation. Students should be involved in Practice Sessions.
2. The content topics should be conveyed through real-life situations. Lecture classes should be conducted as Lecture cum Tutorial classes.
3. Keeping in view the requirements of students, the teachers may have to prepare some learning aids task materials.
4. Some time should be spent in teaching stress and intonation.
5. In teaching 'Speaking skill,' emphasis should be on *clarity, intelligibility, fluency, (as well as accepted pronunciation).*
6. Micro Presentation and Group Discussion Sessions should be used for developing Communicative Competence
7. The Language Lab, device should be used for giving audio-visual inputs to elicit students' responses by way of Micro-Presentation, Pair Conversation, Group Talk and Class Discussion.
8. The teacher must function as *a creative monitor in the Language Lab for the following:*

A. **Developing Listening Comprehension Skill;**

1. Developing Listening Comprehension through Language Lab Device
2. Developing sub skills of the Listening Skill by Conversational Practice Sessions
3. Focusing on intelligent and advanced Listening Sessions e.g. Seminars, Paper Presentation, Mock Interviews etc.
4. Conducting Conversational Practice: Face to Face & Via Media (Telephone, Audio, Video + Clips)

B. **Developing Speaking Competence:**

a) Helping students in achieving *clarity and fluency*; manipulating paralinguistic features of speaking (*voice modulation ,pitch , tone stress , effective pauses)*

Conducting *Task oriented interpersonal ,informal and semiformal Speaking / Classroom Presentation*4

b) Teaching strategies for Group Discussion

Teaching Cohesion and Coherence

Teaching effective communication & strategies for handling criticism and adverse remarks

Teaching strategies of Turn- taking, effective intervention, kinesics (use of body language) andcourtesies and all componentss of softskills.

C. **Developing Reading Comprehension Skill:**

a) Developing Reading Skill through Non Technical (Literary) Texts(See Recommended Book 5)

1. The Thief by Ruskin Bond
2. The Open Window by Saki
3. Marriage is a private Affair by Chinua Achebe
4. The Moon in the Earthen Pot by Gopini Karunakar

b) Developing Reading Skill through Radio Commentary, Technical Texts and Case Studies (Refer toRecommended Book 1.)* Freedom by G. B. Shaw (Radio Commentary)

a) Guiding students for Intensive & Extensive Reading(See Recommended Book 1)

D. **Developing Writing Competence:**

a) Teaching all varieties of Technical Report, Business Letters and Job Application (Expressing Ideaswithin restricted word limit through paragraph division, Listing Reference Materials through Charts ,Graphs ,Tables and Diagrams);

b) Teaching correct Punctuation & Spelling, Semantics of Connectives, Modifiers and Modals, variety ofsentences and paragraphs

c) Teaching Organizational Communication: Memo, Notice, Circular, Agenda / Minutes etc.

SYLLABUS -- DETAILED OUTLINES

A. ENGLISH LANGUAGE GRAMMAR: 5L

Correction of Errors in Sentences, Building Vocabulary, Word formation, Single Word for a group of Words, Fill in the blanks using correct Words, Sentence Structures and Transformation, Active & Passive Voice, Direct & Indirect Narration, (MCQ Practice during classes)

B. READING COMPREHENSION:

Strategies for Reading Comprehension 1L

Practicing Technical & Non Technical Texts for Global/Local/Inferential/Referential comprehension; 3L

Precis Writing

C.TECHNICAL COMMUNICATION

The Theory of Communication –Definition & Scope, Barriers of Communication, Different Communication Models, Effective Communication (Verbal / Non verbal), Presentation / Public Speaking Skills 5L

(MCQ Practice during classes) 5

D.MASTERING TECHNICAL COMMUNICATION

Technical Report (formal drafting) 3L

Business Letter (formal drafting) 4L

Job Application (formal drafting) 3L

Organizational Communication (see page 3) 3L

Group Discussion –Principle & Practice 3L

Total Lectures 30

MARKS SCHEME (Written Examination) Total Marks 70

1. 10 Multiple Choice Questions(Communication & Eng. Language-Vocabulary & Syntax)Marks 10
2. Short Questions & Precis writing on unseen passages Marks 15 (10+5)
3. 3 Essay type Questions on Technical Communication (Technical Report / Business Letter / JobApplication / Organizational Communication etc,) Marks 45-15*3

MARKS SCHEME (Internal Examination) Total Marks 30

1. Attendance Marks 5
2. Testing Speaking Ability Marks 5
3. Testing Listening Ability Marks 5
4. 2 Unit Tests Marks 15

HU -181 English Language& Technical Communication Lab0-0-3-3-2:

a) Honing 'Listening Skill' and its sub skills through Language Lab Audio device; 3P

b) Honing 'Speaking Skill' and its sub skills; 2P

c) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech; 2P

j) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone , Mobile phone & Role Play Mode); 2P

k) Introducing 'Group Discussion' through audio –Visual input and acquainting them with keystrategies for success;2P

f) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creativeintervention, by using correct body language, courtesies & other soft skills) of GD; 4P

g) Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams /ChartDisplay/Technical/Non Technical Passages; Learning Global / Contextual / Inferential Comprehension; 2P

h) Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; PracticeSessions 2P

Total Practical Classes 17

Books Recommended:

Dr. D. Sudharani: Manual for English Language LaboratoryPearson Education (WB edition),2010

Board of Editors: Contemporary Communicative Englishfor Technical CommunicationPearson Longman, 2010

PH-101 Physics-I 3-1-0-4-4:

Module 1: Oscillation:

1.1 Simple Harmonic motion: Preliminary concepts, Superposition of Simple Harmonic motions in two mutually perpendicular directions: Lissajous figure.
1.2 Damped vibration: Differential equation and its solution, Logarithimic decrement, Quality Factor.
1.3 Forced vibration: Differential equation and its solution, Amplitude and velocity resonance, Sharpness of resonance. Application in L-C-R circuit. (2L+3L+3L)

Module 2: Optics I:

2.1 Interference of electromagnetic waves: Condition for sustained interference, double slit as an example. Qualitative idea of Spatial and Temporal Coherence, conservation of energy and intensity distribution, Newton's ring.
2.2 Diffraction of light: Fresnel and Fraunhoffer class. Fraunhoffer diffraction for single slit and double slit. Intensity distribution of N-slits and plane diffraction grating (No deduction of the intensity distributions for N-slit), Missing orders. Rayleigh criterion, resolving power of grating and microscope. (3L+5L)

Module3: Optics II

3.1 Polarization: General concept of polarization, Plane of vibration, Qualitative discussion on plane, circularly and elliptically polarized light. Polarization through reflection and Brewster's law.Double refraction (birefringence) – Ordinary and Extra-ordinary rays. Nicol's prism, Polaroid, Half wave and quarter wave plate.
3.2 Laser: Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co-efficient (derivation of the mutual relation), Optical resonator and condition necessary for active Laser action, Ruby Laser, He-Ne Laser, application of laser.
3.3 Holography: Theory of holography, viewing of hologram, applications. (4L+4l+3L)

Module 4: Quantum Physics:

4.1 Concept of dependence of mass with velocity, mass energy equivalence, energy-momentum relation (no deduction required), Blackbody radiation: Rayleigh Jean's law (derivation without the calculation of number of states), Ultraviolet catastrophe, Wien's law, Planck's radiation law (calculation of average energy of the oscillator), Derivation of Wein's law and Stephan's law from Planck's radiation law. Rayleigh Jean's law and Wien's law as limiting case of Planck's law. Compton's effect (calculation of Compton wavelength is required).
4.2 Wave-particle duality and de Broglie's hypothesis. Concept of matter waves, Davission-Germer experiment, Concept of wave packets and Heisenberg's uncertainty principle. (5L+4L)

Module 5: Crystallography:

5.1 Elementary ideas of crystal structure: Lattice, Basis, Unit cell, fundamental types of lattice-Bravais Lattice, simple cubic, FCC and BCC lattices (use of models in class during teaching is desirable), Miller indices and Miller planes, coordination number and atomic packing factor.
5.2 X-rays: origin of characteristic and continuous x-rays, Bragg's law (no derivation), determination of lattice constant.

PH-_191 Physics-I Lab. 0-0-3-3-2:

Group 1: Experiment from Higher Secondary knowledge of Physics

1. Determination of thermal conductivity of a good conductor by Searle's method.
2. Determination of thermal conductivity of a bad conductor by Lees and Charlton's method.
3. Determination of dispersive power of the material of given prism.
4. Use of Carry Foster's bridge to determine unknown resistance.

Group 2: Experiments on General properties of matter

5. Determination of Young's modulus by Flexure method and calculation of bending moment and shear force at a point on the beam.
6. Determination of modulus of rigidity by static / dynamic method.
7. Determination of co-efficient of viscosity by Poiseulle's capillary flow method.

Group 3: Optics

Determination of wavelength of light by Newton's ring method
Determination of wavelength of light by Fresnel's bi-prism method.
Determination of wavelength of light by Laser diffraction method.
Determination of numerical aperture and the energy losses related to optical fibre experiment.

Innovative experiment:
One more experiment designed by the student or the concerned teacher or both.

CS-_101 Introduction to Computer Programming 3-1-0-4-4:

Fundamentals of Computer:
History of Computer, Generation of Computer, Classification of Computers 2L
Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output Devices 3L
Binary & Allied number systems representation of signed and unsigned numbers. BCD, ASII. Binary Arithmetic & logic gates 6L
Assembly language, high level language, compiler and assembler (basic concepts) 2L
Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX, Algorithm & flow chart 2L

C Fundamentals:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements 3L

Operators & Expressions:
Arithmetic operators, relational and logical operators, type, conversion, increment and decrementoperators, bit wise operators, assignment operators and expressions, precedence and order of evaluation.Input and Output: Standard input and output, formatted output -- printf, formatted input scanf. 5L

Flow of Control:
Statement and blocks, if - else, switch, loops - while, for do while, break and continue, go to and labels 2L

Fundamentals and Program Structures:
Basic of functions, function types, functions returning values, functions not returning values, auto,external, static and register variables, scope rules, recursion, function prototypes, C preprocessor,command line arguments. 6L

Arrays and Pointers:
One dimensional arrays, pointers and functions, multidimensional arrays. 6L

Structures Union and Files:
Basic of structures, structures and functions, arrays of structures, bit fields, formatted and unformatted files. 5L

Recommended reference Books:
Introduction To Computing (TMH WBUT Series), E. Balagurusamy,TMH

Kerninghan, B.W.	The Elements of Programming Style
Yourdon, E.	Techniques of Program Structures and Design
Schied F.S.	T heory and Problems of Computers and Programming
Gottfried	Programming with C Schaum
Kerninghan B.W. & Ritchie D.M.	The C Programming Language
Rajaraman V.	Fundamental of Computers
Balaguruswamy	Programming in C
Kanetkar Y.	Let us C
M.M.Oka	Computer Fundamentals,EPH
Leon	Introduction to Computers,Vikas
Leon-	Fundamental of Information Technology,Vikas
Ram B.	Computer Fundamentals, New Age International
Ravichandran D.	Programming in C, New Age International
Xavier C. C	Language & Numerical Methods, New Age Inter.
Xavier C.	Introduction to Computers, New Age International
Rao S.B.	Numerical Methods with Programs in Basic Fortran Pascal & C++,
Dutta N.	Computer Programming & Numerical Analysis, Universities Press
Bhanu Pratap	Computer Fundamentals
Rajaram	Computer Concepts & C Program, Scitech

CS-191 Principles of Computer Programming Lab 0-0-3-3-2:

Exercises should include but not limited to:
1. DOS System commands and Editors (Preliminaries)
2. UNIX system commands and vi (Preliminaries)

3. Simple Programs: simple and compound interest. To check whether a given number is apalindrome or not, evaluate summation series, factorial of a number , generate Pascal's triangle,find roots of a quadratic equation
4. Programs to demonstrate control structure : text processing, use of break and continue, etc.
5. Programs involving functions and recursion
6. Programs involving the use of arrays with subscripts and pointers
7. Programs using structures and files.

M-101 Mathematics-I 3-1-0-4-4:

Module I

Matrix: Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, Adjoint of a determinant, Jacobi's theorem on adjoint determinant. Singular and non-singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, orthogonal matrix and its properties, Trace of a matrix. Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations, Eigen values and eigen vectors of a square matrix (of order 2 or 3), Caley-Hamilton theorem and its applications. **9L**

Module II

Successive differentiation: Higher order derivatives of a function of single variable, Leibnitz's theorem (statement only and its application, Problems of the type of recurrence relations in derivatives of different orders and also to find $(y_n)_0$. **2L**

Mean Value Theorems & Expansion of Functions: Rolle's theorem and its application, Mean Value theorems – Lagrange & Cauchy and their application, Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Expansions of functions by Taylor's and Maclaurin's theorem, Maclaurin's infinite series expansion of the functions: $\sin x$, $\cos x$, e^x, $log(1+x)$, $(a+x)^n$, n being an integer or a fraction. **5L**

Reduction formula: Reduction formulae both for indefinite and definite integrals of types

$$\int sin^n x dx\,,\ \int cos^n x dx\,,\ \int sin^m x cos^n x dx\,,\ \int cos^m x \sin nx\, dx,\ \int \frac{dx}{(x^2+a^2)^n}$$

where m, n are positive integers. **2L**

Module III

Calculus of Functions of Several Variables: Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives and related problems, Homogeneous functions and Euler's theorem and related problems up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems, Concept of line integrals, Double and triple integrals. **9L**

Module IV

Infinite Series: Preliminary ideas of sequence, Infinite series and their convergence/divergence, Infinite series of positive terms, Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test and Raabe's test (statements and related problems on these tests), Alternating series, Leibnitz's Test (statement, definition) illustrated by simple example, Absolute convergence and Conditional convergence. **5L**

Module-V

Vector Algebra and Vector Calculus: Scalar and vector fields – definition and terminologies, dot and cross products, scalar and vector triple products and related problems, Equation of straight line, plane and sphere, Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions, Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative. Related problems on these topics.Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Statements and applications).**8L**

Total 40 Lectures

Suggested Reference Books

1. **Advanced Engineering Mathematics** 8e by Erwin Kreyszig is published by Wiley India
2. **Engineering Mathematics**: B.S. Grewal
5**. Calculus**: M. J. Strauss, G. L. Bradley and K. L. Smith (3PrdP Edition, 1PstP Indian Edition 2007, Pearson Education)
6**. Engineering Mathematics**: S. S. Sastry (PHI)
7. **Advanced Engineering Mathematics, 3E**: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP),Indian Edition.
8. **Differential Calculas**, Ghosh & Maity (Central)

9. **Integral Calculus**, Ghosh & Maity (Central)
10. **Higher Algebra-Classical & Modern**, J.G. Chakravorty and P.R. Ghosh(U.N. Dhur)
11. **Vector Analysis (Schaum Series),** M. R. Spiegel (MGH)

ME-101 Engineering Mechanics 3-1-0-4-4:

Module – 1

Importance of mechanics in Engg.;Introduction to Statics; Concept of particle and Rigid Body; Types of Forces: 2L
Introduction to Vector Algebra; Parallelogram Law; Triangle and Polygon Law; Addition and Subtraction of Vector; Dot product and Cross product of Vectors; Unit Vector; Dot product and Cross product of Vectors and their applications. Types of Vectors (Sliding Vector, Bound Vector). 4L+1T
Two dimensional force system, Resolution of forces; Moments; Varignon's theorem; Couple; Equivalence of Force and Force –Couple system. 4L+2T

Module – II

Equilibrium of a body under two dimensional force system and under two dimensional force-moment system; Free body diagram; Lami's Theorem. 3L+1T
Friction; Co-efficient of friction; Laws of friction; Angle of Repose; Wedge friction. 3L+1T

Module – III

Centroid and Centre of Gravity; Centroid of Triangle, Quadrant of a circle and rectangle; Centroid of a composite area. 3L+1T
Moment of Inertia of a plane figure about Co-planer axes; Parallel axis theorem; Polar Moment of Inertia; Mass Moment of Inertia of cylinder, sphere and cone about the axis of symmetry. 3L+1T

Module – IV

Introduction to Dynamics; Kinematics and Kinetics; Newton's Laws of motion; Plane rectilinear motion under uniform and non-uniform acceleration; 3L+1T
x-t, v-t and a-t graphs; Motion under gravity; Plane Curvilinear motion; Circular motion; Projectile motion. 3L+1T

Module –V

Kinetics of particles; Newton's second Law; D' Alembert's principle; Principle of work, Energy and power; Principle of conservation of energy. 3L+1T

Module –VI

Concept of stresses and strains; Normal stress; Shear stress; Normal strain; Shear strain; Hooke's Law; Poisson's ratio; Stress-strain diagram of ductile material and brittle material; Elastic Modulus and Shear Modulus; Factor of safety-basic idea; bulk Modulus; Volumetric strain. 3L+1T

Books Recommended :

1. Engineering mechanics : Statics and dynamics by I.H. Shames, 4th ed. – PHI.
2. Engineering mechanics by Timoshenko, Young and Rao, Revised 4th ed. – TMH.
3. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P.
4. Fundamentals of Engineering Mechanics by Debabrata Nag & abhijit Chanda – Chhaya Prakashani.
5. Engineering Mechanics by Basudeb Bhattacharya- Oxford University press.
6. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – pearson.
7. Engineering mechanics [vol-1 & II] by Meriam & kraige, 5th ed. – Wiley india.

ME-191 Engineering Drawing &Graphics Lab. 0-0-3-3-2:

A. THEORETICAL PART

1. Introduction to Lines , Lettering, Dimensioning, Scales. – 1L
2. Geometrical Construction and curves. – 1L
3. Projection of points, Lines and Surfaces. – 2L
4. Projection of solids. – 2L
5. Isometric Views. – 1L
6. Sectional Views. - 1L
7. Development of Surfaces. – 1L
8. Introduction to Computer Aided Drafting. – 3L

B. PRACTICAL PART

1. LINES, LETTERING, DIMENSIONING, SCALES: Plain scale, Diagonal scale. - 6hrs.
2. GEOMETRICAL CONSTRUCTION AND CURVES : Construction of Polygons, Parabola, Hyperbola , Ellipse. – 6 hrs.
3. PROJECTION OF POINTS, LINES, SURFACES : Orthographic projection – 1st and 3rd angle projection, Projection of lines and surfaces – Hexagon. – 3 hrs.
4. PROJECTION OF SOLIDS : Cube, Pyramid, prism, Cylinder, Cone. – 6 hrs.
5. DRAWING ISOMETRIC VIEW FROM ORTHOGONAL / SECTIONAL VIEWS OF SIMPLE SOLID OBJECTS. – 3 hrs.
6. FULL AND HALF SECTIONAL VIEWS OF SOLIDS. – 3 hrs.
7. DEVELOPMENT OF SURFACES : Prism , Cylinder, Cone. – 3 hrs.

Books Recommended :

1. Narayana, K.L. and Kannaiah, P. Text Book of engineering Drawing " Engineering Graphics", scitech Publication.
2. Bhatt, N.D. "Elementary Engineering Drawing", Charotar Book Stall, Anand,1998.
3. Lakhsminarayanan, v. and Vaish Wanar, R.S., " Engineering Graphics", Jain brothers, New Delhi,1998.
4. Chandra, A.M. and Chandra Satish, " Engineering Graphics", Narosa, 1998.
5. Jolhe, " Engineering Graphics", Tata Mc Graw –Hill – WBUT Series.
6. Gill, P.S., " A Text Book of Engineering Drawing", Katson Publishing House (Kataria and Sons).
7. Venugopal, K., " Engineering Drawing & Graphics+ AUTO CAD", New Age International.
8. Venkata Reddy K., " Text Book of Engineering Drawing (2nd Edition)", BS Publication.

XC -181 Extra Curricular Activities(NSS/ NSO/NSO ETC) **(0-0-2-2-1:**

a) Creating awareness in social issues
b) Participating in mass education programmes
c) Proposal for local slum area development
d) Waste disposal
e) Environmental awareness
f) Production Oriented Programmes
g) Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:

1. Women's development – includes health, income-generation, rights awareness.
2. Hospital activities – Eg. writing letters for patients, guiding visitors
3. Old age home – visiting the aging in-mates, arranging for their entertainment.
4. Children's Homes - visiting the young in-mates, arranging for their entertainment
5. Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)
6. Gender issues- Developing an awareness, to link it with Women's Cell of college

Participating in mass education programmes

1.Adult education
2. Children's education

Proposal for local slum area development

One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness

- Resource conservation – Awareness to be developed on water, energy,soil.
- Preservation of heritage monuments- Marches, poster campaigns
- Alternative energy consciousness amongst younger school-children.
- Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSSparks.
- Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes

5. Working with people and explaining and teaching improved agricultural practices
6. Rodent control land pest control practices;
7. Soil-testing, soil health care and soil conservation;
8. Assistance in repair of agriculture machinery;

9. Work for the promotion and strengthening of cooperative societies in villages;
10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
11. Popularization of small savings and
12. Assistance in procuring bank loans
Relief & Rehabilitation work during Natural calamities
g) Assisting the authorities in distribution of rations, medicine, clothes etc.;
h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
i) Working with the local people in reconstruction of their huts, cleaning of wells, buildingroads etc.;
j) Assisting and working with local authorities in relief and rescue operation;Collection of clothes and other materials, and sending the same to the affected areas;

2nd semester:

HU-202 Economics for Engineers 3-0-0-3-3:

1. **Financial Accounting**: Meaning, Nature and scope of Financial Accounting, Accounting concepts & conventions, Business Transactions, Different types of Vouchers, Analysis of Transactions, Recording in Journals and cash books, Posting of Ledgers, Preparation of Trial balance, Preparation of Final Accounts (Trading Account, Profit & Loss A/C and Balance Sheet)
2. **Cost Accounting:** Introduction, Classification of Costs; Break-even Analysis; Budgeting & Budgetary Control, Objectives, Advantages & Limitations of Budgeting, Cash Budget, Flexible Budget, Master Budget, etc
3. **Financial Management:** Cost of Capital: Capital Budgeting, Working Capital Management
4. **Economics**

   Introduction: Scarcity and Choice. Definition and Scope of Economics.Concept of Equilibrium.Concept of Market.

   Demand and Revenue Analysis: Meaning of demand, Determinants of demand, Exception to the law of demand. Elasticity of demand- Meaning, Price Elasticity of demand.Price Elasticity of Supply.

   Cost and Production Analysis: Cost concept: Classification of cost- Cost output relationship- Cost function and its determinants, uses of Cost function. Production: Meaning, Factors of production- Land, Labour, capital and organization.

References

1 Modern Accountancy A. Mukherjee & M. Hanif Tata McGraw- Hill
2 Accountancy (Vol.1) Dr. S.K. Paul New Central Book Agency
3 Practice in Accountancy S. P. Basu & Monilal Das Rabindra Library
4 Modern Economic Theory K.K. Dewett S.Chand
5 Fundamentals of Economic Principles and problems : A. Banerjee & D. Maumder; ABS Publishing House
6 Economics for Business John Sloman & Mark Sutdiffe Pearson Education
7 Management Accounting R.K. Sharma & S. Gupta Kalyani Publishers
8 Financial Management Dr. S. Kr. Paul New Central Book Agency
9 Financial Management Dr. D. Majumder; Sk. Raju Ali & Lutfun Nesha; ABS Publishing
10. S. A. Sherlekar & V.S. Sherlekar : Modern Business Organization & Management, Himalay Publishing House

EE-201: Basic Electrical Engineering 3-1-0-4-4

Introduction: Overview of Source of energy, Generation, Transmission and Distribution of Electric Power.

DC Network: Introduction of Electric Circuit, Loop Analysis, Node-voltage analysis. Star - Delta & Delta-star Transformations, Superposition Theorem, Thevenin's Theorem, Norton's theorems, Analysis of dc network in presence of one non-linear element, Transients in R-L , R-C and R-L-C circuits.

Single-phase AC Network: Single-phase AC Circuits, Generation of Sinusoidal Voltage Waveform (AC) and Some Fundamental Concepts, Representation of Sinusoidal Signal by a Phasor, Current and Resonance in R-L-C Series and parallel Circuits.

Three-phase AC Network: Three-phase AC Circuits, Three-phase Balanced Supply, Three-phase Delta-Connected Balanced Load, Power in a Three-phase Circuit.

Magnetic Circuits: Magnetic circuits, Core losses, Eddy Current & Hysteresis Loss.

Transformer: Ideal & Practical Transformer, Testing, Efficiency & Regulation, Three Phase Transformer, Auto-Transformer, Problem solving on Transformers

Three-phase Induction Motor: Construction, Principle of Operation, Rotating Magnetic Field, Equivalent Circuit, Power Flow Diagram, Torque-Slip (speed) Characteristics in Three-phase Induction Motor, Starters for Induction Motor.

DC Machines: , Constructional Features, Principle of Operation, EMF & Torque Equation of D.C Machines, D.C Generators, D.C Motors, Losses, Efficiency and Testing of D.C. Machines, Problem Solving on D.C Machines.

Measuring Instruments: Study of DC-AC Measuring Instruments, Study of Electro-Dynamic Type Instrument, Study of Single Phase Induction Type Energy Meter.

General structure of electrical power system: Power generation to distribution through overhead linesand underground cables with single lone diagram.

Text books:

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition 2005.
3. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
4. Basic Electrical Engineering, J.P. Tewari, New age international publication

Reference books:

1. Basic Electrical Engineering(TMH WBUT Series), Abhijit Chakrabarti & Sudipta Nath, TMH
2. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education,Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Basic Electrical Engineering, T.K. Nagsarkar & M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH
5. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

EE-291: Basic Electrical Engineering Lab. 0-0-3-3-2

List of Experiments:

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
(b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit
8. Calibration of ammeter and voltmeter.
9. Open circuit and Short circuit test of a single phase Transformer.
10. No load characteristics of D.C shunt Generators
11. Starting and reversing of speed of a D.C. shunt
12. Speed control of DC shunt motor.
13. Measurement of power in a three phase circuit by two wattmeter method

CH-201 Chemistry-I: 3-1-0-4-4:

Module 1:Chemical Thermodynamics

Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics: Different statements, mathematical form.

Internal energy: Definition, example, characteristics, physical significance, mathematical expression for change in internal energy, expression for change in internal energy for ideal gas.

Enthalpy: Definition, characteristics, physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. **3L**

Heat Capacity: Definition, classification of heat capacity (C_p and C_V): Definition and general expression of C_p–C_V. Expression of C_p–C_V for ideal gas.

Reversible and irreversible processes: Definition, work done in isothermal reversible and isothermal irreversible process for ideal gas, adiabatic changes: Work done in adiabatic process, interrelation between thermodynamic parameters (P, V and T), slope of P–V curve in adiabatic and isothermal process.

Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchhoff's law. **3L**

2nd law of thermodynamics: Statement, mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for ideal gas, concept of inversion temperature. Evaluation of entropy: Characteristics and expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. **2L**

Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas, Maxwell's Expression (only the derivation of four different forms), Gibbs Helmholtz equation, condition of spontaneity and equilibrium reaction. **2L**

Module 2:Industrial Chemistry and Polymerization

Industrial chemistry

Solid Fuel: Coal, classification of coal, constituents of coal, carbonization of coal (HTC and LTC), coal analysis: Proximate and ultimate analysis.

Liquid fuel: Petroleum, classification of petroleum, refining, petroleum distillation, thermal cracking, octane number, cetane number, aviation fuel (aviation gasoline, jet gasoline), and bio-diesel.

Gaseous fuels: Natural gas, water gas, coal gas, bio-gas. **5L**

Polymerization

Concepts, classifications and industrial applications

Polymer molecular weight (number avg. weight avg. viscosity avg.: Theory and mathematical expression only), Poly dispersity index (PDI).

Polymerization processes (addition and condensation polymerization), degree of polymerization, copolymerization.

Preparation, structure and use of some common polymers: plastic (PE: HDPE, LDPE), rubber (natural rubber, SBR), fibre (nylon 6.6). Vulcanization, conducting and semi-conducting polymers. **3L**

Module 3: Reaction dynamics, and structure and reactivity of organic molecules

Reaction dynamics: Reaction laws: rate and order; molecularity; zero, first and second order kinetics.

Pseudounimolecular reaction, Arrhenius equation. Mechanism and theories of reaction rates (Transition state theory, Collision theory:). Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics). **3L**

Structure and reactivity of Organic molecules

Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals. Brief studies on some addition, elimination, and substitution reactions. **3L**

Module 4: Electrochemistry

Conductance: Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (strong and weak electrolyte). Kohlrausch's law of independent migration of ions, transport numbers, and hydration of ions.

Conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCl vs $AgNO_3$. **2L**

Electrochemical cell: Cell EMF and its thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, quinhydrone half cell and calomel half cell (construction, representation, cell reaction, expression of potential, discussion, application).

Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, discussion, application). Application of EMF measurement on (a) ascertain the change in thermodynamic function (ΔG, ΔH, ΔS) (b) ascertain the equilibrium constant of a reversible chemical reaction (c) ascertain the valency of an ion. **3L**

Module 5: Solid state and coordination chemistry

Solid state Chemistry

Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency). Role of silicon and germanium in the field of semiconductor.**2L**

Coordination chemistry:

Double salt, complex salt, Werner's theory of coordination compounds, coordination number, ligand, chelate, stability constant: stepwise and overall. **2L**

Reference Books

1. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).
2. S. Glasstone, Text Book of Physical Chemistry, Macmillan India Limited.
3. S. Pahari, Physical Chemistry, New Central Book Agency.
4. S. Sarkar, Fuels and Combustion, Taylor & Francis (3rd Edition), 2009
5. P. Ghosh, Polymer Science and Technology of Plastics and Rubbers, Tata McGraw HillPublishing Company Limited.
6. F.W. Billmeyer: Textbook of Polymer Science is published by Wiley India (is now an Indian print).
7. Joel R. Fried, Polymer Science and Technology, Pearson Education (2nd Edition).
8. I. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc.
9. Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.
10. Organic Chemistry, Mark Loudon, 4th Edition, Oxford Publishers.
11. Inorganic Chemistry–R. L. Dutta, Current Distributors

CH-291 Chemistry-I Lab. 0-0-3-3-2:

List of Experiments

1. To Determine the alkalinity in a given water sample.
2. Redox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. Estimation of available chlorine in bleaching powder.
5. To determine chloride ion in a given water sample by argentometric method (using chromate indicator solution).
6. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water)
7. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
8. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
9. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
10. Determination of dissolved oxygen present in a given water sample.
11. Estimation of available oxygen in pyrolusite.

M-201 Mathematics-II 3-1-0-4-4:

Module I

***Ordinary differential equations (ODE)- First order and first degree*:** Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation). 6**L**

Module II

***ODE- Higher order and first degree*:** General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations, Solution of simultaneous linear differential equations. **7L**

Module III

Partial Differential Equations: Origin of PDE, its order and degree, concept of solution in PDE. Solution of First Order Partial differential equation by Lagrange's Method, Integral Surfaces passing through a given curve, Solution of non-linear first order partial differential equations by Charpit's method, Solution of Second order Linear partial Differential equations with constant coefficients and with variable coefficients. **14L**

Module IV

***Improper Integral*:** Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. **3L**

Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of $\frac{f(t)}{t}, t^n f(t), f^{(n)}(t) and \int f(u)du.$ Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT**:** Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT. **10L**

Total 40 Lectures

Suggested Reference Books:

1. **Advanced Engineering Mathematics**, Erwin Kreyszig, (Wiley Eastern)
2. **Engineering Mathematics:** B.S. Grewal (S. Chand & Co.)
3. **Engineering Mathematics (Volume 2):** S. S. Sastry (Prentice-Hall of India)
4. **Advanced Engineering Mathematics, 3E**: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition
5. **An Introduction to Differential Equations**, R.K. Ghosh and K.C.Maity (New Central Book Agency)
6. **Elements of Partial Differential Equations**, I. N. Sneddon, (McGraw-Hill International)
7. **Laplace Transforms**, M. R. Spiegel(MGH)

EC-201 Basic Electronics Engineering 3-1-0-4-4:

Pre-requisite: Knowledge of class XII level Physics and Mathematics

Introduction: Basic ideas on different circuit components (Resistor,Inductor,Capacitor) 1L

Module – 1: Semiconductors: **4L**

Crystalline material: Mechanical properties, Conductors, Semiconductors and Insulators: electrical properties. Energy band theory, Fermi levels; Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Module – 2: Diodes and Diode Circuits: 3L+3L = 6L

Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion region, Junction capacitance, V-I characteristics of diode, Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, (PIV, DC voltage and current, ripple factor, efficiency), idea of regulation, rectifier filter circuits, clipper, clamper, voltage multiplier circuits, breakdown mechanism of diodes, Zener diode,Varactor diode.

Module – 3: Bipolar Junction Transistors : **5L+2L=7L**

Formation of PNP / NPN junctions, energy band diagram; current flow diagram, transistor mechanism and transistor principles, CE, CB, CC configuration, transistor input output characteristics: amplification factors for CB,CC and CE modes. Biasing and Bias stability: calculation of stability factor; small signal analysis, h-parameter model.

Module – 4: Field Effect Transistors: **5L**

Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD amplifier configurations, FET parameters, small signal equivalent circuits for different configurations; CMOS: Basic Principles.

Module – 5: Feed Back Amplifier and Operational Amplifiers: **4L+4L = 8L**

Positive and negative feed back, close loop gain, open loop gain, topologies of feed back amplifier,:output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feed back: instability and oscillation, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, open loop characteristics of operational amplifier; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant gain multiplier, Voltage follower, Comparator, Integrator, Differentiator. OPAMP parameters: CMRR, OFFSET parameters, slew rate.

Module – 6: Special Semiconductor devices: **3L**

SCR, DIAC, TRIAC, UJT, IGBT- structure, characterization, principle of operation and applications.

Module – 7: Cathode Ray Oscilloscope (CRO) **4L**

CRT structure**,** block diagram, operation, Deflection systems, sweep circuit operation, basic block of CRO, applications of CRO, Frequency,phase and amplitude measurement using CRO, Lissajous figure.

Module – 8:Digital Electronics: **2L**

Introduction to binary number; Basic Boolean algebra;,De Morgan's Theorem, Logic gates.

Outcome: The students will be able to select proper electronics component and device depending on the requirement.The student should be able to use required rectifier circuit and to calculate it's different parameters.The students must be able to design a transistor amplifier.

Recommended Books:

Text.

1. Chattopadhyay & Rakshit:Electronics Fundamentals & Applications
2. Millman & Halkias: Integrated ElectronicsReferences:
1. Boylestad & Nashelsky: Electronic Devices & Circuit Theory
2. Sanjeev Gupta: Electrinics Devices Circuits

3. Malvino: Electronic Principle

EC-291 Basic Electronics Engineering Lab. 0-0-3-3-2:

There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimeters etc will be given.

List of Experiments:

1. Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
2. Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.
7. Study of Characteristic curves for CB, CE and CC mode transistors
8. Study of I-V characteristics of Field Effect Transistors.
9. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
10. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
11. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.

ME-292 Workshop Practice 0-0-3-3-2:

Jobs:

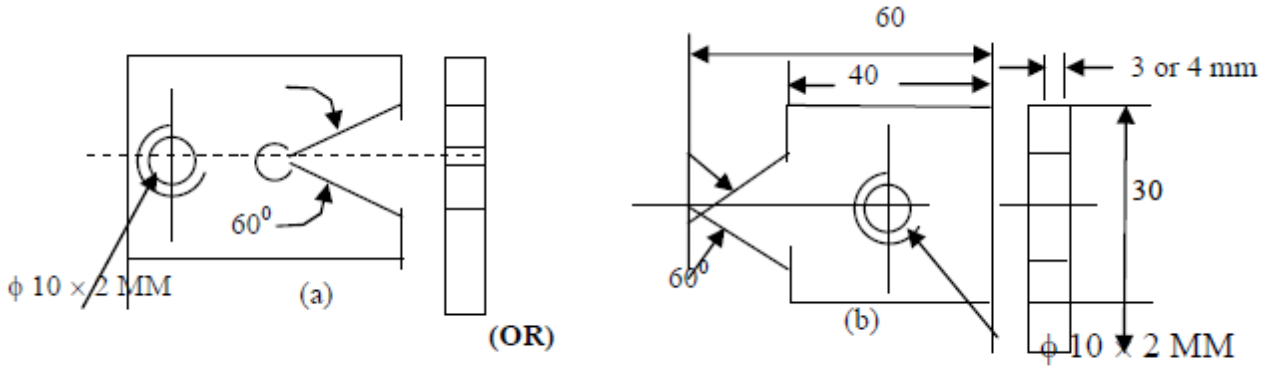

Fig.1: Job for fitting practice

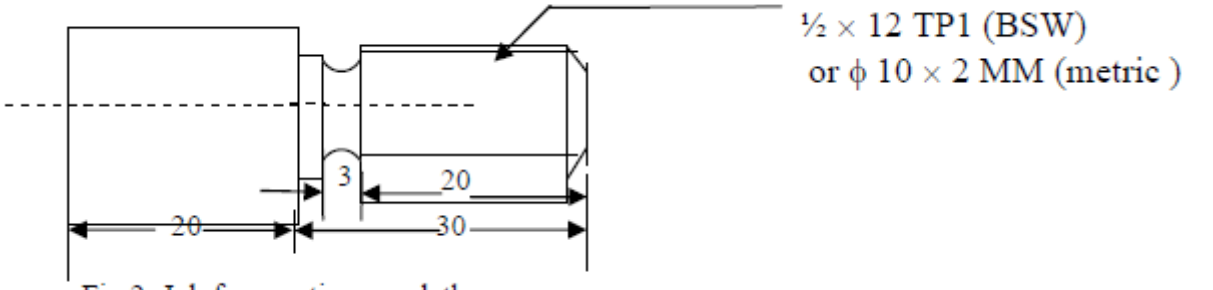

Fig.2: Job for practice on a lathe

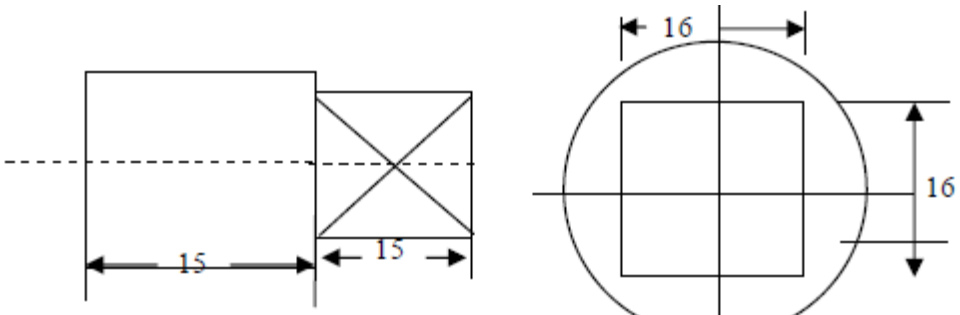

Fig.3: Job for practice on a shaping and/or milling machine

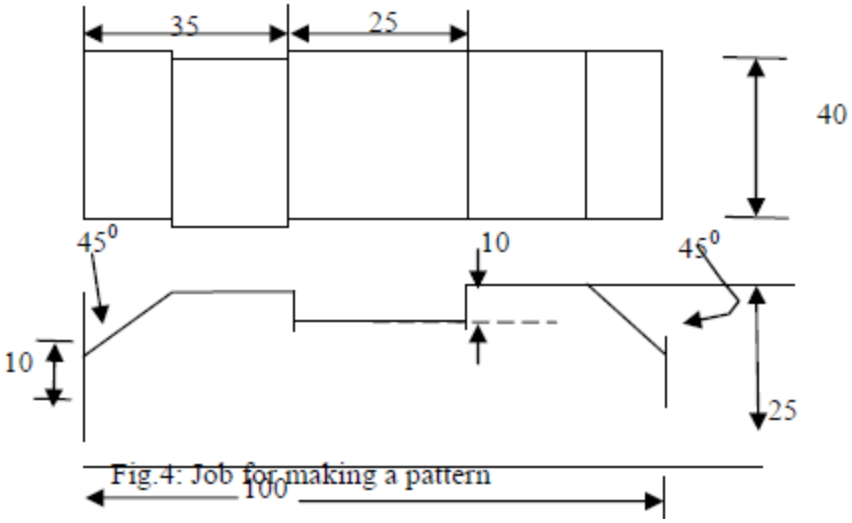

Fig.4: Job for making a pattern

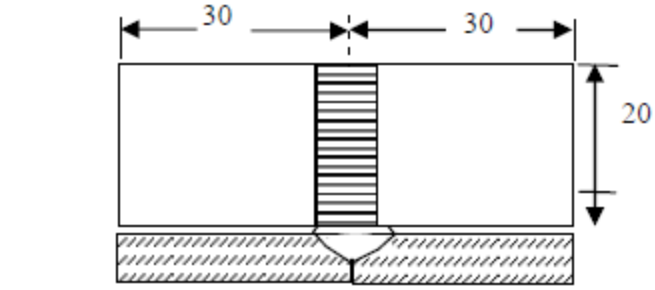

Fig.5: Welding specimen for practice

1. FITTING : Making a gauge from MS plate as shown in Fig.1.

Operations required:

a. Squaring and finishing of the blank by filing
b. Making the Vee-portion by sawing and filing
c. Drilling (in machine) and tapping (hand)

2. MACHINING : To make a pin as shown in Fig.2 from a □20mm mild steel rod ina lathe.
3. MACHINING : To make a MS prism as shown in Fig.3 from a □20mm mild steelrod in ashaping and / or milling machine.
4. PATTERN MAKING, SAND MOULDING AND CASTING: To make awooden pattern and a sand mould with that pattern for casting a cast iron block as shown in Fig.4.
5. WELDING (GAS WELDING): To join two thin mild steel plates or sheets (1 to 3mm thick) as shown in Fig. 5 by gas welding.
6. WELDING (ARC WELDING) : To join two thick (6mm) MS plate asshown in Fig. 5 by arc welding.

7. SHEET METAL WORK (in 1 day or 3 hours); Forming a cone, for example.

3rd semester:

HU-301 VALUES & ETHICS IN PROFESSION 3-0-0-3-3:

Science, Technology and Engineering as knowledge and as Social and Professional Activities.
Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development
Energy Crisis: Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics,
Appropriate Technology Movement of Schumacher; later developments Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.
Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.
Ethics of Profession: Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists.Codes of professional ethics. Whistle blowing and beyond, Case studies.
Profession and Human Values: Values Crisis in contemporary society
Nature of values: Value Spectrum of a good life
Psychological values: Integrated personality; mental health
Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.
Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity
Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.
Books:
1. Stephen H Unger, Controlling Technology: Ethics andthe Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

PH(EE)-301 Physics-II 3-1-0-4-4:

Quantum mechanics:
• Generalized co-ordinates, Lagrange's equation of motion and Lagrangian, generalized force potential, moment and energy. Hamilton's Equation of motion and Hamiltonian.Properties of Hamilton and Hamilton's equation of motion.
• Concept of probability and probability density, operator, Commutator, Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Physical interpretation of wave function Ψ(normalization and probability interpretation), Expectation values, Application of Schrödinger equation-Particle in an infinite squarewell potential (1-D and 3-D potential well), Discussion on degenerate levels.
Statistical mechanics:
• Concept of energy levels and energy states. Microstates, Macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (no deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics. Fermi distribution at zero and non – zerotemperature.
Dielectric Properties:
• Dielectric Material: Concept of Polarization, the relation between D, E and P, Polarizability, Electronic, Ionic, Orientation & Space charge polarization, behavior of Dielectric under alternating field, Dielectric losses.
The Magnetic properties:
• Magnetization M, relation between B, H & M. Bohr megneton, Diamagnetism-Larmor frequency & susceptibility, Curie law, Weiss molecular field theory & Curie-Weiss law, Hysteresis loss, Antiferromagnetism, Ferromagnetism& Ferrites (analitative).
Crystal structure:
• Crystal structure- Bravais lattice, Miller indices

- Crystal diffraction (qualitative), Bragg's law andreciprocal lattice,Brillouin zone. (Qualitative description)
- Free electron theory of metal – calculation of Fermi energy, density of states.
- Band theory of solids- Bloch theorem, Kronig Penny model.
- Electronic conduction in solids-Drude's theory, Boltzmann equation, Wiedemann Frantz law.
- Semiconductor-Band structure, concept of electron and holes, Fermi level, density of states.

Superconductivity: BCS theory (qualitative) , operation of cryotron, Meissner effect.

Text Books:

1. Perspectives of Modern Physics: A. Baiser
2. Modern Physics and Quantum Mechanics E.E. Anderson
2.Refresher course in B.Sc. Physics (Vol. III): C.L. Arora
3.Fundamentlas of Physics (Vol. III): Haliday, Resnick & Krane
4.Engineering Physics: R.K. Kar
5.Classical Mechanics: a) A.K. Roychaudhuri
b) R.G. Takwal & P.S. Puranic
6. Quantum Mechanics: a) Eisberg & Resnic
b) A.K. Ghatak & S. Lokanathan
c) S.N. Ghoshal
7.Statistical Mechanics and Thermal Physics: a) Sears and Salinger
b) Avijit Lahiri
c) Evelyn Guha
8.Solid Sate Physics: a) A.J. Dekker
b) C. Kittel
c) Aschroft & Mermin
d) S.O. Pillai

PH(EE)-391 Physics-II Lab. 0-0-3-3-2:

1. Determination of dielectric constant of a given dielectric material.
2. Determination of thermo electric power at a certain temperature of a given thermocouple.
3. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
4. Determination of Planck constant using photocell.
5. Determination of Lande'g factor using Electron spin resonance spectrometer.
6. Determination of Stefen's radiation constant.
7. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
8. Determination of Rydberg constant by studying Hydrogen –Helium spectrum.
9. Determination of Hall coefficient of semiconductor.
10. Determination of Band gap of semiconductor.
11. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

M-302 Mathematics-III 3-1-0-4-4:

Fourier Series: Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Special wave forms: Square wave, Half wave Rectifier, Full wave Rectifier, Saw-toothed wave, Triangular wave.

Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π, Fourier Series for functions of period $2l$, Dirichlet's conditions, Sum of Fourier series. Examples. Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Parseval's identity (statement only).Examples.

Fourier Transform: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Examples.Fourier Transform of Derivatives.Examples.Convolution Theorem (statement only), Inverse of Fourier Transform, Examples.

Calculus of Complex Variable : Complex functions, Concept of Limit, Continuity and Differentiability. Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be

analytic. Harmonic function and Conjugate Harmonic function, related problems. Construction of Analytic functions: Milne Thomson method, related problems**.**

Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve. Examples.Cauchy's theorem (statement only).Cauchy-Goursat theorem (statement only).Examples.Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function.Examples.Taylor's series, Laurent's series.Examples.

Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m. Examples on determination of singularities and their nature. Residue, Cauchy's Residue theorem (statement only), problems on finding the residue of a given function, evaluation of definite integrals:

$$\int_0^{\infty} \frac{\sin x}{x}\,dx, \int_0^{2\pi} \frac{d\theta}{a + b\cos\theta + c\sin\theta}, \oint_C \frac{P(z)}{Q(z)}\,dz$$

(elementary cases, P(z) & Q(z) are polynomials of 2nd order or less).

Concept of transformation from z-plane to w-plane.Concept of Conformal Mapping.Idea of some standard transformations.Bilinear Transformation and determination of its fixed point.

Probability: Classical definition of probability and its limitation. Axiomatic definition of probability.Conditional probability.Independent events and related problems.Baye's theorem (Statement only) & related problems.One dimensional random variable.Probability distributions-discrete and continuous.Expectation and Varience.Binomial, Poisson,Uniform,Exponential,Normal distributions and related problems.

Partial Differential Equation (PDE): Solution by Separation of variables and Integral Transform(Laplace & Fourier transform) methods:(i) One dimensional Wave equation (ii) One dimensional Heat equation, (iii) Two dimensional Laplace equation.

Series solution of Ordinary Differential Equation (ODE): Validity of the series solution of an ordinary differential equation. General method to solve $a_0(x)\,y'' + a_1(x)y' + a_2(x)\,y = 0$ and related problems.Series solution, Bessel function, recurrence relations of Bessel's Function of first kind. Legendre's equation:Series solution, Legendre function, recurrence relations and orthogonality relation.

Text Books:

1. Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
2. Das N.G.: Statistical Methods, TMH.
3. Grewal B S: Higher Engineering Mathematics, Khanna Publishers.
4. James G.: Advanced Modern Engineering Mathematics, Pearson Education.
5. Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.

References:

1. Sneddon, I. N..: Elements of Partial Differential Equations, McGraw-Hill International
2. Kreyzig E.: Advanced Engineering Mathematics, John Wiley and Sons.
3. Potter M.C, Goldberg J.L and Aboufadel E.F.: Advanced Engineering Mathematics, OUP.
4. Ramana B.V.: Higher Engineering Mathematics, TMH.
5. Spiegel M.R. , Lipschutz S., John J.S., and Spellman D., : Complex Variables, TMH.
6. Sneddon, I. N..: Fourier Transforms, Dover
7. Sneddon, I. N..: Use of Integral Transforms, MGH
8. Bhatia, R, Fourier Series, MAA

ME(EE)-301 Elements of Mechanical Engineering 3-0-0-3-3:

Basic Concepts of Thermodynamics: Introduction, Microscopic and Macroscopic viewpoints

Definition of Thermodynamic systems: closed, open and isolated systems

Concept of Thermodynamics state; state postulate.

Definition of properties: intensive, extensive & specific properties.Thermodynamic equilibrium

Thermodynamic processes; quasi-static, reversible &irreversible processes; Thermodynamic cycles, Zeroth law of thermodynamics.Concept of empirical temperature.Heat and Work, Definition& units of thermodynamic work.Examples of different forms of thermodynamic works;example of electricity flow as work.Work done during expansion of a

compressible simplesystem, Definition of Heat; unit of Heat, Similarities & Dissimilarities between Heat & WorkIdeal Equation of State, processes; Real Gas, Definition of Ideal Gas; Ideal Gas Equations of State.Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes. Equations of State of Real Gases: Van der Waal's equation; Virial equation of state. Properties of Pure Substancesp-v & P-T diagrams of pure substance like H2O, Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status. Definition of dryness fraction of steam, degree of superheat of steam.
1st Law of Thermodynamics: Definition of Stored Energy & Internal Energy, 1st Law of Thermodynamics for cyclic processes ,Non Flow Energy Equation , Flow Energy & Definition of Enthalpy,Conditions for Steady State Steady flow: Steady State Steady Flow Energy Equation.
2nd Law of Thermodynamics: Definition of Sink, Source Reservoir of Heat.Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators, Kelvin – Planck & Clausius statements of 2nd Law ofThermodynamics , Absolute or Thermodynamic scale of temperature , Clausius Integral.
Entropy :Entropy change calculation for ideal gas processes.Carnot Cycle & Carnot efficiency , PMM-2; definition & its impossibility, Air standard Cycles for IC engines, Otto cycle; plot on P-V, T-S planes; Thermal efficiency, Diesel cycle; plot on P-V, T-S planes; Thermal efficiency , Rankine cycle of steam, h-s chart of steam (Mollier's Chart), Simple Rankine cycle plot on P-V, T-S, h-s planes , Rankine cycle efficiency with & without pump work ,(Problems are to solved for each module)
Properties & Classification of Fluids: Ideal & Real fluids, Newton's law of viscosity; Newtonian and Non-Newtonian fluids ,Compressible and Incompressible fluids,
Fluid Statics: Pressure at a point, Measurement of Fluid Pressure
Manometers : simple & differential, U-tube , Inclined tube, Fluid Kinematics, Stream line, laminar & turbulent flow,external & internal flow , Continuity equation , Dynamics of ideal fluids, Bernoulli's equation, Total head; Velocity head; Pressure head , Application of Bernoulli's equation
Measurement of Flow rate : Basic principles, Venturimeter , Pilot tube , Orifice meter.
Text :

1 Engineering Thermodynamics - P K Nag, 4thedn, TMH.
2 Fluid Mechanics and Hydraulic Machines - R K Bansal

References :

1 "Fundamentals of Thermodynamics" 6e by Sonntag & Van Wylin published by Wiley India.
2 Engineering Thermodynamics – Russel & Adeliyi (Indian edition), OUP
3 Engineering Thermodynamics – Onkar Singhh, New Age International Publishers Ltd.
4 Basic Engineering Thermodynamics – R Joel, 5thEd., Pearson
5 Introduction to Fluid Mechanics and Fluid Machines - S.K.Som and G.Biswas. 2nd edn, TMH
6 Fluid Mechanics by A.K.Jain.

EC(EE)-301 Analog & Digital Electronic Circuit 3-0-0-3-3:

Filters & Regulators: Capacitor filters, π-section filter, ripple factor, series and shunt voltage regulator, percentage regulation, Concept of SMPS.
Trans-resistance & Trans-conductance, Emitter follower circuits, High frequency model of Transistor.
Oscillators: Hartley's, Phase shift, Wien bridge, & Crystal oscillators.
Operational amplifier: Constant current source (Current mirror etc), Level shifter, CMRR, Voltage followercircuits.
Schmitt Trigger, Instrumentation Amplifier, Log & Antilog, amplifier, Trans-conductance multiplier, Precision rectifier, Voltage to current & Current to voltage converter.
Multivibrator: Monostable, Bistable multivibrator, Monostable & Astable operation using 555 timer.
Special function circuits: VCO & PLL
Data and number system: Binary, Octal and Hexadecimal representation and their conversion, BCD, ASCII, EBDIC, Gray codes andtheir conversion, Signed binary numbers representation with 1's and 2's complement methods, Binary arithmetic.
Boolean algebra: Various logic circuits, Representation in SOP and POS forms, Minimization of logic expressions by algebraic method, K-map method. Combinational circuits: Adder and sub tractor circuit, Circuit of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and parity Generator.
Memory systems: RAM, ROM, EPROM, EEROM 4

Basic memory elements, S-R, J-K, D, and T Flipflop, various types of Registers, Counters & their design, Irregular counter, State table & State transition diagram, Sequential circuit design methodology.
Different types of A/D and D/A conversion techniques.
Books:

1. Microelectronic Circuits, Sedra & Smith, Oxford University Press.
2. Integrated Electronics, Milman & Halkias, Mc Graw Hill Company.
3. Electronic devices & Circuits, Balbir Kumar & ShailB. Jain, PHI.
4. Op-amps and Linear IC's, R.A. Gayakwad, PHI.
5. Microelectronic Circuit- Analysis & Design, Rashid,Cenage Learning.
6. Electronic Circuits: Discrete & Integrated, 3rd Edition, Schilling & Belove, Mc Graw Hill Company.
7. Electronic principles, 6th Edition, Malvino, Mc Graw Hill Company.
8. Operational Amplifier & Linear IC's, Bell, Oxford University Press.
9. 2000 Solved Problems in Electronics, Jimmie J. Cathey, Mc Graw Hill Inc.
10. Electronic Devices -System & Application, Robert Diffenderfer, Cengage Learning.
11. Op- Amps & Linear Integrated Circuits, Ravi Raj Dudeja & Mohan Dudeja, Umesh Publication.
12. Digital Principles & Application, 5th Edition, Leach & Malvino, Mc Graw Hill Company.
13. Modern Digital Electronics, 2nd Edition, R.P. Jain.Tata Mc Graw Hill Company Limited
14. Fundamental of Digital Circuits, A. Anand Kumar, PHI.
15. Digital Logic Design, Morries Mano, PHI.
16. Digital Integrated Electronics, H. Taub & D. Shilling, Mc Graw Hill Company.
17. Digital Electronics, James W. Bignell & Robert Donovan, Thomson Delman Learning.
18. Fundamental of logic Design, Charles H. Roth, Thomson Delman Learning

EC(EE)-391 Analog & Digital Electronic Circuit Lab. 0-0-3-3-2:

1. Study of Ripple and Regulation characteristics of full wave rectifier with and without capacitorfilter.
2. Study of Zener diode as voltage regulator.
3. Construction of two stage R-C coupled amplifier & study of its gain and Bandwith.
4. Study of class A, C & Push pull amplifier.
5. Realisation V-I & I-V converter using Operational Amplifier.
6. Study of timer circuit using NE 555 and configuration of Monostable and Astable Multivibrator.
7. Study of DAC & ADC
8. Realisation of basic gates using Universal logic gates.
9. Realisation of RS-JK & D filpflop using logic gates.
10. Design of Combinational circuit for BCD to decimal conversion to drive 7-segment display usingMultiplexer.
11. Realisation of Synchronous Up/Down counter.
12. Construction of simple Decoder & Multiplexer circuits using logic gates.
13. Construction of adder circuit using Shift register & Full adder.

EE-301 Electric Circuit Theory 3-1-0-4-4

Introduction: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals.

Coupled circuits: Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Modeling of coupled circuits, Solution of problems.

Laplace transforms: Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits. Transient analysis of different electrical circuits with and without initial conditions. Concept of Convolution theorem and its application. Solution of Problems with DC & AC sources.

Fourier method of waveform analysis: Fourier series and Fourier Transform (in continuous domain only). Application in circuit analysis, Solution of Problems

Network equations: Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power
transfer theorem. Millman's theorem and its application in three phase unbalanced circuit analysis. Solution of Problems with DC & AC sources.

Graph theory and Networks equations: Concept of Tree, Branch, Tree link, Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials. Duality, Solution of Problems
Two port networks analysis: Open circuit Impedance & Short circuit, Admittance parameter, Transmission parameters, Hybrid parameters and their inter relations. Driving point impedance & Admittance. Solution of Problems
Filter Circuits: Analysis and synthesis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of Problems.

Text Books:
1. Networks and Systems, D. Roy Chowdhury, New Age International Publishers
2. Network Analysis and Synthesis, C.L. Wadhwa, New Age International Publishers
3. Circuit and Networks: Analysis and synthesis, A. Sudhakar & S.S. Palli, 4th edition. TMH Education Pvt. Ltd.
4. Circuit theory, Dr. Abhijit Chakrabarty, Dhanpat Rai & Co Pvt. Ltd.
Reference Books:
1. Network Analysis, M.E. Valkenburg, Pearson Education .
2. Fundamental of Electric circuit theory, D. Chattopadhay & P.C. Rakshit, S. Chand.
3. Engineering Circuit Analysis, W.H. Hyat, J.E. Kemmerly & S.M. Durbin, The Mc Graw Hill Company.
4. Electric Circuit, M. Nahvi & J.A. Edminister, Schum's outline series, The Mc Graw Hill Company.
5. Electric Circuit Analysis, S. Sivanagaraju, G. Kishor, C.Srinivasa Rao, Cengage Learning
6. Fundamental of Electric Circuits, Charles K. Alexander, Mathew. N.O. Sadiu, TMH Educaton.
7. Engineering Circuit Analysis, W.H. Hayt, J.E. Kemmerly, S.M. Durbin, The Mc Graw Hill Companies
8. Introduction to Electric Circuits, Richard C. Dorf, James A. Svoboda, Wiley India Edition.
9. Electric Circuits, Syed A. Nasar, Schaum's solved problem series, TMH Publishing Company Limited.

EE-391 Electric Circuit Theory Lab. 0-0-3-3-2

Transient response of R-L and R-C network: simulation with PSPICE /Hardware
2. Transient response of R-L-C series and parallel circuit: Simulation with PSPICE/ Hardware
3. Determination of Impedance (Z) and Admittance (Y) parameter of two port network: Simulation /Hardware.
4. Frequency response of LP and HP filters: Simulation / Hardware.
5. Frequency response of BP and BR filters: Simulation /Hardware.
6. Generation of Periodic, Exponential, Sinusoidal, Damped Sinusoidal, Step, Impulse, Ramp signalusing MATLAB in both discrete and analog form.
7. Determination of Laplace transform and Inverse Laplace transform using MATLAB.
8. Amplitude and Phase spectrum analysis of different signals using MATLAB.
9. Verification of Network theorem using SPICE

HU-381 Technical Report Writing Practice 0-0-2-2-1:

Guidelines for Course Execution:
Objectives of this Course: This course has been designed:
1. To inculcate a sense of confidence in the students.
2. To help them become good communicators both socially and professionally.
3. To assist them to enhance their power of Technical Communication.
Detailed Course Outlines:
Technical Report Writing:
1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)
Interview Sessions;
a) Training students to face Job Interviews confidently and successfully
b) Arranging Mock Interviews and Practice Sessions forintegrating Listening Skill with Speaking Skill in a formal situation for effective communication
4. Presentation:
a) Teaching Presentation as a skill
b) Strategies and Standard Practices of Individual /Group Presentation

c) Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids
5. Competitive Examination:
a) Making the students aware of Provincial /National/International Competitive Examinations
b) Strategies/Tactics for success in Competitive Examinations
c) SWOT Analysis and its Application in fixing Target
Books – Recommended:

1. Nira Konar: English Language Laboratory: A Comprehensive Manual PHI Learning, 2011
2. D. Sudharani: Advanced Manual for Communication Laboratories & Technical Report Writing Pearson Education (W.B. edition), 2011

4th semester:

M(CS)-401 NUMERICAL METHODS 3-0-0-3-3:

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.
Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.
Numerical integration: Trapezoidal rule, Simpson's1/3 rule, Expression for corresponding error terms.
Numerical solution of a system of linear equations:Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.
Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method.
Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Correctormethods and Finite Difference method.
Text Books:
1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).

References:
1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods,OUP.
5. Srimanta Pal: Numerical Methods, OUP.

M(CS)-491 NUMERICAL METHODS 0-0-3-3-2:

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Euler's and Runga-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

EE-403 Field Theory 3-1-0-4-4

Introduction: Co-ordinate systems and transformation, Cartesian coordinates, Circular cylindrical coordinates, Spherical coordinates & their transformation. Differential length, area and volume in different coordinate systems. Solution of problems
Introduction to Vector calculus: DEL operator, Gradient of a scalar, Divergence of a vector & Divergence theorem, Curl of a vector & Strokes theorem, Laplacian of a scalar, Classification of vector fields, Helmholtz's theorem. Solution of problems.
Electrostatic field: Coulomb's law, field intensity, Gauss's law, Electric potential and Potential gradient, Relation between E and V, an Electric dipole and flux lines. Energy density in electrostatic field.
Boundary conditions: Dielectric-dielectric, Conductor –dielectric, Conductor-free space.

Poisson's and Laplace's equation, General procedure for solving Poisson's and Laplace's equation. Solution of problems
Magneto static fields: Biot- savart law, Ampere's circuit law, Magnetic flux density, Magnetic static and Vector potential, Forces due to magnetic field, Magnetic torque and moments, Magnetisation in material, Magnetic boundary condition, Inductor and Inductances, Magnetic energy, Force on magnetic
material. Solution of problems
Electromagnetic fields: Faraday's law, Transformer and motional emf, Displacement current, Maxwell's equations, Time varying Potential, Time harmonic fields. Solution of problems
Electromagnetic wave propagation: Wave equation, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good conductor, Skin effect, Skin depth, Power & Poynting vector, Reflection of a plane wave at normal incidence, reflection of a plane wave at
oblique incidence, Polarisation. Solution of problems.
Transmission line: Concept of lump & distributed parameters, Line parameters, Transmission line equation & solutions, Physical significance of solutions, Propagation constants, Characteristic impedance, Wavelength, Velocity of propagation. Solution of problems
Text Books:
1. Elements of Electromagnetic, Mathew N.O. Sadiku, 4th edition, Oxford university press.
2. Engineering Electromagnetic, W.H. Hyat & J.A. Buck, 7th Edition, TMH
3. Theory and problems of Electromagnetic, Edminister, 2nd Edition, TMH
4. Electromagnetic field theory fundamentals, Guru & Hizroglu, 2nd edition, Cambridge University
Press.
Reference Books:
1. Electromagnetic with application, Krause, 5th Edition, TMH.
2. Elements of Engineering Electromagnetic, N.N. Rao, 6th Edition, Pearson Education.

ME(EE)-401: Thermal Power Engineering 3-0-0-3-3:

Water Tube & Fire Tube boilers, Circulating Principles, Forced Circulation, Critical pressure, Superheaters, Reheaters, attemperators, induced draught, forced draught and secondary air Fans, Boiler performance analysis and heat balance. Combustion Systems, Environmental Protection – ESP, Cyclone Separator, DustCollector etc.
Rotary Thermodynamic devices – Steam turbines & their classifications – Impulse & Reaction type Turbines, Thermodynamics of compressible fluid-flow, equation and continuity – Isentropic flow throughnozzles, velocity diagram, Blade efficiency, optimum velocity ratio, multi-staging, velocity & pressure compounding, losses in turbines, erosion of turbineblades, turbine governing, performance analysis ofturbine, Condensing system.
IC Engines – classification. Analysis of a standardcycle, fuel characteristic of SI & CI Engine, Combustion, Engine performance. Automotive Engine exhaust emission and their control.
Gas turbine Analysis – Regeneration - Reheating, Isentropic efficiency.Combustion efficiency.
Text:
1. P.K.Nag- Engineering Thermodynamics – TMH ,2/e
2. P K Nag- Power Plant Engg. - TMH Pub
3. P.S. Ballaney- Thermal Engineering – Khanna Pub
4. Domkundwar & Arora- Power Plant Engineering –.Dhanpat Rai & Co.
Reference:
1. Cengel --- Thermodynamics , 3/e ,TMH
2. Et-Wakil—Power Plant Engineering , MH
3. M W Zemansky & R.H.Dittman -Heat and Thermodynamics – McGraw Hill ,7/e

ME(EE)-491: Thermal Power Engineering Lab. 0-0-3-3-2:

1. Study of Cut Models – Boilers IC Engines
   - Lanchashire Boiler
   - Bahcock & Willcox Boiler
   - Cochran Boiler
   - Vertical Tubular Boiler
   - Locomotive Boiler
   - 4S Diesel Engine

- 4S Petrol Engine
- 2S Petrol Engine

2. Load Test on 4 Stroke Petrol Engine & Diesel Engine by Electrical Load Box.
3. Load Test on 4 Stroke Diesel Engine by Rope Brake Dynamometer.
4. Heat Balance on 4 Stroke Diesel Engine by Rope Brake Dynamometer & by Electrical Load Box.
5. Valve Timing Diagram on 4S Diesel Engine Model & 4S Petrol Engine Model.
6. To find the Calorific Value of Diesel Fuel & Coal by Bomb Calorimeter.
7. To find the Flash Point & Fire Point of Petrol & Diesel Fuel.
8. To find the Cloud Point & Pour Point of Petrol & Diesel Fuel.
9. To find Carbon Particle Percentage in Diesel Engine Exhaust Smoke by Smokemeter and trace theBHP Vs. % Carbon Curve.
10. Measurement of the Quality of Steam – Enthalpy & Dryness fraction.
11. To find out the Boiler performance – Boiler efficiency & Steam evaporation rate.
12. To visit a Thermal Power Station & study of the followings :

a) Boiler b) Steam pipe c) Furnaced) Economizer e) Preheater f) Steam turbinesg) Alternator h) Water treatment plant i) E. S. P.

CH-401: Basic Environmental Engineering & Elementary Biology **3-0-0-3-3:**

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.

Mathematics of population growth and associated problems, Importance of population study inenvironmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.

Ecology: Elements of ecology: System, open system, closed system, definition of ecology, species, population,community, definition of ecosystem- components types and function. Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain ,Food web. Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.

Air pollution and control :Atmospheric Composition: Troposphere, Stratosphere,Mesosphere, Thermosphere, Tropopause and Mesopause.

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget.

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. Smog, Photochemical smog and London smog.

Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification.

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

Water Pollution and Control :Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. River/Lake/ground water pollution: River: DO, 5 dayBOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication. Ground water: Aquifers, hydraulic gradient, ground water flow.

Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] ,Waste water treatment system, primary and secondarytreatments [Trickling filters, rotating biologicalcontractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. Water pollution due to the toxic elements and theirbiochemical effects: Lead, Mercury, Cadmium, and Arsenic.
Land Pollution: Lithosphere; Internal structure of earth, rock and soil Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping,Land filling, incineration, composting, recycling.Solid waste management and control (hazardous and biomedical waste). Noise Pollution :Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise], Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, Noise pollution control. L
Environmental Management: Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. 2L
References/Books
1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.

EE-401 Electrical Machines-I 3-1-0-4-4:

Transformer: Basic theory, Ideal transformer - Magnetizing current waveform. - Construction of transformers. - Effects of harmonics and harmonic compensation - Practical single phase transformer, - Equivalent circuit - Variable frequency operation. - Phasor diagram, - Regulation. - Switching surges, Mechanical forces in transformers - Losses, Efficiency. - Parallel operation - Three winding transformer .- Polyphase connections. - Scott connected transformer - Auto transformer - Transformer windings. - Tap-changing and voltage control - Basics of transformer design
DC Machines: Construction of DC machines – lap and wave windings - EMF equation - Torque equation. - Methods of excitation of DC generators. - Commutation in DC machines. - Armature reaction, - Equivalent circuit. - Self excitation of generators. - Characteristics of DC generators. - Parallel operation of generators. - DC motor operation and characteristics. - Parallel operation of motors. - Losses in DC machines, Efficiency. - Brush less, commutator-less DC machine - Starting, speed control & braking of DC.motors. Design of DC machines.

Text Books:
1 Electrical Machinery, P.S. Bhimra, 6th Edition, Khanna Publishers.
2 Electric machines, D.P. Kothari & I.J Nagrath, 3rd Edition, Tata Mc Graw-Hill Publishing Company Limited.
3 Electrical Machines, P.K. Mukherjee & S. Chakrabarty, Dhanpat Rai Publication.
Reference Books:
1. Electric Machinery & Transformers, Bhag S. Guru and H.R. Hiziroglu, 3rd Edition, Oxford University press.
2. Electrical Machines, R.K. Srivastava, Cengage Learning
3. Theory of Alternating Current Machinery, Alexander S Langsdorf, Tata Mc Graw HillEdition.
4. The performance and Design of Alternating Current Machines, M.G.Say, CBS Publishers& Distributors.
5. Electric Machinery & transformer, Irving L Koskow, 2nd Edition, Prentice Hall India

EE-491 Electrical Machines-I Lab. 0-0-3-3-2

1. Study of the characteristics of a separately excited DC generator.
2. Study of the characteristics of a DC motor
3. Study of methods of speed control of DC motor
4. Study of the characteristics of a compound DC generator (short shunt).
5. Measurement of speed of DC series motor as a function of load torque.
6. Study of equivalent circuit of a single phase transformer.
7. Polarity test on a single phase transformer & study of different connections of three phasetransformer.
8. Study of equivalent circuit of three phase Induction motor by no load and blocked rotortest.
9. Study of performance of wound rotor Induction motor under load.

10. Study of performance of three phase squirrel- cage Induction motor –determination ofiron, friction & windage loss.

EE-402 ELECTRICAL& ELECTRONIC MEASUREMENT 3-0-0-3-3:

Measurements: Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments.

Analog meters: General features, Construction, Principle of operation and torque equation of Moving coil, Moving iron, Electrodynamometer, Induction instruments • Principle of operation of the Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers.

Instrument transformer: Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current& Potential transformer, errors.

Measurement of Power: Principle of operation of Electrodynamic & Induction type wattmeter. Wattmeter errors.

Measurement of resistance: Measurement of medium, low and high resistances, Megger.

Measurement of Energy: Construction, theory and application of AC energy meter, testing of energy meters.

Potentiometer: Principle of operation and application of Crompton's DC potentiometer, Polar and Co-ordinate type AC potentiometer. Application.

AC Bridges: Measurement of Inductance, Capacitance and frequency by AC bridges.

Cathode ray oscilloscope (CRO): Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO.

Electronic Instruments: • Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator.

Sensors & Transducers: • Introduction to sensors & Transducers, Strain gauge, LVDT, Temperature transducers, Flow measurement using magnetic flow measurement.

Text Books:

1. A course in Electrical & Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai & sons.
2. Electrical Measurement & Measuring Instruments, E.W. Golding & F.C. Wides, Wheeler Publishing.
3. Electronic Instruments, H.S. Kalsi, Tata Mc-Graw hill, 2nd Edition.

Reference Books:

1. Sensors & Transducers, D. Patranabis, PHI, 2nd edition.
2. Digital Instrumentation, A.J. Bouwens, Tata Mc-Graw hill.
3. Modern Electronic instrumentation & Measuring instruments, A.D. Helfric & W.C. Copper, Wheeler Publication.
4. Instrument transducers, H.K.P. Neubert, Oxford University press.

EE-492 ELECTRICAL& ELECTRONIC MEASUREMENT Lab. 0-0-3-3-2:

1. Instrument workshop- Observe the construction of PMMC, Dynamometer, Electrothermal and Rectifier type of instruments, Oscilloscope and Digital multimeter.
2. Calibrate moving iron and electrodynamometer type ammeter/voltmeter by potentiometer.
3. Calibrate dynamometer type wattmeter by potentiometer.
4. Calibrate AC energy meter.
5. Measurement of resistance using Kelvin double bridge.
6. Measurement of power using Instrument transformer.
7. Measurement of power in Polyphase circuits.
8. Measurement of frequency by Wien Bridge.
9. Measurement of Inductance by Anderson bridge
10. Measurement of capacitance by De Sauty Bridge.
11. Measurement of capacitance by Schering Bridge.

5th semester:

HU-501 PRINCIPLE OF MANAGEMENT 3-0-0-3-3:

Basic concepts of management: Definition – Essence, Functions, Roles, Level.

Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organization Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organizational Effectiveness.

Management and Society– Concept, External Environment, CSR, Corporate Governance, Ethical Standards.

People Management– Overview, Job design, Recruitment & Selection, Training & Development, Stress Management. Managerial Competencies– Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship

Leadership:Concept, Nature, Styles.

Decision making: Concept, Nature, Process, Tools & techniques.

Economic, Financial & Quantitative Analysis– Production, Markets, National Income, Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.

Customer Management– Market Planning & Research, Marketing Mix, Advertising & Brand Management.

Operations & Technology Management– Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Text Books:

1. Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)
3. Management – Stoner, James A. F. (Pearson)
4. Management - Ghuman, Tata McGraw Hill(TMH)

EE-501 Electrical Machines-II 3-1-0-4-4:

AC Machines: Construction of AC machines - Armature windings - emf equation - MMF of poly phase windings, rotating magnetic field. - IM action, Generalized transformer - Equivalent circuit, Performance calculation. - Testing, losses, efficiency - Torque, Power, and Power factor - Starting, speed control and braking - Single phase induction motor - Armature reaction in induction motors. - Equivalent cage rotor. - Induction generators, line excited, self excited. - Cascade connection, Induction frequency converter -. Harmonics and their effects - High torque cage machines - Induction regulators, Linear induction machines - Magnetic circuit of AC machines - Magnetizing and .leakage fluxes. Basics of induction machine design.

Synchronous Machines: Armature reaction, - Equivalent circuit - Generator load characteristic - Regulation by emf method. Regulation of alternators by MMF and Potier methods - Parallel operation of alternators.. Generators on infinite bus bars, Capability chart of alternators. Electrical load diagram. Determination of Xd, Xq of salient pole machines - Mechanical load diagram, O & V curves - Regulation of salient pole alternators -Three phase and single phase short circuit on alternators - Starting of synchronous motors. Synchronous condensers.Synchronous induction motor.Principles of design. Reluctance machines

Text Books:

1. Electrical Machinery, P.S. Bhimra, Khanna Publishers.
2. Electrical Machines, Nagrath & Kothary, TMH
3. Electrical Machines, Theory & Applications, M.N. Bandyopadhyay, PHI
4. Electrical Machines,K. Krishna Reddy, Published by Scitech Publications.

Reference Books:

1. Electric Machinery & Transformer, Bhag S. Guru and H.R. Hiziroglu, 3rd Edition, Oxford University press.
2. Electric Machinery & Transformes, Irving L. Kosow, PHI
3. Electric Machinery, A.E.Fitzgerald, Charles Kingsley,Jr. & Stephen D. Umans, 6th Edition, Tata McGraw Hill
4. Electrical Machines, R.K. Srivastava, Cengage Learning
5. Theory of Alternating Current Machinery, Alexander S Langsdorf, Tata Mc Graw Hill Edition
6. The performance and Design of Alternating Current Machines, M.G.Say, CBS publishers & distributors.
7. Problems in Electrical Engineering, Parker smith, 9th Edition, CBS publishers &distributors.

8. Electric Machines, Charles A. Gross, CRC press

EE-591 Electrical Machines-II Lab. 0-0-3-3-2:

1. Different methods of starting of a 3 phase Cage Induction Motor & their comparison [DOL, Auto transformer & Star-Delta]
2. Speed control of 3 phase squirrel cage induction motor by different methods & their comparison [voltage control& frequency control].
3. Speed control of 3 phase slip ring Induction motor by rotor resistance control.
4. Determination of regulation of Synchronous machine by
a. Potier reactance method.
b. Synchronous Impedance method.
5. Determination of equivalent circuit parameters of a single phase Induction motor.
6. Load test on single phase Induction motor to obtain the performance characteristics.
7. To determine the direct axis resistance [Xd] & quadrature reactance [Xq] of a 3 phase synchronous machine by slip test.
8. Load test on wound rotor Induction motor to obtain the performance characteristics.
9. To make connection diagram to full pitch & fractional slot winding of 18 slot squirrel cage Induction motor for 6 poles & 4 pole operation.
10. To study the performance of Induction generator.
11. Parallel operation of 3 phase Synchronous generators.
12. V-curve of Synchronous motor

EE-502 Power System-I 3-1-0-4-4:

Overhead transmission line: Choice of frequency, Choice of voltage, Types of conductors, Inductance and Capacitance of a single phase and three phase symmetrical and unsymmetrical configurations. Bundle conductors. Transposition.Concept of GMD and GMR. Influence of earth on conductor capacitance.
Overhead line construction: Line supports, Towers, Poles, Sag, Tension and Clearance, Effect of Wind and Ice on Sag. Dampers.
Insulators: Types, Voltage distribution across a suspension insulator string, String efficiency, Arching shield& rings, Methods of improving voltage distribution across Insulator strings, Electrical tests on line Insulators.
Corona: Principle of Corona formation, Critical disruptive voltage, Visual critical corona discharge potential, Corona loss, advantages & disadvantages of Corona. Methods of reduction of Corona.
Cables: Types of cables, cable components, capacitance of single core & 3 core cables, dielectric stress, optimum cable thickness, grading, dielectric loss and loss angle.
Performance of lines: Short, medium (nominal , T) and long lines and their representation. A.B.C.D constants, Voltage regulation, Ferranti effect, Power equations and line compensation, Power Circle diagrams.
Generation of Electric Power: General layout of a typical coal fired power station, Hydro electric power station, Nuclear power station, their components and working principles, comparison of different methods of power generation. Introduction to Solar & Wind energy system.
Tariff: Guiding principle of Tariff, different types of tariff.
Indian Electricity Rule-1956: General Introduction.
Text Books:
1. Electrical Power System, Subir Roy, Prentice Hall
2. Power System Engineering, Nagrath & Kothery, TMH
3. Elements of power system analysis, C.L. Wodhwa, New Age International.
4. Electrical Power System, Ashfaq Hussain, CBS Publishers & Distributors
Reference Books:
1. Electric Power transmission & Distribution, S.Sivanagaraju, S.Satyanarayana, Pearson Education.
2. A Text book on Power system Engineering, Soni, Gupta, Bhatnagar & Chakrabarti, Dhanpat Rai & Co.
3. Electric Power distribution system Engineering, 2nd Edition, T. Gonen, CRC Press.
4. www.powermin.nic.in/acts_notification/pdf/ier**1956**.pdf

EE-592 Power System-I Lab. 0-0-3-3-2:

1. Determination of the generalized constants A.B, C, D of long transmission line.
2. Simulation of DC distribution by network analyzer.
3. Measurement of earth resistance by earth tester.
4. Dielectric strength test of insulating oil.
5. Determination of breakdown strength of solid insulating material.
6. Different parameter calculation by power circle diagram
7. Study of different types of insulator.
8. Active and reactive power control of alternator.
9. Study and analysis of an electrical transmission line circuit with the help of PSPICE.
10. Dielectric constant, tan delta, resistivity test of transformer oil.

EE-503 Control System-I 3-1-0-4-4:

Introduction to control system: Concept of feedback and Automatic control, Effects of feedback, Objectives of control system, Definition of linear and nonlinear systems, Elementary concepts of sensitivity and robustness. Types of control systems, Servomechanisms and regulators, examples of feedback control systems. Transfer function concept. Pole and Zeroes of a transfer function. Properties of Transfer function.

Mathematical modeling of dynamic systems: Translational systems, Rotational systems, Mechanical coupling, Liquid level systems, Electrical analogy of Spring–Mass-Dashpot system. Block diagram representation of control systems. Block diagram algebra. Signal flow graph. Mason's gain formula.**Control system components:** Potentiometer, Synchros, Resolvers, Position encoders. DC and AC tacho-generators. Actuators. Block diagram level description of feedback control systems for position control, speed control of DC motors, temperature control, liquid level control, voltage control of an Alternator.

Time domain analysis: Time domain analysis of a standard second order closed loop system. Concept of undamped natural frequency, damping, overshoot, rise time and settling time. Dependence of time domain performance parameters on natural frequency and damping ratio. Step and Impulse response of first and second order systems. Effects of Pole and Zeros on transient response. Stability by pole location. Routh-Hurwitz criteria and applications.

Error Analysis: Steady state errors in control systems due to step, ramp and parabolic inputs. Concepts of system types and error constants.

Stability Analysis: Root locus techniques, construction of Root Loci for simple systems. Effects of gain on the movement of Pole and Zeros.

Frequency domain analysis of linear system: Bode plots, Polar plots, Nichols chart, Concept of resonance frequency of peak magnification. Nyquist criteria, measure of relative stability, phase and gain margin. Determination of margins in Bode plot. Nichols chart. M-circle and M-Contours in Nichols chart.

Control System performance measure: Improvement of system performance through compensation. Lead, Lag and Lead- lag compensation, PI, PD and PID control.

Text books:

1. Modern Control Engineering, K. Ogata, 4th Edition, Pearson Education.
2. Control System Engineering, I. J. Nagrath & M. Gopal. New Age International Publication.
3. Control System Engineering, D. Roy Choudhury, PHI
4. Automatic Control Systems, B.C. Kuo & F. Golnaraghi, 8th Edition, PHI Reference Books:
1. Control Engineering Theory & Practice, Bandyopadhyaya, PHI
2. Control systems, K.R. Varmah, Mc Graw hill
3. Control System Engineering, Norman Nise, 5th Edition, John Wiley & Sons
4. Modern Control System, R.C. Dorf & R.H. Bishop, 11th Edition, Pearson Education.
5. Control System Design, C. Goodwin Graham, F. Graebe F. Stefan, Salgado. E. Mario, PHI
6. Modeling & Control of dynamic system, Macia & Thaler, Thompson
7. Modern Control Technology Components & Systems, 3rd edition, C.T Kilian, Cengage Learning.
8. Modern Control Engineering, Y. Singh & S. Janardhanan, Cengage Learning
9. Control System Engineering, R. Anandanatarajan & R. Ramesh Babu, , SCITECH
10. Automatic Control system, A. William, Wolovich, Oxford

EE-593 Control System-I Lab. 0-0-3-3-2:

1. Familiarization with MAT-Lab control system tool box, MAT-Lab- simulink tool box & PSPICE
2. Determination of Step response for first order &Second order system with unity feedback on CRO &calculation of control system specification like Time constant, % peak overshoot, settling time etc. from theresponse.
3. Simulation of Step response & Impulse response for type-0, type-1 & Type-2 system with unity feedback using MATLAB & PSPICE.
4. Determination of Root locus, Bode plot, Nyquist plot using MATLAB control system tool box for 2nd ordersystem & determination of different control system specification from the plot.
5. Determination of PI, PD and PID controller action of first order simulated process.
6. Determination of approximate transfer functions experimentally from Bode plot.
7. Evaluation of steady state error, setting time , percentage peak overshoot, gain margin, phase margin with addition of Lead

CS(EE)-501(a) Data Structure and Algorithm 3-0-0-3-3:

Introduction: Importance of study of Data structure, Concept of data structure: Data and data structure,Abstractdata type and data type. Algorithm and programs, Basic idea of pseudo-code, Algorithm efficiency and analysis, time and space analysis of algorithms-order notations.

Different representation: row major, column major. Sparse matrix, its implementation and usage.Array representation of polynomials. Singly linked list, circular linked list, doubly linked list, linked list representation of polynomialand applications.

Stack & queue: Stack and its implementation, (using array, using linked list) application. Queues, circular queue, dequeue, Implementation of queue- both linear and circular (using array, usinglinked list) applications. Recursion: Principle of recursion- use of stack, difference between recursion and iteration, tail recursion. Application-The Tower of Hanoi, Eight Queen Puzzle.

Nonlinear data structure: Trees:Basic terminologies, forest, tree representation (using array, using linked list). Basic trees, binary tree traversal (Pre-,in-,post-order), threaded binary tree(left, right, full), nonrecursive traversal algorithm using threaded binarytree, expression tree. Binary search tree-operations (creation, insertion, deletion, searching), Height balanced binary tree-AVL tree (insertion, deletion with examples only). B tree orations ((insertion, deletion with examples only)

Graph: Graph definition and concept, (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut vertex /articulation point, pendant node, clique, complete graph, connected –strongly connected component, weakly connected component-path, shortest path, isomorphism. Graph representation/storage implementation- adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity- Depth First Search (DFS), Breadth-First Search (BFS), concept of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge, application. Minimal spanning tree-Prim's algorithm (Basic ideaof greedy methods)

Searching, Sorting: Sorting algorithm, Bubble sort and optimization, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (Concept, of max heap, application-priority queue, radix sort. Searching, sequential search, binary search, interpolation search.Hashing, Hashing functions, collision resolution techniques.

Text Books:

1. Data structure using C, Reema Thareja, Oxford.
2. Data structure, S.Lipschutz.
3. Data structure and program design in C, Robert L Krusse, B.P.Leung

Reference Books:

1. Data structure using C++, Varsha H. Patil, Oxford

CS(EE)-591(a) Data Structure and AlgorithmLab. 0-0-3-3-2:

1. Implementation of array operation
2. Stack and queue: adding, deleting elements. Circular Queue: adding &deleting elements, Merging problems .
3. Evaluation of expression operation on multiple stack & queues.
4. Implementation of linked lists, inserting, deleting, inverting a linked list,implementation of stacks & queue using linked list.
5. Polynomial addition, Polynomial multiplication
6. Sparse Matrices, Multiplication, addition
7. Recursive and Nonrecursive traversal of Trees

8. Threaded binary tree traversal. AVL tree implementation.
9. Application of Trees. Application of sorting and searching algorithm.
10. Hash tables implementation, searching, inserting and deleting, searching &sorting techniques.

CS(EE)-501(b) Computer Organization 3-0-0-3-3:

Basic organization of the stored program in computer and operation sequence for execution of a program.Role of operating systems and compiler/ assembler. Fetch, decode and execute cycle. Concept of operator, operand, registers and storage.Instruction format. Instruction sets and addressing modes. Commonly used number systems. Fixed and floating point representation of numbers.

Overflow and underflow. Design of address- ripple carry and carry look ahead principles. Design of ALU ,Fixed point multiplication-Booth's algorithm , Fixed point division-Restoring and non restoring algorithms. Floating point-IEEE 754 standard.

Memory unit design with special emphasis on implementation of CPU-memory interfacing.Memory organization.Static and dynamic memory, memory hierarchy, associative memory.Cache memory.Virtual memory.Data path design for read/write access.

Design of control unit-hardwired and micro programmed control.Introduction to instruction pipelining.

Introduction to RISC architecture, RISC vs. CISC architecture.I/O operations-Concepts of handshaking. Polled I/O,Interrupt and DMA.

Text Books:

1. Computer System architecture, M.M. Mano, PHI
2. Computer Architecture, P. Behrooz, Oxford University Press.

Reference Books:

1. Computer Architecture & Organization, J.P. Hayes, Mc Graw Hill.
2. Computer Organization, Hamacher, Mc Graw Hill.
3. Computer Organization & design, P. Pal Chaudhuri, PHI
4. Computer Organization & Architecture, P. N. Basu, Vikas Pub.

CS(EE)-591(b) Computer Organization Lab. 0-0-3-3-2:

1. Familiarity with IC chips e.g.
(a) Multiplexer
(b) Decoder
(c) Encoder
(d) Comparator
Truth table verification and clarification from Data-book.
2. Design an Adder/Sub tractor composite unit.
3. Design a BCD adder
4. Design of a Carry-Look-Ahead Adder circuit.
5. Use of a multiplexer unit to design a composite ALU.
6. Use of an ALU chip for multibit arithmetic operation.
7. Implementations of read write operation using RAM IC.
8. Cascade two RAM ICs for vertical and horizontal expansion.

CS(EE)-591(c) MICROPROCESSOR & MICROCONTROLLER 3-0-0-3-3:

Introduction to Computer architecture: Architecture of a typical Microprocessor**,** Bus configuration, The CPU module, ROM & RAM families, Introduction to assembly language & machine language programming, Instruction set of typical microprocessor (e.g. 8085), Subroutine & stack, Timing diagram, Memory Interfacing, Interfacing input output-port, Interrupt & interrupt handling, Serial & parallel data transfer scheme, Programmed & interrupt driven data transfer, Direct memory access, Programmable peripheral devices, Programmable interval timer, Analog input-output using AD & DA converter.

Assembly language programme of a typical Microprocessor: Use of compilers, assembler, linker & debugger.

Basic 16 bit Microprocessor (e.g. 8086): Architecture, Min-max mode.

Introduction to microcontroller: Architecture & instruction set of a typical microcontroller (e.g. PIC16F84 device), Feature of popular controller (processor 8031/8051), its programming & interfacing.

Text Books:

1. Microprocessor architecture, programming & application with 8085, R. Gaonker, Penram International.
2. Advanced Microprocessors and Peripheral, Ajay Kumar Ray, Koshor M Bhurchandi, TMH Publishing Co.
3. Microprocessor & Interfacing, D.V. Hall, Mc Graw Hill.
4. The 8051 microcontroller, Ayala, Thomson.
5. Interfacing through Microprocessors ,E. Srinivasa Reddy, Published by Scitech Publications (India) Pvt. Ltd.

Reference Books:

1. Advanced Microprocessors, Y. Rajasree, New Age international Publishers.
2. An introduction to the Intel family of Microprocessors, James L. Antonakos, Pearson Education,
3. The 8051 Microcontroller and Embedded systems, Muhammad Ali Mazidi & J. G. Mazidi, Pearson Education.
4. The 8086 Microprocessors: Programming & Interfacing the PC, K.J.Ayala, Thomson.
5. Microprocessor & Peripherals, S.P. Chowdhury & S. Chowdhury, Scitech.
6. Microchip technology data sheet, www.microchip.com

CS(EE)-591(c) MICROPROCESSOR & MICROCONTROLLER Lab. 0-0-3-3-2:

1. Familiarization with 8085 register level architecture and trainer kit components including the memory map. Familiarization with process of storing and viewing the contents of memory as well as registers.
2. (a) Study of prewritten program on trainer kit using the basic instruction set (data transfer, load/store, arithmetic, logical)

(b) Assignment based on that.

3. (a) Familiarization with 8085 simulator on PC

(b) Study of prewritten program using basic instruction set (data transfer, load/store,arithmetic, logical).
(c) Assignment based on that.

4. Programming using kit/simulator.
   - (a) Lookup table
   - (b) Copying a block of memory
   - (c) Shifting a block of memory.
   - (d) Packing and unpacking of BCD numbers.
   - (e) Addition of BCD number
   - (f) Binary to ASCII conversion
   - (g) String matching

5. Program using subroutine calls and using IN/OUT instruction using 8255 PPI on thetrainer kit e.g. subroutine for delay, reading switch state and glowing LEDs accordingly,finding out frequency of pulse train etc.
6. Interfacing any 8 bit latch (74LS373) with trainer kit as a peripheral mapped output portwith absolute address decoding.
7. Interfacing with I/O module :
   - (a) ADC
   - (b) Speed control of DC motor with DAC
   - (c) Keyboard
   - (d) Multi digit display with multiplexing.
   - (e) Stepper motor
8. Study of 8031/8051 Micro controller kit and writing program for the following task using the kit
   - (a) table look up
   - (b) basic arithmetic and logical operation
   - (c) interfacing of keyboard and stepper motor.

CS(EE)-501(d) Computer Architecture 3-0-0-3-3:

Introduction: Review of basic computer architecture(Revisited), Quantitative techniques in computer design,measuring and reporting performance.

Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards,techniques for handling hazards.Exception handling.Pipeline optimization techniques; Compiler techniques forimproving performance.
Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memoryreplacement policies.
Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, superpipelined and VLIWprocessor architectures. Array and vector processors. (
Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture.Cluster computers.
Non von Neumann architectures: data flow computers,reduction computer architectures, systolic architectures.
Text books:
[To be detailed]

CS(EE)-591(d) Computer Architecture Lab. 0-0-3-3-2:

1. HDL introduction
2. Basic digital logic base programming with HDL
3. 8-bit Addition, Multiplication, Division
4. 8-bit Register design
5. Memory unit design and perform memory operatons.
6. 8-bit simple ALU design
7. 8-bit simple CPU design
8. Interfacing of CPU and Memory

EE-581 Seminar 0-0-3-3-2:

Each and every student have to appear in Group Discussion, Self Introduction, Technical seminar & non-technical seminar on very recent topics.

6th semester:

EE-601 Control System –II 3-1-0-4-4:

State variable model of continuous dynamic systems: Converting higher order linear differential equations into State Variable (SV) form.Obtaining SV model from Transfer Function. Obtaining characteristic equation and transfer functions from SV model. Obtaining SV equation directly for R-L-C and spring-mass-dashpotsystems.Concept and properties associated with state equations. Linear transformations on statevariables. Canonical forms of SV equations. Companion forms. Solutions of stateequations. State transition matrix, properties of state transition matrix.
Controllability and Observability.Linear state variable feedback controller, the poleallocation problems.Linear system design by state variable feedback.
Analysis of discrete time (sampled data) systems using Z-transform: Difference equation. Inverse Z transforms. Stability and damping in Z domain. Practicalsampled data systems and computer control system. Practical and theoretical samplers.Sampling as Impulse modulation.Sampled spectra and aliasing. Anti-aliasing filters. Zeroorder hold.Approximation of discrete (Z-domain) controllers with ZOH by Tustintransform and other methods.State variable analysis of sampled data system.Digitalcompensator design using frequency response.
Introduction to nonlinear systems: Block diagram and state variable representation of nonlinear systems. Characteristics ofcommon nonlinearities.Phase plane analysis of linear and nonlinear second order systems. Methods of obtainingphase plane trajectories by graphical method, isoclines method. Qualitative analysis ofsimple control systems by phase plane methods.Describing function analysis. Limit cycles in nonlinear systems. Prediction of limit cyclesusing describing function technique.Stability concepts for nonlinear systems. BIBO Vs state stability. Definitions of Lyapunovfunctions.Lyapunov analysis of LTI systems, Asymptotic stability, Global asymptoticstability. The first and second methods of Lyapunov to analyze nonlinear systems.
Text Books:

1. Control System Engineering, D. Roy Chowdhuri, PHI
2. Control system Engineering, I.J. Nagrath & M. Gopal, New Age International.
3. Digital Control & State Variable Methods, M. Gopal, 2nd Edition, TMH
4. Introduction to Control Systems, D.K. Anand & R.B. Zmood , 3rd Edition, (Butterworth-Heinemann) Asian Books.

. **Reference Books:**

1. Control System Design, Goodwin, Pearson Education.
2. Nonlinear Control system, J.E. Gibson, Mc Graw Hill Book Co.
3. Control theory & Practice, M.N. Bandyopadhyaya, PHI
4. Digital Control system, B.C. Kuo, Oxford University Press.
5. Digital Control System, C.H. Houpis, Mc Graw Hill International.
6. Discrete Time control system, K. Ogata, Prentice Hall, 1995
7. Sampled Data Control system, E.I. Jury, John Wiley & Sons Inc.
8. System Dynamics and Control, Eronini Umez, Eronini, Thomson
9. Modern Control system, R.C. Dorf & R.H. Bishop, Pearson Education
10. Control Engineering, Ramakalyan, Vikas
11. Control System R\Engineering, A. Natarajan Reddy, Scitech
12. Control System Theory with Engineering Application, Lyshevski, Jaico

EE-691 Control System –II Lab. 0-0-3-3-2:

1. Study of a practical position control system obtaining closed step responses for gain setting corresponding toOver-damped and under-damped responses. Determination of rise time and peak time using individualizedcomponents by simulation. Determination of un-damped natural frequency and damping ration fromexperimental data.
2. Tuning of P, PI and PID controller for first order plant with dead time using Z-N method. Process parameters(time constant and delay/lag) will be provided. The gain of the controller to be computed by using Z-Nmethod. Steady state and transient performance of the closed loop plant to be noted with and without steadydisturbances. The theoretical phase margin and gain margin to be calculated manually for each gain setting.
3. Design of Lead, Lag and Lead-Lag compensation circuit for the given plant transfer function. Analyze stepresponse of the system by simulation.
4. Obtain Transfer Function of a given system from State Variable model and vice versa. State variable analysisof a physical system - obtain step response for the system by simulation.
5. State variable analysis using simulation tools. To obtain step response and initial condition response for asingle input, two-output system in SV form by simulation.
6. Performance analysis of a discrete time system using simulation tools. Study of closed response of acontinuous system with a digital controller and sample and hold circuit by simulation.
7. Study of the effects of nonlinearity in a feedback controlled system using time response. Determination ofstepresponse with a limiter nonlinearity introduced into the forward path of 2nd order unity feedback controlsystems. The open loop plant will have one pole at the origin and other pole will be in LHP or RHP. Toverify that
(i) with open loop stable pole, the response is slowed down for larger amplitude input
(ii) for unstable plant, the closed loop system may become oscillatory with large input amplitude
by simulation
8. Study of effect of nonlinearity in a feedback controlled system using phase planeplots. Determination of phase plane trajectory and possibility of limit cycle ofcommon nonlinearities.

EE-602 Power Systems-II 3-1-0-4-4:

Representation of Power system components: Single-phase representation of balanced three phase networks, the one-line diagram and theimpedance or reactance diagram, per unit (PU) system.

Distribution substation: Types of substations, location of substations, substation equipments and accessories,earthling (system & equipment), feeder and distributors, radial and loop systems.

Load flow studies: Network model formulation, formation of Ybus , load flow problem, Gauss-Siedel method,Newton-Raphson method, Decoupled load flow studies, comparison of load flow methods.

Faults in Electrical systems: Transient on a transmission line, short circuit of a synchronous machine under no load &

loaded condition.Symmetrical component transformation, sequence impedance and sequence network ofpower system, synchronous machine, transmission lines and transformers.Symmetrical component analysis of unsymmetrical faults, single linetoground fault, line to line fault, double lineto ground fault.

Power system stability: Steady state stability, transient stability, equal area criteria, swing equation, multi machine stability concept,

Power system protection: Protective zones, Relaying elements and quantities.Protective relays, basic requirements and type of protection, phase and amplitudecomparator, grading (time & current), classification of Electromagnetic relays, Directionalrelay, Distant relay, Differential relay, basic aspects of static and digital relays, relayprotection scheme for transformer, feeder, generators and motors.Circuit breakers, circuit breaking transients, transient recovery voltage, current choppingand resistance switching, circuit breaker rating, arc and arc extinction, circuit breaker types,oil circuit breaker, vacuum circuit breaker, air blast circuit breaker, SF6 circuit breaker andoperating mechanism, advantages and disadvantages of different types.

Text Books:

1. Modern Power System Analysis, D.P. Kothari & I.J. Nagrath, 4th Edition, Tata McGraw Hill.
2. Electrical Power Systems, Subir Ray, PHI
3. Switchgear protection and power systems, Sunil S Rao, Khanna Publications.
4. A text book on Power System Engineering, M.L.Soni, P.V.Gupta, U.S. Bhatnagar & A. Chakrabarti, Dhanpat Rai & CO.

Reference Books:

1. Protection & Switchgear, B. Bhalja, R.P. Maheshwari, N.G.Chothani, Oxford.
2. Power system protection & switchgear, B.Ram & D.N. Vishwakarma, Tata McGraw Hill.
3. Handbook of Electrical Power Distribution, G. Ramamurthy, University Press
4. Electric Power Transmission and Distribution, S. Sivanagaraju, S.Satyanarayana, Pearson Education.
5. Power Systems Stability, Vol. I,II& II, E.W. Kimbark, Wiley.
6. Power Engineering, D.P Kothari & I.J. Nagrath, Tata McGraw Hill.
7. Power Systems Analysis, A. R. Bergen & V. Vittal, Pearson Education.
8. Computer Aided Power systems analysis, Dr. G. Kusic, CEC press.

EE-692 Power Systems-II Lab.0-0-3-3-2:

1. Study of the characteristics of on delay relay and off delay relay.
2. Test to find out polarity, ratio and magnetization characteristics of CT and PT.
3. Test to find out characteristics of(a) under voltage relay(b) earth fault relay.
4. Study on DC load flow
5. Study on AC load flow using Gauss-seidel method
6. Study on AC load flow using Newton Raphson method.
7. Study on Economic load dispatch.
8. Study of different transformer protection schemes by simulation.
9. Study of different generator protection schemes by simulation.
10. Study of different motor protection schemes by simulation.
11. Study of different characteristics of over current relay.
12. Study of different protection scheme for feeder.

EE-603 Power Electronics 3-1-0-4-4:

Introduction: Concept of power electronics, application of power electronics, uncontrolled converters,advantages and disadvantages of power electronics converters, power electronics systems,power diodes, power transistors, power MOSFETS, IGBT and GTO.

PNPN devices: Thyristors, brief description of members of Thyristor family with symbol, V-Icharacteristics and applications. Two transistor model of SCR, SCR turn on methods,switching characteristics, gate characteristics, ratings, SCR protection, series and paralleloperation, gate triggering circuits, different commutation techniques of SCR.

Phase controlled converters: Principle of operation of single phase and three phase half wave, half controlled, fullcontrolled converters with R, R-L and RLE loads, effects of free wheeling diodes andsource inductance on the performance of converters. External performance parameters ofconverters, techniques of power factor improvement, single phase and three phase dualconverters.

DC-DC converters: Principle of operation, control strategies, step up choppers, types of choppers circuits basedon quadrant of operation, performance parameters, multiphase choppers and switchingmode regulators.
Inverters: Definition, classification of inverters based on nature of input source, wave shape of outputvoltage, method of commutation & connections. Principle of operation of single phase andthree phase bridge inverter with R and R-L loads, performance parameters of inverters,methods of voltage control and harmonic reduction of inverters. Brief idea of ResonantPulse inverters.
AC controllers: Principle of on-off and phase control, single phase and three phase controllers with R andR-L loads.Principle of operation of cycloconverters, circulating and non circulating mode ofoperation, single phase to single phase step up and step down cycloconverters, three phaseto single phase Cycloconverters, three phase to three phase Cycloconvetter.
Applications: Speed control of AC and DC motors. HVDC transmission.Static circuit breaker, UPS,static VAR controller.
Text Books:
1. Power Electronics, K. Hari Babu, Published by Scitech Publications.
2. Power Electronics, M.D. Singh and K.B. Khanchandani, Tata Mc Graw Hill. 2007
3. Power Electronics, V.R. Moorthi, Oxford, 2005
4. Power Electronics, M.H. Rashid, PHI, 3rd Edition
5. Power Electronics, P.S. Bhimra, Khanna Publishers, 3rd Edition.
Reference Books:
1. Modern Power Electronics & AC drives, B.K. Bose, Prentice Hall
2. Power Electronics, Mohan,Undeland& Riobbins, Wiley India
3. Element of power Electronics, Phillip T Krein, Oxford, 2007
4. Power Electronics systems, J.P. Agarwal, Pearson Education, 2006
5. Power Electronics, M.S. Jamil Asghar, PHI, 2007
6. Analysis of Thyristor power conditioned motor, S.K. Pillai, University Press.
7. Power Electronics : Principles and applications, J.M. Jacob, Thomson

EE-693 Power Electronics Lab. 0-0-3-3-2:

1. Study of the characteristics of an SCR.
2. Study of the characteristics of a Triac
3. Study of different triggering circuits of an SCR
4. Study of firing circuits suitable for triggering SCR in a single phase full controlled bridge.
5. Study of the operation of a single phase full controlled bridge converter with R and R-L load.
6. Study of performance of single phase half controlled symmetrical and asymmetrical bridge converters.
7. Study of performance of step down chopper with R and R-L load.
8. Study of performance of single phase controlled converter with and without source inductance (simulation)
9. Study of performance of step up and step down chopper with MOSFET, IGBT and GTO as switch(simulation).
10. Study of performance of single phase half controlled symmetrical and asymmetrical bridgeconverter.(simulation)
11. Study of performance of three phase controlled converter with R & R-L load. (simulation)
12. Study of performance of PWM bridge inverter using MOSFET as switch with R and R-L load.
13. Study of performance of three phase AC controller with R and R-L load (simulation)
14. Study of performance of a Dual converter. (simulation)
15. Study of performance of a Cycloconverter (simulation)

CS(EE)-601(a) Software Engineering 3-1-0-4-4:

Overview of system analysis & design: Business system concept, System development life cycle, waterfall model, Spiral Model, Feasibility Analysis, Technical feasibility, Cost-benefit Analysis, COCOMO model.
System design: Context diagram and DFD, Problem partitioning, Top down and bottom up design, decision tree, decision table and structured English, Functional Vs object oriented approach.
Testing:Levels of testing, Integration testing, Test case specification, Reliability assessment, Validation & Verification metrics, Monitoring & control.
System project management: Project scheduling, Staffing, software configuration management, Quality assurance, Project monitoring.

Fundamentals of Object oriented design in UML: Static and dynamic models, necessity of modeling, UML diagrams, Class diagrams, Interaction diagrams, Collaboration diagram, Sequence diagram, State chart diagram, Activity diagram, Implementation diagram.

Text Books:

1. Software Engineering, R.G. Pressman,TMH
2. Software Engineering Fundamental, Behforooz, OUP
3. Software Engineering, Ghezzi, PHI

Reference Books:

1. An integrated approach to Software Engineering, Pankaj Jalote, Narosa
2. Software quality, Benmenachen, Vikas
3. IEEE standard on Software Engineering.
4. Software defect Prevention, Kane, SPD.
5. Essentials of Software Engineering, Uma, Jaico

CS(EE)-691(a) Software Engineering 0-0-3-3-2:

Pre-requisite: For the software Engineering Lab, design a project proposal which will be used throughout the lab for performing different experiments using CASE tools.

1. Preparation of requirement document for proposed project in standard format.
2. Project schedule preparation using tools like MSP project, Generation of Gnatt and PERT chart fromschedule. Prepare project management plan in standard format..
3. Draw Use case diagram, Class diagram, Sequence diagram and prepare Software design document usingtools like Rational Rose.
4. Estimate project size using Function Point (FP)/Use Case Point. Use Excel/Open Office template forcalculation.
5. Design Test Script/Test Plan (both Black box and White Box approach) for a small component of theproposed project. (Develop that component using programming languages like c/Java/VB etc.)
6. Generate test result and perform defect cause analysis using Pareto or Fishbone diagram.
7. Compute Process and Product Metrics (e.g. Defect Density, Defect Age, Productivity, Cost etc.)8. Familiarization with any Version control system like CVS/VSS/PVCS etc.Following projects can be used as dummy projects:

• Library management system
• Railway reservation system
• Employee payroll
• Online banking system
• Online Shopping Cart
• Online Examination

CS(EE)-601(b) DBMS 3-1-0-4-4:

Introduction: Concept & Overview of DBMS, Data model, Database language, Database administrator, Database users, Three Schema architecture of DBMS.

Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints,Keys, Entity-Relationship Diagram, Weak Entity sets, Extended E-R features.

Relational Model: Structure of relational Databases, Relational Algebra, Relational; calculus, Extended Relational Algebra operations, Views, Modification of the Database.

SQL and Integrity Constraints: Concept of DDL, DML, DCL. Basic structure, Set operations, Aggregate functions, Null values, Domain constraints, Referential integrity, Constraints, assertions, views, Nested sub queries, Data base security application development using SQL, Stored procedures and triggers.

Relational Database design: Functional dependency, Different anomalies in designing a Database, Normalization using functional dependencies, Decomposition, Boyce-Codd normal form, 3NF, Normalization using multi-valued dependencies, 4NF, 5 NF.

Internal of RDBMS: Physical data structures, Query optimization: join algorithm, statistics and cost base optimization, Transaction processing, Concurrency control and recovery management: transaction model properties, state serializability, look base protocols, two phase locking.

File organization & index structures: File & records concepts, Placing file records on disk, Fixed and variable sized records, Types of single –Level index (primary. Secondary, clustering), Multilevel Indexes, Dynamic multilevel indexes using B tree and B+ tree.

Text Books:

1. Database System Concepts, F. Henry& Abraham Silderscharz, Mc Graw Hill.
2. Database Management system, Ramakrishnan, Mc Graw Hill.
3. Principles of Database Systems, J.D. Ullman, Galgotia Publication.

Reference Books:

1.Principles of Database Management Systems. Martin James. PHI.
2. Database management Systems, A.K. Majumder & Pritimay bhattacharjya, Tata Mc Graw Hill.

CS(EE)-691(b) DBMS Lab. 0-0-3-3-2:

1. Creating Database:

• Creating a Database
• Creating a table
• Specifying Relational Data Types
• Specifying Constraints
• Creating Indexes.

2 .Table and record Handling

1. INSERT statement
2. Using SELECT and INSERT together
3. DELETE, UPDATE, TRUNCATE statements
4. DROP, ALTER statements

3. Retrieving Data from Database

• The SELECT statement
• Using the WHERE clause
• Using Logical Operators in the WHERE clause
• Using IN, BETWEEN, LIKE, ORDER,BY GROUP BY and HAVING

4. Clause

• Using AGGREGATE function
• Combining Tables using JOINS
• Sub queries

5. Database Management.

• Creating views
• Creating Column Aliases
• Creating Database Users

CS(EE)-601(c) Object Oriented Programming 3-1-0-4-4:

Object oriented Design: Concept of Object oriented programming language, Major and minor elements, Object,Class, relationship among objects, aggregation, links, relationship among classes-association, aggregation using instantiation, meta-class, grouping constructs.

Object oriented concept: Difference between OOP and other conventional programming, advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism.

Basic concepts of Object oriented programming usingJava: Class & Object properties: Basic concepts of Java programming-advantages of Java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested and inner classes, basic string handling concepts, -String (discuss char(), compare(), equals(), equalsIgnorecase(), indexOf(), length(), substring(), toCharArray(),toLowercCase(), tostring(), methods), concept of mutable and immutable string, command line arguments, basics of I/O operations-keyboard input using BufferedReader & Scanner classes. Reusability properties: Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes, &methods, interfaces. Creation of packages, importing packages, member access for packages. Exception

handling &Multithreading : Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread synchronization, inter thread communication, deadlocks for threads, suspending & resuming threads.
Applet Programming (using swing): Basics of appletprogramming, applet life cycle, difference between application & applet programming, parameter passing in applet in applets, concept of delegation event model and listener, I/O in applets, use of repaint(), getDocumentBase(), getCodeBase() methods, layout manager (basic concept), creation of buttons (JButton class only) & text fields.
Text Books:
1. Object Oriented Modeling and design, James Rambaugh& Michael Blaha, PHI.
2. Object Oriented Programming with C++ and Java, D. Samanta, PHI
3. Programming with Java: A Primer, E. Balagurusamy, TMH.
Reference Books:
1. Object oriented system Development, Ali Bahrami, McGraw Hill.
2. The complete reference Java2, Patrick Naughton & Herbert Schildt, TMH

CS(EE)-691(c) Object Oriented ProgrammingLab. 0-0-3-3-2:

1. Assignments on class, constructor, overloading, inheritance, overriding.
2. Assignments on wrapper, class, arrays.
3. Assignments on developing interfaces-multiple inheritance, extending interfaces.
4. Assignments on creating and accessing packages.
5. Assignments on multithreaded programming.
6. Assignment on applet programming

CS(EE)-601(d) Computer Network 3-1-0-4-4:

Overview of Data Communication and Networking: Introduction, Data communications: components, data representation (ASCII, ISO etc.),direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure(type of connection, topology), categories of network (LAN, MAN,WAN);
Internet: briefhistory, Protocols and standards; Reference models: OSI reference model, TCP/IP referencemodel, their comparative study.
Physical Level: Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital)& transmission media (guided & unguided); Circuit Switching: time division & spacedivision switch, TDM bus; Telephone Network.
Data link Layer: Types of errors, framing (character and bit stuffing), error detection & correction methods;Flow control; Protocols: Stop & wait ARQ, Go-Back-N ARQ, Selective repeat ARQ,HDLC;]
Medium Access sub layer: Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple accessprotocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA TraditionalEthernet, fast Ethernet (in brief).
Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, sub netting; Routing : techniques, staticvs. dynamic routing , Unicast Routing Protocols: RIP, OSPF, BGP; Other Procols: ARP, IP,ICMP, IPV6.
Transport layer: Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop chokepackets; Quality of service: techniques to improve QoS:Leaky bucket algorithm, Token bucket algorithm,
Application Layer: Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography(Public, Private Key based), Digital Signature, Firewalls.
Modern topics:ISDN services & ATM, DSL technology, Cable Modem: Architecture and operation in brief.Wireless LAN: IEEE 802.11, Introduction to blue-tooth.
Text Books:
1. Data Communications and Networking (3rd Ed.), A. Forouzan , TMH
2. Computer Networks (4th Ed.), A. S. Tanenbaum, Pearson Education/PHI
3. Data and Computer Communications (5th Ed.), W. Stallings, PHI/ Pearson Education
Reference Books:
1. Computer Networking -A top down approach featuring the internet, Kurose and RosePearson Education

2. Communication Networks, Leon, Garica, Widjaja, TMH
3. Communication Networks, Walrand, TMH.
4. Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.), Comer, Pearson Education/PHI

CS(EE)-691(d) Computer Network Lab. 0-0-3-3-2:

1. Assignments on class, constructor, overloading, inheritance, overriding.
2. Assignments on wrapper, class, arrays.
3. Assignments on developing interfaces-multiple inheritance, extending interfaces.
4. Assignments on creating and accessing packages.
5. Assignments on multithreaded programming.
6. Assignment on applet programming

EE-604(a) High Voltage Engineering 4-0-0-4-4:

Breakdown phenomena: Breakdown of Gases: Mechanism of Break down of gases, Charge multiplication, Secondary emission, Townsend Theory, Streamer Theory, Paschen's Law, Determination of Minimumbreakdown voltage, Breakdown in non uniform field, Effect of polarity on corona inceptionand break down voltage.Partial Discharge: definition and development in solid dielectric.Break Down of Solids: Intrinsic breakdown, Electromechanical break down, Thermalbreakdown, Streamer Breakdown.Breakdown of Liquid: Intrinsic Break down, Cavitation Theory, Suspended particle Theory.Breakdown in Vacuum: Non metallic electron emission mechanism, Clump mechanism,
Effect of pressure on breakdown voltage.

Generation of High Voltage: Generation of high AC voltages: Testing transformer, Cascaded transformer, Series resonantcircuit, single stage and multi stage. Advantages of Series Resonant Circuit in testing ofcables.Generation of DC high voltage: Cockcroft Walton doubler and multistage circuit.Electrostatic generator.Definition of Impulse Voltage as per Indian Standard Specification, Wave front and wave tailtime ,Generation of Impulse Voltage, Multistage
Impulse generator, triggering of Impulse Generator.

Measurement of High Voltage: Sphere gap voltmeter, AC , DC and impulse high voltage measurement as per Indian StandardSpecifications. Resistance and Capacitance Potential dividers, Peak voltmeters for measurementof high AC voltage in conjunction with capacitance dividers. Capacitance Voltage Transformer,Rotating Voltmeter for the measurement of DC high voltage, Electrostatic Voltmeter

Transient in power systems: Lightning Phenomena, Electrification of cloud, Development of Lightning Stroke, lightninginduced over voltage, direct stroke, indirect stroke.Protection of Electrical Apparatus against over voltage, Lightning Arrestors, Valve Type,Metal Oxide arresters, Expulsion type. Effect of location of lightning arresters on protectionof transformer. Protection of substation, Ground wires.Insulation Co ordination, Basic Insulation level.Basic Impulse level, Switching Impulse level. Volt time characteristics of protective devices, Determination of Basic Impulse level ofsubstation equipment.

High Voltage Testing:

High Voltage testing, Testing as per Indian Standard Specifications, Power frequencywithstand, induced over voltage and impulse test on transformers, Power frequency wetwithstand test and impulse test on insulators

Text Books:

1. High Voltage Engineering, C.L. Wadhawa, New Age International Publishers.
2. High Voltage Engineering, M.S. Naidu & V. Kamraju, Tata MC Graw Hill publication.
3. Book of Bgamude.

Reference Books:

1.High Voltage Engineering, M.A. Salem, H. Anis, A. E. Morahedy, R. Radwan, Marcel Dekker, Inc.

EE-604(b) Illumination Engineering 4-0-0-4-4:

Light, sight & color: Sources of light: Day light, artificial light sources, energy radiation, visible spectrum ofradiation, black body radiation and full radiator. Incandescence, dependence of light o/p ontemperature. Theory of gas discharge and production of light. Perception of light and color,optical system of human eye, eye as visual processor. Reflection, refraction and otherbehavior of light.

Measurement of light: Measurement of light - radiometric and photometric quantities, units of measurement,

standardization. Measurement of light distribution, direct and diffused reflection,fundamental concepts of colourimentry and measurement of colour.

Lamp, accessories & luminaries: Light production by gas discharge, fluorescence, incandescence, daylight principle of operation, light efficacy, color, electrical characteristics, typical applications, dimmingcondition of GLS filament, tungsten halogen lamps, fluorescent tubes, compact fluorescentlamp (CFL), low and high pressure sodium lamps, high pressure mercury lamp, metalhalide lamp.Functions of luminaries, classification, Materials Used in luminaries manufacturing,reflection, refraction, diffusion, polarization and optical design, photometric measurements,application data and its use.LED.

Interior lighting: Objectives quantity and quality of light, selection of lamps, luminaries section, placement.Design considerations for lighting of offices, conference rooms, hospitals, teaching places,house etc., design calculations.

Lighting control: Types of lighting controls, strategy for selection, benefits of lighting control.Electric distribution system for lighting, maintenance strategies, group replacementschedule.Techniques of achieving energy efficient lighting design, role of computers in lightingdesign, advantages and limitations of computer aided lighting design.

Text Books:

1. Utilization of Electric Power, C.L. Wadha, New Age International Ltd.
2. Generation, Distribution and Utilization of electrical energy, C.L. Wadha, New Age International Ltd.
3. Art and Science of Utilization of Electrical Energy, H. Partab, Dhanpat Rai & Sons.
4. Standard Hand Book for Electrical Engineers, Fink & Beaty, McGraw Hill International

EE-604(c) Energy Management and Audit 4-0-0-4-4:

Introduction: Energy Scenario, Energy Analysis of Fuels, Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Pricing, Energy Sector Reforms,

Energy and Environment: Air Pollution, Climate Change, Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features.

Basics of energy and it's various forms: (a) thermal (b) Electricity (c) Non-Conventional Sources Thermal: Different Fuels & its Energy Contents, Temperature & Pressure, Heat Capacity. Steam and Moist Air.

Electricity: AC & DC, Load Management, Maximum Demand Control, Aggregated Technical & Commercial Losses (ATC), Electricity Tariffs.

Non-Conventional: Concept of Renewable Energy and its Various Forms (Solar energy, Wind Energy, Bioenergy, Hydro energy, geothermal energy, Wave and tidal energy.). Some Applications related to Non-Conventional Energy Sources.

Energy Management: Need for Energy Management, Various Approaches, Cost Effectiveness, Bench Marking, Optimization of Energy Requirements and Maximization of System Efficiencies. Fuel and Energy Substitution..A Few Case Studies of Real Systems.

Energy Audit: Definition, Requirements for Energy Audit, Different Approaches viz, Preliminary and Detailed Energy Audit, Case Studies for Real Systems.

Books:

1. Albert : Plant Engineers & Managers Guide to Energy Conservation.
2. Wayne C. Turner Energy management handbook, John Wiley and Sons.
3. www.bee.org

REFERENCES:

1. NPC energy audit manual and reports
2.. Guide to Energy Management, Cape Hart, Turner and Kennedy
3.. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by NPC
4. M.K.Lahiri : Saving of Electricity by System Management. M.K. Lahiri Publication

EE-604(d) RENEWABLE & NON CONVENTIONAL ENERGY 4-0-0-4-4:

Introduction to Energy sources: Renewable and non-renewable energy sources, energy consumption as a measure of Nation's development; strategy formeeting the future energy requirements Global and National scenarios, Prospects of renewable energy sources. Impact ofrenewable energy generation on environment, Kyoto Protocol.

Solar Energy: Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solarradiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentratingcollectors, Solar air heaters-types, solar driers, storage of solar energy-thermal storage, solar pond , solar

water heaters,solar distillation, solar still, solar cooker, solar heating & cooling of buildings, photo voltaics - solar cells, different typesof PV Cells, Mono-poly Crystalline and amorphous Silicon solar cells. Design of PV array. Efficiency and cost of PVsystems& its applications. PV hybrid systems.

Wind Energy: Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, varioustypes and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis ofaerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations

Energy from Biomass: Biomass conversion technologies, Biogas generation plants, classification, advantages and disadvantages, constructionaldetails, site selection, digester design consideration, filling a digester for starting, maintaining biogas production, Fuelproperties of bio gas, utilization of biogas.

Geothermal Energy: Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dryrock, magma. advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

Energy from Ocean: Ocean Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC inIndia. Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages,limitation and scope of tidal energy. Wave energy and power from wave, wave energy conversion devices, advantages anddisadvantages of wave energy.

Magneto Hydrodynamic power generation: Principle of MHD power generation, MHD system, Design problems and developments, gas conductivity, materials forMHD generators and future prospects.

Hydrogen Energy: Introduction, Hydrogen Production methods, Hydrogen storage, hydrogen transportation, utilization of hydrogen gas,hydrogen as alternative fuel for vehicles.

Fuel cell: Introduction, Design principle and operation of fuel cell, Types of fuel cells, conversion efficiency of fuel cell, applicationof fuel cells

Text Books:

4. Non conventional Energy sources, G.D. Rai, Khanna Publishers.
5. Renewable energy sources and conversion technology, Bansal Keemann, Meliss, Tata Mc Graw Hill.
6. Non conventional Energy, Ashok V. Desai, New Age International Publishers Ltd.

Reference Books:

1. Renewable energy resources and emerging technologies, D.P. Kothari, Prentice Hall of India Pvt. Ltd.

Seventh semester:

EE-701 Electric Drives 4-0-0-4-4:

Electric Drive: Concept, classification, parts and advantages of electrical dives. Types of Loads, Componentsof load toques, Fundamental torque equations, Equivalent value of drive parameters for loadswith rotational and translational motion. Determination of moment of inertia, Steady statestability, Transient stability. Multiquadrant operation of drives. Load equalization.

Motor power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination ofmotor rating for continuous, short time and intermittent duty, equivalent current, torque andpower methods of determination of rating for fluctuating and intermittent loads. Effect of loadinertia& environmental factors.

Stating of Electric Drives:Effect of starting on Power supply, motor and load. Methods of stating ofelectric motors. Acceleration time Energy relation during stating, methods to reduce theEnergy loss during starting.

Braking of Electric Drives:

Types of braking, braking of DC motor, Induction motor and Synchronous motor, Energy lossduring braking,

DC motor drives: Modeling of DC motors**,** State space modeling, block diagram & Transfer function, Singlephase, three phases fully controlled and half controlled DC drives. Dual converter control ofDC drives. Power factor, supply harmonics and ripple in motor current chopper controlled DCmotor drives.

Induction motor drives: Stator voltage variation by three phase controllers, Speed control using chopper resistance inthe rotor circuit, slip power recovery scheme. Pulse width modulated inverter fed and currentsource inverter fed induction motor drive. Volts/Hertz Control, Vector or Field orientedcontrol.

Synchronous motor drives: Variable frequency control, Self Control, Voltage source inverter fed synchronous motordrive, Vector control.

Introduction to Solar and Battery Powered Drive, Stepper motor, Switched Reluctance motordrive
Industrial application: Drive consideration for Textile mills, Steel rolling mills, Cement mills, Paper mills, Machine tools. Cranes & hoist drives.

Text Books:

1. Fundamental of Electrical Drives, G.K. Dubey, New Age International Publication.
2. Electric Drives, Vedam Subrahmanyam, TMH
3. A first course on Electrical Drives, S.K. Pillai, , New Age International Publication.
4. Electrical Machines and Drives ,Manikandan, Published by Scitech Publications (India) Pvt. Ltd.

Reference Books:

1. Electric motor drives, R. Krishnan, PHI
2. Modern Power Electronics & Ac drives, B.K. Bose, Pearson Education.
3. Electric Motor & Drives. Austin Hughes, Newnes.

EE-791 Electric DrivesLab. 0-0-3-3-2:

1. Study of thysistor controlled DC Drive.
2. Study of Chopper fed DC Drive
3. Study of AC Single phase motor-speed control using TRIAC.
4. PWM Inverter fed 3 phase Induction Motor controlusing PSPICE / MATLAB / PSIM Software.
5. VSI / CSI fed Induction motor Drive analysis using MATLAB/DSPICE/PSIM Software.
6. Study of V/f control operation of 3Φinduction motor drive.
7. Study of permanent magnet synchronous motor drive fed by PWM Inverter using Software.
8. Regenerative / Dynamic braking operation for DC Motor - Study using software.
9. Regenerative / Dynamic braking operation of AC motor - study using software.
10. PC/PLC based AC/DC motor control operation.

HU-701 Financial Management &Accounts 3-0-0-3-3:

Introduction: Financial Management, Financial Planning and Capitalization- definitions, objectives, changing roles and functions, Financial Decision.

Capital Budgeting: Nature of Investment decision, Importance of Capital Budgeting, The Capital. Budgeting Process - Investment Criterion, Pay-back period, Accounting, ROR (Rate of Return) Method, Discounting Cash flow method, Net - present value method, IRR (Internal Rate of Return) method, The benefit-Cost Ratio method.

Management of Working Capital: Various concepts, Elements, Classification, Financing and importance of working capital, Investment analysis, Cash flow determination, cost of capital,capital budgeting methods.

Budgeting Control Technique: Concepts of Budget, budgeting and budgetary control, Objectives, Functions, Uses, Advantages, Limitations; Master Budget and Report.

Cost - Volume - Profit Analysis: Classification of costs, Allocation, apportionment and absorption, Cost centers, different costing systems, Cost analysis for managerial decisions, Meaning of Linear CVP analysis, Objectives, Assumptions, Break- Even analysis, determining the Break-Even point profit, Volume graph profit, Volume ratios margin of Safety.

Introduction to Accounting: Basic accounting concepts, important definitions, uses, limitations, advantages; types of Accounting, Financial statements, introduction to Journal Accounting; different types of Vouchers, double entry bookkeeping, different types of transactions related to Financial Accounting.

Financial Control: Posting of Ledgers and preparation of Trial Balance; preparation of Balance Sheet and Profit and Loss Accounts; Controlling other departments by Financial Accounting (A practical Approach).

Books:

1. Financial Management and Accounting - P. K. Jain, S. Chand & Co.
2. Management & Accounting: Principles and Practice- R. K. Sharma & Shashi Kumar Gupta, Kalyani Publishers.
3. Advanced Management Accounting - Kaplan & Atkinson, PHI.
4. Fundamentals of Financial Management - Van Home,PE.
5. Financial Mgmt Accounting, Gupta,Pearson
6. Financial Mgmt, I.M. Pandey, Vikas
7. Financial Mgmt., Khan & Jain, TMH
8. Financial Mgmt , Mcmenamin, OUP

9. Financial Mgmt & Policy, Van Horne, PHI
10. Financial Mgmt,Kulkarni& Satyaprasad, Himalaya

EE-702(a) Power System III 3-0-0-3-3:

Objectives of Power System Operation: Power Systems in Restructured Environment; Distributed and Dispersed Generation; Environment Aspects of ElectricPower Generation.

Economic Operation of Energy Generation Systems: Generation Cost Curves; Economic Operation of Thermal System; Plant Scheduling; Transmission Loss and PenaltyFactor; Hydro-Thermal Scheduling; Concept of Reserves and Constraints; Unit Commitment.

Automatic Generation Control: Concept of AVR and ALFC Loops, Significance of Double Loop in ALFC; Exciter and VAR Control; Single AreaLoad Frequency Control; Two Area Load Frequency Control; Frequency Response.

Compensation in Power System: Reactive Power Sensitivity and Voltage Control; Load Compensation with Capacitor Banks; Line Compensation withReactors; Shunt and Series Compensation; Fixed Series Capacitors; Thyristor Controlled Series Capacitors;Introduction to SVC and STATCOM.

Power System Transients: Types of System Transients; Overvoltage in Transmission Lines; Propagation of Surges and Travelling Waves;Protection Against Lightning and Surges;

Text Books

1. Power System Engineering, Kothari & Nagrath, Mc Graw Hill
2. Power System Analysis, Granger and Stevension, Mc Graw Hill
3. Electric Power Genration operation and control, Wood and Woolenberg, Willey.

Reference Books:

1. Power system stability and Control, P. Kundur , Mc Graw Hill
2. Modern power system analysis, Kothari & Nagrath, Mc.Graw Hill
3. Power system Analysis, Nagsarkar & Sukhija, Pearson
4. Power system analysis, operation and control, Chakrabarti and Halder, PHI
5. Book of Elgand.

EE-702(b) Control System-III 3-0-0-3-3:

Feedback Linearization:Motivation, Input–Output Linearization, Full-State Linearization, State Feedback Controland Stabilization.

Sliding Mode Control: Overview of SMC, Motivating Examples, Stabilization of second order system;Advantages and disadvantages.

Optimal control system: Formulation of optimal control problem: Minimum time, minimum energy, minimum fuelproblem, state regulator, output regulator & tracking problems.Calculus of variations: Constrained fixed point and variable point problems, EulerLagrange equations.Problems with equality and inequality constraints. Engineering application, Lagrange,Mayer& Bolza problems, Pontryagin's maximum (minimum) principle.Multiple decision process in discrete and continuous time - The dynamic programming.Numerical solution of two point boundary value problems - the steepest descent methodand the Fletcher - Powell Method.

Text Books:

1. Applied Nonlinear control, J.J.E. Slotine & W. Li, Prentice Hall
2. Modern Control theory, M. Gopal, 2nd Edition, New age international publishers.
3. Introduction to control system, D.K. Anand & R.B. Zmood, Asian book Pvt. Ltd.

Reference Books:

1. Adaptive control system, K.J. Astrom and B. Wittenamark, Addision WesleyPublishing Co
2.Nonlinear control systems, Springer Verlag..

EE- 702(c)Electrical Machines-III 3-0-0-3-3:

Generalised Theory of Electric machines.
Transients and dynamics of A.C Machines, Synchronous and Induction machines.
Direct Current machine Dynamics.
Space Vectors and its application to the analysis of electrical machines specially induction motors.

Motor behavior under asymmetrical voltage supply.
Harmonic effects on induction motor- harmonic equivalent circuit and harmonic torque.
References:
1.Electrical Machines, M.S.Sarma and M.K. Pathak, Cengage Learning
2.P.S Bimbra, Generalised theory of Electrical Machines, Khanna Publications
3.B.K Bose, Modern Power Electronics and a.c drive, Pearson Education
4.R. Krishnan,Electric Motor Drive, Prentice Hall of India(P) Ltd

EE- 702(d) Advanced Power Electronics 3-0-0-3-3:

DC-DC converters:Analysis and detailed design of buck, boost, buck-boost, Cuk and SEPIC converters, Analysis and detailed design of isolated dc-dc converters including forward, flyback, push-pull, full bridge and dual-active bridge topologies, Continuous and discontinuous current modes of operation, Linearized, small-signal average models of dc-dc converters, Voltage mode and current mode control design methods, Design of magnetics for dc-dc convertersPower management, Switching regulators for modern processors – multi-phase voltage regulators, design for high dynamic performance, switched capacitor converters, features of power management integrated circuits
Digital control of power electronic converters: Review of digital control systems, Digital control techniques for power converters; modeling and simulation.
Design examples of multi-phase VR, and PWM dc-ac converter, AC-DC PWM rectifiers.
Power quality issues: Boost and flyback converter based power factor correction circuits (PFC), Models, design and control of PFC, Full bridge bi-directional PWM rectifiers, applications in front end of motor drives, DC-AC PWM inverters, Voltage source inverters - topology and PWM techniques, Models of single phase and three phase inverters and control methods, Applications in low frequency AC synthesis.
Three-phase PWM techniquesGrid interface of renewable energy resourcesPower converters and control for interfacing solar and wind energy to gridDistributed generation and impact on power distribution systems, Microgrids and smart grid technologies using power electronic converters.
Soft switching and resonant converters : Concept of ZVS and ZCS, Zero voltage transition converters, Resonant converters and applications in lightingPractical issues in power electronic convertersSelection criteria for diodes, MOSFETs and IGBTs; gate drive circuits , Thermal management, EMI and layout issues

Books:

1. N. Mohan, T.M. Undeland, W.P. Robbins, “Power Electronics: Converters, Applications and Design,” John Wiley and sons, 3rd edition, 2003.
2. R.W. Erickson, D. Maksimovic, “Fundamentals of Power Electronics” Kluwer Academic Publishers, second edition.
3. NPTEL http://nptel.iitm.ac.in
4. Power quality enhancement using custom power devices, A. Ghosh and G. Ledwich, Kluwer Academic Publication, 2. Power quality, C. Shankran, CRC Press, 2001.
5. Handbook of power quality, editor: Angelo Baggini, John Wiley & Sons, 2008.
6. Electrical power systems quality Roger C. Dugan et al., Tata McGrawHill, 2002.
7. Instantaneous power theory and application to power conditioning, H. Akagi et al., IEEE Press, 2007.

EE-703(a) Power Plant Instrumentation& Control 3-0-0-3-3:

Concepts of Power plants of different types: Setups, energy conversions and measurementrequirements, examples of Thermal, Hydal, and Nuclear plants. Thermal power plant andsystem instrumentation.
Instrumentation for :(i) Turbines(ii) Condensers(iii) Generators(iv) Coal handling(v) Water treatment(vi) Feed water, combustion air and flue gases
Control:Boiler Control - Steam pressure control, combustion control, Furnace Draft control, Steamtemperature control, Feed water control, Data logger and computer control, supervisorycontrol and monitoring system.Instrumentation for safety interlocks - protective gears, emergency measures, Alarmsystems and Analysis etc. Pollution measurement, monitoring and control.
Data handling-processing, logging, acquisition, accounting, display and storage.Instrumentation for Generator and Busbar coupling.Introduction to power plant modeling/simulation

Text Books:

1. Principles of Industrial Instrumentation, D. Patranabis, TMH New Delhi
2. Power Plant Engineering, K.K. Ramalingam, Published by Scitech Publications (India) Pvt. Ltd.

Reference Books:

1. Electric Power Engineering Handbook – Edited by L. L. Grigsby.
2. Instrument Engineers Handbook, B. G. Liptak, Chilton Book Co., Philadelphia

EE-703(b) Sensors and Transducers 3-0-0-3-3:

Mechanical and Electromechanical sensor: Definition, principle of sensing & transduction, classification.Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: materials, design consideration, sensitivity, gauge factor,variation with temperature, adhesive, rosettes.
Reluctance change type, Mutual inductance change type,transformer action type, Magnetostrictive type, brief discussion with respect to material,construction and input output variable, Ferromagnetic plunger type, short analysis.
Construction, material, output input relationship, I/O curve, discussion.

Capacitive sensors: Variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth typeand cylindrical type, variable dielectric constant type, calculation of sensitivity.Stretched diaphragm type: microphone, response characteristics.Piezoelectric element: piezoelectric effect, charge and voltage co-efficient,crystal model, materials, natural & synthetic type, their comparison, force& stress sensing, ultrasonic sensors.

Thermal sensors: Material expansion type: solid, liquid, gas & vapor

Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermistermaterial, shape, ranges and accuracy specification.Thermo emf sensor: types, thermoelectric power, general consideration,Junction semiconductor type IC and PTAT type.Radiation sensors: types, characteristics and comparison.Pyroelectric type.

Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity,Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive,performance characteristics.Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive cell types,materials, construction, response.Geiger counters, Scintillation detectors, Introduction to smart sensors

Text Books:

1. Sensor & transducers, D. Patranabis, 2nd edition, PHI
2. Instrument transducers, H.K.P. Neubert, Oxford University press.
3. Measurement systems: application & design, E.A.Doebelin, Mc Graw Hill.

EE-703(c) Biomedical Instrumentation 3-0-0-3-3:

Fundamentals: Introduction to Physiological Systems –Organism, Cardiovascular, Respiratory, Renal,Hepatic, Gastrointestinal, Endocrinal, Nervous, Muscular, Cellular.Biological Signals – Bioelectric events, Biomechanical Systems, Cellular &Membranephenomenon. The Action Potential and Propagation through Nervous System. The Peripheral Nervous Systems and sensory mechanisms.Biomaterials.Fundamentals of Electrophysiology –EKG, EEG, EMG, Evoked potentials. Quantificationof Biological Signals.

Measurement & Analysis: Biological Sensors- Bio-electrodes, Biosensors and Transducers for Cardiology, Neurology, Pulmonary, Oxygen saturation & gaseous exchange, flow measurement,goniometry, Endoscopy, Impedance Plethysmography.Biological Amplifiers –Instrumentation Amplifiers for Electrophysiology(ECG, EMG, EEG, EOG), Filters, Power Supplies. Recording and Display systems, Digital Conversion for storage, Electrical Hazards inmeasurements, Isolation Circuits, calibration, alarms & Multi-channel re-constitution.Hospital requirements – Multi-parameter bed-side monitors, Central Nursing Stations,Defibrillators, Ventilators, Catheters, Incubators.

Life-Support & Treatment: Cardiac Support: Implantable & programmable Pacemakers, External & InternalDefibrillators, Coronary Angiography.Electro-physiotherapy: Shortwave & ultrasonic diathermy, Transcutaneous. Nerve Stimulators in pain relief, Traction Systems,Ultrasound in bone fracture regeneration, hypothermia & hyperthermia systems.Lasers in treatment and surgery : Opthalmic, Ablators, Endoscopic. Assists and Artificiallimbs- Orthoses , passive and powered Prostheses

Imaging: Fundamentals of X-Rays, Radiological Imaging, Digital Radiology, DSA.Computer Tomography, Image Processing, solid state sensors, whole-body scans.Gamma camera & radio- isotope imaging.Ultrasonography-Transducers, Signal Conditioners, 2D & 3D scans, Doppler &ColourDoppler.Fundamentals of Magnetic Resonance Imaging and PET – scans.

Books:

1. Handbook of Biomedical Instrumentation , R S Khandpur, Tata –Mcgraw Hill Education
2. Understanding the Human Machine- A Primer for Bioengineering, M E Valentiniuzzi , World Scientific Publishing Co.
3. Biomedical Instrumentation and Measurements, L Cornwell, F.J. Weibell & E.A. Pfeiffer, Prentice Hall.
4. Medical Instrumentation – Application & Design, J G Webster & J W. Clark , Houghton Miffin Publication.
5. Introduction to Bio-medical Equipment Technology, J J Carr & JM Brown Regents , Prentice Hall.
6. Design of Micro- controller based Medical Instrumentation, J Tompkins & J G Webster, Prentice Hall Inc
7. A systems approach to Biomedicine, W.B. Blesser , McGraw Hill..
8. . Biomedical Engineering, J H U Brown, J E Jacobs & L Stark, Davis Co, Philadelphia, USA.
9. Principles of Applied Biomedical Instrumentation, L A Geddes & L E Baker, John Wiley & sons.
10. Biological Control Systems, J H Milsum, Mc Graw Hill.
11.. Bioelectric Phenomena, R Plonsey, McGraw-Hill.

EE-703(d) PROCESS CONTROL 3-0-0-3-3:

General review of process, Process control & automation, Servo and regulatory control,Basic process control loop block diagram.Characteristic parameter of a process, Process quality, Process potential, Process resistance,Process capacitance, Process lag, Self regulation.Process modeling, Process equations-their limitations-general approach,. Typical processesand derivation of their functions.Characteristics and functions of different modes of control actions, Schemes and analysis ofOn-Off, Multistep, Floating, Time proportional, PID control.Effect of disturbances and variation in set point in process control.Offset-why it appears and how it is eliminated-analysis and mathematical treatment.

Process reaction curves, Controllability-using (i) deviation reduction factors (ii) gainbandwidth product, State controllability.Tuning controllers: both closed and open loop methods (Ziegler-Nichols, Cohen, PRCmethod and 3-C method of parameter adjustment)Electronic PID controller designPneumatic controllers-brief analysis. Different control strategies-schemes, brief analysis and uses(i) Ratio control(ii) Cascade control(iii) Feed forward control(iv) Multivariable control

Final control element: actuators (Pneumatic actuators, Electrical actuators) and controlvalves (Globe, Ball. Butterfly, Gate, Pinch), different parts, Fail Position, ValveCharacteristics, Cv, single & Double seated valves, Valve sizing, Valve selection,Cavitation, Flashing, Noise.Control valve accessories- Air filter regulator, I/P converter, Pneumatic positioner, ElectroPneumatic positioner, limit switches, Motion transmitter.Brief study of safety valves and Solenoid valves.

Introduction to Programmable Logic controllers- Basic Architecture and function, Inputoutputmodules and interfacing, CPU and memory, Relays, Timers, Counters and theiruses, PLC programming and applications, Introduction to DCS

Books:

1. Principle of Process control, D. Patranabis, TMH
2. Automatic Process Control, D.P. Eckman, John Wiley.
3. Process control, P. Harriott, Mc Graw Hill
4. Chemical process control, G. Stephanpoulos, PHI
5. Process control instrumentation technology, C.D. Johnson, PHI
6. Process Control-Principles and application, S. Bhanot, Oxford University press.
7. Process Control, S.K. Singh, PHI
8. Process dynamic & Control, S. Sundaram, Cengage Learning.
9. Instrument Engineers Handbook, B.G. Liptak, Chilton Book Co. Philadelphia.

EC(EE)-701(a) RF & Microwave Engg : 4-0-0-4-4:

Introduction:RF& Microwave Spectrum, Typical applications of RFand Microwave, Safety considerations.

Microwave Waveguide and Waveguide Resonator: Rectangular Waveguide- Design consideration, TE & TM modes, TE10mode analysis, cut-off frequency,propagation constant, intrinsic wave impedance, phase and group velocity, power transmission, attenuation, waveguide excitation, wall current; Introduction of circular waveguide; Rectangular waveguide resonator- Design consideration, resonantfrequency, Q-factor, excitation.

Planar Transmission line:Micro-strip lines, Coplanar waveguide, Slot line-design consideration, field patterns, propagation characteristics, Comparison for different characteristics of the above mentioned lines.

High frequency Circuit Elements: Difference in High frequency and relatively low frequency behavior of Lumped circuit components. Miniaturization and Design of Lumped components at High RF. Realization of reactive elements as Waveguide and Planar Circuit components.

Waveguide Passive Components and their S-matrix Representation: N-port networks-Properties of S matrix, Transmission matrix & their relationships; Microwave passive components and their S matrix representation: Attenuators, Phase shifter, Directional coupler, Bethe-hole coupler, Magic tee, hybrid ring, Circulators, Isolators; Design procedure of filter (maximally flat and equal ripple) using insertion loss method-specification, low-pass prototype design, scaling and conversion, implementation.

Microwave Tubes: Electron beam & Field interaction for energy exchange in resonant (two cavity klystron, Reflex Klystron, Magnetron) and non-resonant (TWT &BWO) microwave active devices: Typical characteristics & applications (only physical explanation is required, no mathematical derivation required).

Semiconductor Microwave devicesTED (Gunn diode) & Avalanche Transit Time (IMPATT) device, Schottky diode, PIN diode- characteristics & applications; Microwave bipolar transistor, Microwave field effect transistor(MESFET).

Microwave Amplifier Design: Basic consideration in the design of RF amplifier- Transistor S-parameter, Stability, matching network, noise figure; Matching network design using lumped elements and L-Section. Brief introduction to NBA, LNA.

Typical Microwave Test Bench & measurement: VSWR meter, Tunable detector, Slotted line and Probe detector, Frequency meter, Network analyzer, Measurement of VSWR – low, medium and high, Measurement of power: low, medium and high, Frequency measurement.

Books:

1. Microwave Engineering, 3Rd Ed David M. Pozar, Willey & Sons Inc.
2. Microwaves, K C Gupta, New Age Publishers.
3. Microwave Engineering, A Das & S Das, TMH.
4. Microwave Devices & Circuits, SY Liao , PearsonEducation /PHI
5.Microwave Engineering-Passive Circuits, PA Rizzi , Pearson Education.
6.Foundation of Microwave Engineering, 2ed edition, Robert E Collin, McGraw Hill, Inc.
7.Microwave Devices & Circuit Design , GP Srivastava & VL Gupta, PHI

EC(EE)-791(a) RF & Microwave Engg Lab : 4-0-0-4-4:

1. Determination of phase and group velocities in a waveguide carrying TE Wave from Dispersion diagram [ω−β Plot].
2. Measurement of unknown impedance using shift in minima technique using a waveguide test bench/ Measurement of the susceptance of an inductive and or a capacitive window using shift in minima technique using a waveguide test bench
3. Study of the characteristics of a Reflex Klystron oscillator
4. Study of Gunn-oscillator Characteristics using X-band waveguide test bench.
5. Measurement of coupling factor, Directivity, Insertion loss and Isolation of a Directional coupler using X-band waveguide test bench set up.
6. Scattering matrix of a magic tee / E-plane tee / H-plane tee using waveguide test bench at X-band.
7. Experimental/Simulation Study of filter (LPF, HPF,BPF) response.
8. Measuring of dielectric constant of a material using waveguide test bench at X-band.

EC(EE) -701(b) Digital Signal Processing 4-0-0-4-4:

Discrete-time signals: Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, sequences,-periodic, energy, power, unit-sample, unit step, unit ramp & complex exponentials, arithmetic operations on sequences.

LTI systems: Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercise, properties ofconvolution, interconnection of LTI systems with physical interpretations, stability and causality conditions, recursive and non recursive systems.

Discrete Time Fourier Transform(DTFT): Concept of frequency in discrete and continuous domain and their relationship (radian and radian/sec), freq. response in the discrete domain.Discrete system's response to sinusoidal/complex inputs (DTFT), Representation ofLTI systems in complex frequency domain.

Z- Transforms: Definition, mapping between s-plane & z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequenceswith examples & exercises, characteristic families of signals along with ROC, convolution, correlation and multiplication using Z- transform, initial value theorem, Perseval's relation, inverse Z-

transform by contour integration, power series & partial-fraction expansions with examples and exercises.
Discrete Fourier Transform: Concept and relations for DFT/IDFT, Relation between DTFT & DFT. Twiddle factors and their properties, computational burden on direct DFT, DFT/DFT as linear transformation, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circulation convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences-Overlap-Save and Overlap-Add methods with examples and exercises.
Fast Fourier Transforms: Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithm, signal flow graph, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises.
Filter design: Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transform, design of linear phase FIR filters no. of taps, rectangular, Hamming and Blackman windows. Effect of quantization.
Digital Signal Processor: Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs in assembly Language.
FPGA: Architecture, different sub-systems, design flow for DSP system design, mapping of DSP algorithms onto FPGA.
Books:

1. Digital Signal Processing-A computer based approach, S. Mitra, TMH
2. Digital Signal Processing: Principles, Algorithms & Application, J.C. Proakis & M.G. Manslakis, PHI
3. Fundamental of Digital Signal Processing using MATLAB , Robert J. Schilling, S.L. Harris, Cengage Learning.
4. Digital Signal Processing-implementation using DSP microprocessors with examples from TMS320C54XX, Avtar Singh & S. Srinivasan, Cengage Leasrning
5. Digital Signal Processing, Chen, OUP
6. Digital Signal Processing, Johnson, PHI
7. Digital Signal Processing using MATLAB, Ingle, Vikas.
8. Digital Signal Processing, Ifeachor, Pearson Education.
9. Digital Signal Processing, A.V. Oppenhein & R.W. Shaffer, PHI
10. Theory and application of Digital Signal Processing, L.R. Rabiner & B. Gold, PHI
11. Digital Signal Processing, Ashok Ambarder, Cengage Learning.
12. Digital Signal Processing, S. Salivahanan, A. Vallavaris & C. Gnanpruja, TMH.
13. Xilinx FPGA user manual and application notes

EC(EE) -791(b) Digital Signal Processing Lab. 0-0-3-3-2:

Simulation Laboratory using standard Simulator:

1. Sampled sinusoidal signal, various sequences and different arithmetic operations.
2. Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.
3. Z-transform of various sequences – verification of the properties of Z-transform.
4. Twiddle factors – verification of the properties.
5. DFTs / IDFTs using matrix multiplication and also using commands.
6. Circular convolution of two sequences using graphical methods and using commands, differentiation between linear and circularconvolutions.
7. Verifications of the different algorithms associated with filtering of long data sequences and Overlap –add and Overlap-save methods.
8. Butterworth filter design with different set of parameters.
9. FIR filter design using rectangular, Hamming and Blackman windows.

Hardware Laboratory using either 5416 or 6713 Processor and Xilinx FPGA:

1. Writing & execution of small programs related to arithmetic operations and convolution using Assembly Language of TMS320C
5416/6713 Processor, study of MAC instruction.
2. Writing of small programs in VHDL and downloading onto Xilinx FPGA.
3. Mapping of some DSP algorithms onto FPGA.

EC(EE) -701(c) Optical Communication & N/W 4-0-0-4-4:

Introduction to communication systems: Principles, components; Different forms of communications in brief, advantages of optical fibre communication, spectral characteristics.

Optical Fibre wave guide: Structure, Single and Multimode operation; Attenuation, Material and wave guide dispersion.

Optical Sources: Light Emitting Diode; principle, structures, powerand efficiency, coupling to fibres.

Laser diodes; principle, double heterostructure, gain and index guiding, distributed lasers.Quantum Well Lasers; Modes and narrow linewidth lasers. Modulation; Bandwidth for modulation, Optical transmitters: components.

Optical Detectors: Device types, optical detection principles, efficiency, responsivity, bandwidth. Preamplifiers; noise sources, signal to noise ratio.

Point-to-point link and Wavelength Division Multiplexing:Building blocks; Multiplexing; Intensity Modulation/Direct Detection system; Principle of Regeneration; WDM link, Optical amplifiers; EDFA, SOA, Raman amplifier, Fabry-Perot filters. Dispersion compensation and management, Link analysis and Bit-Error-Rate calculation.

Optical Network: LAN, MAN, WAN; Topologies: bus, star, ring; Ethernet; FDDI; Telecom networking:SDH/SONET.

Different forms of access networks: Telephony; ISDN; Cable TV; Broadcast and Switched Networks; HFC networks; FTTC and FTTHnetworks; All optical networks.

Books:

1. Optical Networks – A practical perspective : Rajiv Ramaswami, K. N. Sivarajan, Galen H. Sasaki (Morgan-Kaufman)
2. Optical Fibre Communication : John M. Senior (Pearson)
3. Optical Fibre Communication : Gerd Kaiser (TMH)
4. Optical Communication Systems : John Gawar (PHI)

EC(EE) -791(c) Optical Communication & N/W Lab. 0-0-3-3-2:

Experiment with Optical fibre:

1. To calculate attenuation constant, bending loss andnumerical aperture of optical fibre.
2. Experiments using LED module: Study of DC characteristics.
3. I-V characteristics of LED (i) using optical fibrebetween LED and power meter and (ii) without usingoptical fibre.
4. P-I characteristics of LED (i) using optical fibre between LED and power meter and (ii) without using optical fibre.
5. Experiment with fibre Optic analog link:
6. Input-output characteristics using long optical fibre. Calculation of attenuation per unit length of optical fibre.

EC(EE)-701(d) Digital Communication : 4-0-0-4-4:

Probability Theory and Random Processes:Conditional probability, communication example, joint probability, statistical independence,random variable-continuous and discrete, cumulative distribution function, probabilitydensity function – Gaussian, Rayleigh and Rician, mean, variance, random process,stationary and ergodic processes, correlation coefficient, covariance, auto correlationfunction and its properties, random binary wave, power spectral density.

Signal Vector Representation: Analogy between signal and vector, distinguishibility of signal, orthogonality andorthonormality, basis function, orthogonal signal space, message point, signal constellation,geometric interpretation of signals, likelihood functions, Schwartz inequality, Gram-Schmidtorthogonalization procedure, response of the noisy signal at the receiver, maximumlikelihood decision rule, decision boundary, optimum correlation receiver; probability of error , error function, complementary error function, Type-I and Type-II errors

Digital Data Transmission: Concept of sampling, Pulse Amplitude Modulation (PAM), interlacing and multiplexing of samples, Pulse Code Modulation (PCM), quantization, uniform and non-uniform quantization,quantization noise, binary encoding, A-Law and b -law companding, differential PCM, deltamodulation and adaptive delta modulation. Digital transmission components, source,multiplexer, line coder, regenerative repeater, concept of line coding – polar/unipolar/bipolarNRZ and RZ, Manchester, differential encoding and their PSDs, pulse shaping, Inter SymbolInterference. (ISI), Eye pattern, Nyquist criterion for zero ISI, equalizer, zero forcing equalizer,timing extraction.

Digital Modulation Techniques: Types of Digital Modulation, coherent and non-coherent Binary Modulation Techniques,basic digital carrier modulation techniques: ASK, FSK and PSK, Coherent Binary PhaseShift Keying (BPSK), geometrical representation of BPSK signal; error probability ofBPSK, generation anddetection of BPSK Signal, power spectrum of BPSK. Concept of M-ary Communication,M-ary phase shift keying, the average probability of symbol error

for coherent M-ary PSK,power spectra of MPSK,Quadrature Phase Shift Keying (QPSK), error probability of QPSK signal, generation anddetection of QPSK signals, power spectra of QPSK signals, Offset Quadrature Phase shiftQueuing (OQPSK), Coherent Frequency Shift Keying (FSK), Binary FSK, error probabilityof BFSK signals, generation and detection of Coherent Binary FSK signals, power spectraof BFSK signal, Minimum Shift Keying (MSK), signal constellation of MSK waveforms,error probability of MSK signal, Gaussian Minimum Shift Keying: GMSK, basic concept ofOFDM, constellation diagram, Some performance issues for different digital modulationtechniques - Error Vector Magnitude (EVM), Eye Pattern and RelativeConstellation Error (RCE), Conceptual idea for Vector Signal Analyzer (VSA).

Books:

1. Digital Communications, S. Haykin, Wiley India.
2. Principles of Communication Systems, H. Taub and D.L.Schilling, TMH Publishing Co.
3. Wireless Communication and Networks: 3G and Beyond, I. Saha Misra, TMH Education.
4. Digital Communications, J.G.Proakis, TMH Publishing Co.
5. Digital Communications Fundamentals and Applications, B. Sklar and P.K.Ray,Pearson Education.
6. Modern Digital and Analog Communication Systems, B.P.Lathi and Z.Ding, OxfordUniversity Press.
7. Digital Communication, A. Bhattacharya, TMH Publishing Co.

EC(EE)-791(d) Digital Communication Lab. : 0-0-3-3-2:

1. Design, implementation and study of all the properties of 7-length and 15-length pn sequences using shift register.
2. Study of PAM and demodulation.
3. Study of PCM and demodulation.
4. Study of line coders: polar/unipolar/bipolar NRZ ,RZ and Manchester.
5. Study of delta modulator and demodulator.
6. Study of adaptive delta modulator and demodulator. Study of BPSK modulator and demodulator.
7. Study of BFSK modulator and demodulator.
8. Study of ASK modulator and demodulator.
9. Study of QPSK modulator and demodulator.
10. Simulation study of probability of symbol error forBPSK modulation.
11. Simulation study of probability of symbol error forBFSK modulation.

EE-781 Electrical Design Sessional -I 1-0-3-4-3:

Some problems to be taken up from the following jobs and some problems to be taken up in 8th semester through EE-882Electrical Design sessional-II:

- Designing a heating element with specified wattage, voltage and ambient temperature.
- Designing an aircore grounding reactor with specified operating voltage, nominal current and fault current.
- Designing the power distribution system for a small township.
- Designing a double circuit transmission line for a given voltage level and power (MVA) transfer.
- Wiring and installation design of a multistoried residential building (G+4,not less than 16 dwelling flats with a lift and common pump)
- Wiring and installation design of an office building with lift, AC, pump etc.
- Electronic circuit design and component selection
- Power Amplifier Design
- OPAMP circuits design
- Digital design
- Wiring and installation design of a multistoried hospital building with lift, common pump, AC etc.
- Compensation design in control m system.
- Designing of a substation
- Designing an ONAN distribution transformer.
- Designing a three phase squirrel cage induction motor.
- Designing a three phase wound rotor induction motor.
- Designing a split phase squirrel cage induction motor for a ceiling fan or a domestic pump.

- Designing a permanent magnet fractional hp servo motor .
- Designing an instrumentation system.

EE-782 Industrial Training Evaluation 0-0-3-3-2:

Student has to deliver a seminar on Industrial Training conducted after 6th semester

EE-783 Project-I 0-0-3-3-2:

A preliminary / short project to be carried out after discussions with project supervisor.

8th semester:

EE-801 UTILISATION OF ELECTRIC POWER 4-0-0-4-4:

Electric Traction : Requirement of an ideal traction system, Supply system for electric traction, Train movement(speed time curve, simplified speed time curve, average speed and schedule speed),Mechanism of train movement (energy consumption, tractive effort during acceleration,tractive effort on a gradient, tractive effort for resistance, power & energy output for thedriving axles, factors affecting specific energy consumption, coefficient of adhesion).

Electric traction motor & their control:Parallel and series operation of Series and Shunt motor with equal and unequal wheeldiameter, effect of sudden change of in supply voltage, Temporary interruption of supply,Tractive effort and horse power.Use of AC series motor and Induction motor for traction.Traction motor control:DC series motor control, Multiple unit control, Braking of electric motors, Electrolysis bycurrent through earth, current collection in traction system, Power electronic controllers intraction system.

Illumination: The nature of radiation, Polar curve, Law of illumination, Photometry(Photovoltaic cell, distribution photometry, integrating sphere, brightness measurement),Types of Lamps: Conventional and energy efficient, Basic principle of light control, Differentlighting scheme & their design methods, Flood and Street lighting.

Electric Heating welding: Types of heating, Resistance heating, Induction heating, Arc furnace, Dielectric heating,Microwave heating.

Electrolytic processes:Basic principles, Faraday's law of Electrolysis, Electro deposition, Extraction and refining ofmetals, Power supply of Electrolytic processes.

Text Books:

1. Generation Distribution and Utilization of Electrical Energy, C.L. Wadhawa, New Age InternationalPublishers.
2. Art and Science of Utilization of Electrical Energy, H. Partab, Dhanpat Rai & Sons.
3. Utilisation of Electric Energy, E.Openahaw Taylor, Orient Longman

EE- 802 (a) FACTS & HVDC Transmission 4-0-0-4-4:

Introduction: Introduction of DC power transmission technology, comparison of AC and DCtransmission, limitation of HVDC transmission, reliability of HVDC systems, application ofDC transmission, description of DC transmission system, planning for HVDC transmission,modern trends in DC transmission.

Analysis of HVDC converters: Choice of converter configuration, simplified analysis of Graetz circuit, converter bridgecharacteristics, Characteristics of a twelve pulse converter, detailed analysis of converters.

Control of HVDC converter and systems: Necessity of control of a DC link, rectifier control, compounding of rectifiers, power reversalof DC link, voltage dependent current order limit(VDCOL) characteristics of the converter,inverter extinction angle control, pulse phase control, starting and stopping of DC link,constant power control, control scheme of HVDC converters.

Harmonics and filters: Generation of harmonics by converters, characteristics of harmonics on DC side,characteristics of current harmonics, characteristic variation of harmonic currents withvariation of firing angle and overlap angle, effect of control mode on harmonics,noncharacteristic harmonic.Harmonic model and equivalent circuit, use of filter, filter configuration, design of bandpassand high pass filter, protection of filters, DC filters, power line communication and RI noise, filters with voltage source converter HDVC schemes.

Fault and protection schemes in HVDC systems: Nature and types of faults, faults on AC side of the converter stations, converter faults, faulton DC side of the systems, protection against over currents and over voltages, protection offilter units.

Multiterminal HVDC systems: Types of multiterminal (MTDC) systems, parallel operation aspect of MTDC. Control ofpower in MTDC. Multilevel DC systems.Power upgrading and conversion of AC lines into DC lines, Parallel AC/DC systems,FACTS and FACTS converters.

Text Books:

1. HVDC Transmission, S. Kamakshaiah & V. Kamaraju, Tata McGraw hill education.
2. HVDC Power transmission system, K.R.Padiyar, Wiley Eastern Limited.

Reference Books:

1. The Performance, Operation and Control of EHV Power Transmission Systems,A. Chakraborty, D.P. Kothary, A.K. Mukhopadhyay, Wheeler Pub.

2. High Voltage Direct Current Transmission, J. Arrillaga, Peter Pregrinu.Extra High Voltage AC Transmission Engineering, Rakosh Das Begamudre, NewAge International (P) Ltd.
3. High Voltage Direct Current Power Transmission, Colin Adamson and N.G.Hingorani,Garraway Limited, London

EE-802(b)Power Plant Engineering 4-0-0-4-4:

Introduction: Power and energy, sources of energy, review of thermodynamic cycles related to powerplants, fuels and combustion calculations.Load estimation, load curves, various terms and factors involved in power plantcalculations. Effect of variable load on power plant operation, Selection of power plant.

Power plant economics and selection:Effect of plant type on costs, rates, fixed elements, energy elements, customer elements andinvestor's profit; depreciation and replacement, theory of rates. Economics of plantselection, other considerations in plant selection.

Steam power plant: General layout of steam power plant, Power plant boilers including critical and supercritical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systemssuch as coal handling system, pulverizers and coal burners, combustionsystem, draft, ash handling system, Dust collection system, Feed water treatment andcondenser and cooling towers and cooling ponds, Turbine auxiliary systems such asgoverning, feed heating, reheating, flange heating and gland leakage. Operation andmaintenance of steam power plant, heat balance and efficiency, Site selection of a steampower plant.

Diesel power plant: General layout, Components of Diesel power plant, Performance of diesel power plant, fuelsystem, lubrication system, air intake and admission system, supercharging system, exhaustsystem, diesel plant operation and efficiency, heat balance, Site selection of diesel powerplant, Comparative study of diesel power plant with steam power plant.

Gas turbine power plant: Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation andmaintenance, Combined cycle power plants, Site selection of gas turbine power plant .

Nuclear power plant: Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclearreactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear powerplants. Hydro electric station Hydrology, Principles of working, applications, site selection,classification and arrangements, hydro-electric plants, run off size of plant and choice ofunits, operationand maintenance, hydro systems, interconnected systems.Non Conventional Power PlantsIntroduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc.

Electrical system: Generators and their cooling, transformers and their cooling.Instrumentation Purpose, classification, selection and application, recorders and their use,listing of various control rooms.Pollution due to power generation.

Text Books:

1. Power Plant Engineering, P.K. Nag, Tata McGraw Hill.
2. Power Plant Engineering, F.T. Morse, Affiliated East-West Press Pvt. Ltd, NewDelhi/Madras
3. Power Plant Technology El-Vakil, McGraw Hill.

Reference Books:

1. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House

EE-802(c)Power Generation and Economics 4-0-0-4-4:

Economics of Generation : Cost of power generation- Thermal, Hydro and Nuclear. Types of Consumers in a distributionsystem-Domestic, Commercial, Industrial etc. Concept of load factor, plant capacity factor,plant use factor, diversity factor, demand factor. Choice of size and number of generationunits.

Tariff-:Block rate, flat rate, two part, maximum demand, Power factor and three part tariffs.Subsidization and Cross subsidization.Availability tariff of generation companies.Pool tariffof transmission companies. Availability based tariff (ABT).

Unit Commitment: Constraints in Unit Commitment, Spinning reserve, Thermal unit constraints, Hydroconstraints, Must run, Fuel constraints. Unit commitment solution methods,

Economic Dispatch:Transmission loss formulae and its application in economic load scheduling.Computational methods in economic load scheduling. Active and reactive poweroptimization.

State Estimation and load forecasting in power system:

Introduction, state estimation methods, concept of load forecasting, load forecasting techniqueand application in power system.

Text Books:

1. Economic operation of Power System, L.K. Kirchmayar John Wiely, Newyork.
2. Power system Analysis, operation & control, Chakrabarty & Haldar, 2nd edition, PHI.
3. Modern power system analysis, D.P. Kothari & I.J. Nagtrath, Tata McGraw Hill.

References:

1. Power generation operation & control, A.J. Wood & B.F. Wollenberg, Wiley India.
2. Operation and control in power system, P.S.R. Murthy, BSP Publication.

EE-802(d) Power System Dynamics & Control 4-0-0-4-4:

Modeling of Power System Components: Modeling of a synchronous generator along with its components(exciter and turbine), Modeling of a regulating transformer, three phase modeling, modeling of three phase single circuit transmission line, modeling of a pair of three phase mutually coupled transmission line, modeling of shunt capacitor and inductor, modeling of a series capacitor, modeling of an induction motor, modeling of a series capacitor, modeling of a SVC, power network modeling, modeling of a load.

Reactive Power Flow and Voltage Control Problems: Reactive power-voltage coupling concept, reactive power and voltage regulation, load bus reactive power sensitivity, effect of series reactive loss, reactive power requirement for control of voltage in long lines, concept of voltage stability and system voltage expression, stability margins, fundamental aspects of analysis of power system voltage stability- static and dynamic analysis, QV operation of on load tap changer in voltage stability, load flow and voltage stability, voltage security, magnitude and power angle of receiving end bus voltage at voltage stability limit.

Power System Compensation and FACTs Devices; Load compensation, line compensation, passive compensation – static shunt capacitor and reactor, uniformly distributed shunt compensation, shunt compensation at middle of the line using dynamic compensator, series capacitor compensator, comparison between shunt and series compensation, FACTs controllers, (series type, shunt type, combined shunt and series type FACTs controller), advantages of FACTs devices.

Small Signal Stability and Subsynchronous Resonance: Introduction, stability of a dynamic system, modes of oscillation, mechanism of tie line oscillator, small signal stability of a single machine on infinite bus (SMIB), modeling of small signal stability, effect of exciter on small signal stability, SSR in series compensated systems, modeling and analysis of mechanical system and analogy with electrical system, countermeasures to SSR.

Books

1. Power system analysis, operation and control. A.Chakrabarti and S. Halder, PHI publication, (3rd Edn.)
2. Power system dynamics, stability and control. K.R. Padiyar, BS publication. (2nd Edn.)
3. Reactive power control and voltage stability of EHV power transmission system. A. Chakrabarti, D,P Kothari,. A.K Mukhapadhyay and A.De, PHI publication.(1st Edn.)

EE-803(e) AI and Soft Computing 4-0-0-4-4:

Introduction: Intelligent Agents – Agents and environments - Good behavior – The nature ofenvironments – structure of agents - Problem Solving - problem solving agents – exampleproblems – searching for solutions – uniformed search strategies - avoiding repeated states –searching with partial information.

Searching techniques: Informed search and exploration – Informed search strategies – heuristic function – localsearch algorithms and optimistic problems – local search in continuous spaces – onlinesearch agents and unknown environments - Constraint satisfaction problems (CSP) –Backtracking search and Local search for CSP – Structure of problems - Adversarial Search –Games – Optimal decisions in games – Alpha – Beta Pruning – imperfect real-time decision– games that include an element of chance.

Knowledge representation: First order logic – representation revisited – Syntax and semantics for first order logic – Usingfirst order logic – Knowledge engineering in first order logic - Inference in First order logic –prepositional versus first order logic – unification and lifting – forward chaining – backwardchaining - Resolution - Knowledge representation - Ontological Engineering - Categories andobjects – Actions - Simulation and events - Mental events and mental objects.

Learning: Learning from observations - forms of learning - Inductive learning - Learning decision trees- Ensemble learning - Knowledge in learning – Logical formulation of learning – Explanationbased learning – Learning using relevant information – Inductive logic programming -Statistical learning methods - Learning with complete data - Learning with hidden variable -EM algorithm - Instance based learning - Neural networks - Reinforcement learning –Passive reinforcement learning - Active reinforcement learning - Generalization inreinforcement learning.

Applications: Communication – Communication as action – Formal grammar for a fragment of English –Syntactic analysis – Augmented grammars – Semantic interpretation – Ambiguity anddisambiguation – Discourse understanding – Grammar induction - Probabilistic languageprocessing - Probabilistic language models – Information retrieval – Information Extraction– Machine translation.

Text Books:

Artificial Intelligence – A Modern Approach", Stuart Russell, Peter Norvig, 2nd Ed. Pearson Education /PHI, 2004.

Reference Books:

1. Artificial Intelligence: A new Synthesis, Nilsson. J. Nils , Harcourt Asia Pvt. Ltd., 2000.
2. Artificial Intelligence, Rich Elaine & Knight Kevin, 2nd Edition, Tata McGraw-Hill, 2003.
3. Artificial Intelligence-Structures and Strategies for Complex Problem Solving, Geogre

F. Luger, Pearson Education / PHI, 2002.

EE- 803 (f) Advanced Electric Drives 4-0-0-4-4:

Introduction:. Classification of Electric Drives, Requirements of Electric Drives, c. Some Applications

Converters and control: Phase controlled converters, Four quadrant operation , Choppers, AC to DC converters.

DC motor drives: Speed-torque characteristics DC shunt, PMDC and series motors, Dynamic model, c. Speed and position control methods

Inverters and PWM techniques: voltage source inverters, current source inverters, PWM techniques

- sine-triangle comparison, harmonic elimination, hysteresis current controllers , space vector pwm.

AC motor drives: d-q model of induction motor, constant flux speed control structure, vector control model , vector control structure.

Text Books:

1. Fundamental of Electrical Drives, G.K. Dubey, New Age International Publication.
2. Electric Drives, Vedam Subrahmanyam, TMH
3. A first course on Electrical Drives, S.K. Pillai, , New Age International Publication.

Reference Books:

1. Electric motor drives, R. Krishnan, PHI
2. Modern Power Electronics & Ac drives, B.K. Bose, Pearson Education.
3. Electric Motor & Drives. Austin Hughes, Newnes.

EC(EE)-801(a) Digital Image Processing Systems: 4-0-0-4-4:

Introduction to structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, storage, Processing, Communication, Display Image Sampling and quantization, Basic relationships betweenpixels.

Image Transforms (implementation):Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D FT, FFT, IFFT,Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimumtransform: Karhunen – Loeve Hotelling) transform.

Image Enhancement in the Spatial and Frequency Domain:Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatialfiltering: Introduction, Smoothing and sharpening filters. Frequency domain filters: Homomorphic filtering.
Image Data Compression:Fundamentals, Redundancies: Coding, Inter pixel Psycho-visual, fidelity criteria, Imagecompression models, Error free compression, Lossy compression, Image compressionstandards: Binary image and Continuous tone Still Image compression standards, Videocompression standards.
Morphological Image Processing:Introductions, Dilation, Erosion, Opening, closing, Hit -or-miss transformation,Morphological algorithm operations on binary Images, Morphological algorithm operationson gray-scale Images.Image Segmentation, Representation and Description:Detection of discontinuities, Edge linking and Boundary detection, Thresholding regionbased segmentation, Image Representation schemes, Boundary descriptors, and Regional descriptors.

Text Books:
1. Digital Image Processing, R.C Gonzalez and R. Woods, Pearson publication.
2. Digital Image Processing, Anil K. Jain, Prentice-Hall, India.

Reference Books:
1. Digital Image Processing, W.K. Pratt 2nd Edition, John Wiley & Sons.
2. Digital Image Processing and Analysis, B. Chanda & D. Dutta Majumder Prentice-Hall, India.
3. Image Processing- Theory, Algorithms & Architecture, M. A. Sid-Ahmed, McGraw-Hill.

EC(EE)-801(b) Communication Engineering : 4-0-0-4-4:

Elements of communication system: The elements of a communication system, origin of noise and its effect, importance of SNRin system design.Basic principle of linear (AM) modulation, Generation of AM waves, Demodulation of AMwave.Basic principle of nonlinear (FM, PM) modulation.Generation of FM waves.Demodulation of FM waves.Sampling theorem, sampling rate, impulse sampling, reconstruction from samples,Aliasing.Analog pulse modulation-PAM (natural & flat topped sampling), PWM, PPM.Basic concept of Pulse code modulation, Block diagram of PCM, Multiplexing-TDM,FDM.
Digital transmission: Concept of Quantization & Quantization error, Uniform quantizer, Non-uniform quantizer,A-law and μ -law. Encoding, coding efficiency.Line coding & properties, NRZ & RZ,AMI, Manchester coding, PCM, DPCM. Base band pulse transmission, Matched filter,error rate due to noise, ISI, Raised cosine function, Nyquist criterion for distortion-less baseband binary transmission, Eye pattern, Signal power in binary digital signal.
Digital carrier modulation & demodulation technique: Bit rate, Baud rate, Information capacity, Shanon's limit, M-ary encoding, Introduction tothe different digital modulation techniques-ASK.FSK, PSK, BPSK, QPSK, mention of 8BPSK, 16 BPSK.Introduction to QAM, basic of 8 QAM, 16 QAM.Basic concept of Delta modulating, Adaptive delta modulation.Introduction to the concept DPCM.Basic concept of spread spectrum modulation.
Introduction to coding theory: Introduction, News value & Information content, Entropy, Mutual information, Informationrate, Shanon-Fano algorithm for encoding, Shanon's theorem- source coding theorem,Channel coding theorem, Information capacity theorem.Basic principle of Error control & coding.

Text Books:
1. An Introduction to Analog and Digital communication, Simon Haykin, Wiely India.
2. Analog communication system, P. Chakrabarti, Dhanpat Rai & Co.
3. Principle of digital communication, P. Chakrabarti, Dhanpat Rai & Co.
4. Modern Digital and Analog Communication systems, B.P. Lathi, Oxford university press

Reference Books:
1. Digital and Analog communication Systems, Leon W Couch II, PearsonEducation Asia.
2. Communication Systems, A.B. Calson, Mc Graw Hill.

EC(EE)-801(c) VLSI & MICROELECTRONICS 4-0-0-4-4:

Introduction to VLSI Design: VLSI Design Concepts, Moor's Law, Scale of Integration(SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & DigitalVLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI –Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical),Y-Chart, Digital VLSI Design Steps.

MOS structure: E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flatbandvoltage, Potential balance & Charge balance, Inversion, MOS capacitances.**Three Terminal MOS Structure:** Body effect.**Four Terminal MOS Transistor**: Drain current, I-V characteristics. Current-voltageequations (simple derivation).**Scaling in MOSFET**: Short Channel Effects, General scaling, Constant Voltage & Field scaling.**CMOS**: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate usingCMOS.
Micro-electronic Processes for VLSI Fabrication: Silicon Semiconductor Technology- AnOverview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion,Cleaning, Etching, Photo-lithography– Positive & Negative photo-resist.
Basic CMOS Technology – (Steps in fabricating CMOS), Basic n-well CMOS process, p-wellCMOS process, Twin tub process, Silicon on insulator**Layout Design Rule**: Stick diagram with examples, Layout rules.
Hardware Description Language – VHDL or Verilog Combinational & Sequential Logiccircuit Design.
Text Books:
1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.
2. CMOS Digital Integrated Circuit, S.M.Kang & Y.Leblebici, TMH.
3. Modern VLSI Design, Wayne Wolf, Pearson Education.
4. VHDL, Bhaskar, PHI.
5. Advance Digital Design Using Verilog , Michel D. Celliti, PHI

References:
1. Digital Integrated Circuits, Demassa & Ciccone, John Willey &Sons .
2. Modern VLSI Design: system on silicon, Wayne Wolf; Addison Wesley Longman Publisher
3. Basic VLSI Design, Douglas A. Pucknell & Kamran Eshranghian, PHI
4. CMOS Circuit Design, Layout & Simulation, R.J.Baker, H.W.Lee, D.E. Boyee, PHI

EC(EE) -801(d) Embedded System 4-0-0-4-4:

Introduction to Embedded systems: Introduction – Features – Microprocessors – ALU - Von Neumann and Harvard Architecture - CISC and RISC - Instruction pipelining.
Microcontroller: characteristics and Features, Overview and architectures of Atmel 89C52 and Microchip PIC16F877 and 18F452.
Examples of embedded Systems: Bar-code scanner, Laser printer, Underground tank monitoring.
PIC Microcontroller: PIC Microcontrollers: 16F877 Architecture and Instruction Set. External Interrupts, Timers, watch-dog timer, I/O port Expansion, analog-to-digital converter, UART, I2C and SPI Bus for Peripheral Chips, Accessories and special features
Software architecture and RTOS: Software Architecture: Round Robin- Round Robin with interrupts -Function Queue. Scheduling
Architecture RTOS: Architecture -Tasks and Task States -Tasks and Data -Semaphores and Shared Data - Message Queues -Mail Boxes and pipes -Timer Functions -Events -Memory Management, Interrupt , Routines
Basic design using a real time operating system: Overview. General principles.Design of an embeddedsystem.
Software development tools and debugging techniques: Development Tool: Cross-Compiler, Cross-Assemblers,Linker/locator. PROM Programmers, ROM Emulator, In-Circuit Emulators. Debugging Techniques. Instruction set simulators. The assert macro. Testing using laboratory tools.
Text Books:
1. Embedded Systems Architecture, Programming and Design, Ral KamalTMH, 2008.
2. An Embedded Software Primer, D.E. Simon. Pearson Education, 1999.
3. Design with PIC Microcontrollers, J.B. Peatman,Pearson Education, 1998

Reference Books:
1. Embedded Systems Design, Heath Steve, Second Edition-2003, Newnes,
2. Computers as Components; Principles of EmbeddedComputing System Design, Wayne Wolf Harcourt India, Morgan Kaufman Publishers, First Indian Reprint. 2001.
3. Embedded Systems Design – A unified Hardware /Software Introduction, Frank Vahid and Tony Givargis, John Wiley, 2002.

EC(EE)-801(e) Satellite Communication and Remote Sensing : 4-0-0-4-4:

Historical background, Basic concepts, Frequency allocation for satellite services, orbital & spacecraft problems, comparison of networks and services, modulation techniques used for satellite communication.

Orbits- Two body problem, orbital mechanics, geostationary orbit, change in longitude, orbital maneuvers, orbital transfer, orbital perturbations.

Launch Vehicles- principles of Rocket propulsion, powered flight, Launchvehicles for communication satellite.

RF link- noise, the basic RF link, satellite links (up and down) , optimization RF link, intersatellite link, noise temperature, Antenna temperature, overallsystem temperature, propagation factors, rain attenuation model. Tropospheric and Ionospheric EFFECT.

Multiple access- FDMA, TDMA, CDMA techniques, comparison of multiple access techniques, error connecting codes.

Satellite subsystems and satellite link design- AOCS, TT&C , power system, spacecraft antenna, transponder, Friis transmission equation, G/T ratio of earth station.

Remote Sensing: Basic of remote sensing, Electromagnetic Radiation principles, Atmospheric window, Indian satellitesensing satellite system, Active, Passive, ground based andspace based remote sensing. Spatial, spectral, Radiometric and temporal resolution, satellite sensors, detectors and scanning technique, FOV and error sources, Image analysis and Interpretation weather RADAR, LIDAR, acoustic sounding systems, TRMM, AURA-MLS, Megha Tropiques

Altimeter , Scatterometer, Radiometer.

Ground based and radio oceulation techniques, spectral response of water, Sea surface temperature, wind spced, colour monitor, clouds andacrosal, water vopor, convective system, Trace gases.

Ref.:

1. Remote Sensing and GIS - B. Bhatta (oxford university press)
2. Remote sensing of the Environment – J.R. Jenson (Pearson)
3. Global Navigation satellite systems - B. S. Rao (TMH)
4. Satellite communication – D. Roddy (TMH)
5. Remote Sensing - R.A. Schowengerdt)Academic press)

EE- 881 Project-II0-0-6-6-4:

A final / detailed project to be completed, a Thesis on that topic to be submitted and to be appeared in a seminar to defend the submitted final project.

EE- 882 Electrical Design Sessional -II 0-0-6-6-4:

Some problems to be taken up from the following jobs and some problems already taken up in 7th semester through EE-781Electrical Design-I to be left out from the list:

- Designing a heating element with specified wattage, voltage and ambient temperature.
- Designing an aircore grounding reactor with specified operating voltage, nominal current and fault current.
- Designing the power distribution system for a small township.
- Designing a double circuit transmission line for a given voltage level and power (MVA) transfer.
- Wiring and installation design of a multistoried residential building (G+4,not less than 16 dwelling flats with a lift and common pump)
- Wiring and installation design of an office building with lift, AC, pump etc.
- Electronic circuit design and component selection
- Power Amplifier Design
- OPAMP circuits design
- Digital design
- Wiring and installation design of a multistoried hospital building with lift, common pump, AC etc.
- Compensation design in control m system.
- Designing of a substation

- Designing distribution transformer.
- Designing a three phase squirrel cage induction motor.
- Designing a three phase wound rotor induction motor.
- Designing a split phase squirrel cage induction motor for a ceiling fan or a domestic pump.
- Designing a permanent magnet fractional hp servo motor .
- Designing an instrumentation system.
- **To be added more in light of technological advancement.**

EE- 883 Grand - Viva 0-0-0-0-4:
Each student has to appear for final viva.

********************&&&&&&&&&&&&&&&&*************************