

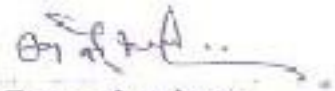
**HIMACHAL PRADESH TECHNICAL UNIVERSITY
HAMIRPUR**



Syllabus
for
B.Tech. First Year
(Common to all Branches)

As per National Education Policy (NEP-2020)

(w.e.f. the Academic Year 2023-2024)


Dean - Academic
H.P. Technical University
Hamirpur - 177 001, HP

S. No.	Group	Branches
1	Group-A	Civil Engineering Computer Science and Engineering Computer Science and Engineering (AI-ML) Computer Science and Engineering (AI-DS) Information and Technology Electronics and Communication Engineering.
2	Group-B	Electrical Engineering Electrical and Electronics Engineering Mechanical Engineering Textile Engineering

Group A: Semester I

Sr. No.	Category	Subject Code	Subject	L	T	P/D	Credits	Evaluation Scheme (Marks)		
								IA	ESE	Subject Total
Theory:										
1	FC	PHY-111	Applied Physics	3	1	0	4	40	60	100
2	FC	HS-111	Communication Skills	3	0	0	3	40	60	100
3	FC	EE-111	Basic Electrical Engineering	3	1	0	4	40	60	100
4	FC	MA-111	Applied Mathematics-1	3	1	0	4	40	60	100
5	MC	EVS-111	Energy and Environment	2	1	0	3	40	60	100
	Labs:							IA	ESVE	Sub. Total
1	FC	PHY-111P	Applied Physics Lab	0	0	2	1	30	20	50
2	FC	HS-111P	Communication Skills Lab	0	0	2	1	30	20	50
3	FC	EE-111P	Basic Electrical Engineering Lab	0	0	2	1	30	20	50
4	FC	*WXX-111P	Workshop	0	0	4	2	30	20	50
			Total	14	04	10	23			700

Group A: Semester II

Sr. No.	Category	Subject Code	Subject	L	T	P/D	Credits	Evaluation Scheme (Marks)		
								IA	ESE	Subject Total
Theory:										
1	FC	CHM-111	Applied Chemistry	3	1	0	4	40	60	100
2	FC	CS-111	Computer Programming	3	0	0	3	40	60	100
3	FC	EC-111	Basic Electronics Engineering	3	1	0	4	40	60	100
4	FC	MA-121	Applied Mathematics-II	3	1	0	4	40	60	100
5	MC	UHV-111	Universal Human Values and Awareness About Himachal Pradesh	3	0	0	3	40	60	100
	Labs:							IA	ESVE	Sub. Total
1	FC	CHM-111P	Applied Chemistry Lab	0	0	2	1	30	20	50
2	FC	CS-111P	Computer Programming Lab	0	0	2	1	30	20	50
3	FC	EC-111P	Basic Electronics Engineering Lab	0	0	2	1	30	20	50
4	FC	ME-111P	Engineering Graphics and Design	0	0	4	2	30	20	50
5	MC	HS-122P	Holistic Health and Yoga	0	0	2	1	30	20	50
			Total	15	03	12	24			750

Legends: L - Lecture

T - Tutorial

P - Practical

CT - Class Test

IA - Internal Assessment

FC- Foundation Course

ESE - End Semester Examination

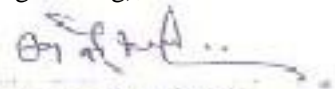
FW - Documentation/ File work and presentation

LP - Lab performance

ESVE - End Semester Exam. / Viva-voce Exam.

MC-Mandatory Course

*WXX where XX is branch code- CE (Civil Engineering), CS (Computer Science & Engineering), IT (Information & Technology), EC (Elect. Comm. & Engineering)


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Group B: Semester I

Sr. No.	Category	Subject Code	Subject	L	T	P/D	Credits	Evaluation Scheme (Marks)		
								IA	ESE	Subject Total
Theory:										
1	FC	CHM-111	Applied Chemistry	3	1	0	4	40	60	100
2	FC	CS-111	Computer Programming	3	0	0	3	40	60	100
3	FC	EC-111	Basic Electronics Engineering	3	1	0	4	40	60	100
4	FC	MA-111	Applied Mathematics-1	3	1	0	4	40	60	100
5	MC	UHV-111	Universal Human Values and Awareness about Himachal Pradesh	3	0	0	3	40	60	100
	Labs:							IA	ESVE	Sub. Total
1	FC	CHM-111P	Applied Chemistry Lab	0	0	2	1	30	20	50
2	FC	CS-111P	Computer Programming Lab	0	0	2	1	30	20	50
3	FC	EC-111P	Basic Electronics Engineering Lab	0	0	2	1	30	20	50
4	FC	ME-111P	Engineering Graphics and Design	0	0	4	2	30	20	50
			Total	15	03	10	23			700

Group B: Semester II

Sr. No.	Category	Subject Code	Subject	L	T	P/D	Credits	Evaluation Scheme (Marks)		
								IA	ESE	Subject Total
Theory:										
1	FC	PHY-111	Applied Physics	3	1	0	4	40	60	100
2	FC	HS-111	Communication Skills	3	0	0	3	40	60	100
3	FC	EE-111	Basic Electrical Engineering	3	1	0	4	40	60	100
4	FC	MA-121	Applied Mathematics-II	3	1	0	4	40	60	100
5	MC	EVS-111	Energy and Environmental	2	1	0	3	40	60	100
Labs:										
1	FC	PHY-111P	Applied Physics Lab	0	0	2	1	30	20	50
2	FC	HS-111P	Communication Skills Lab	0	0	2	1	30	20	50
3	FC	EE-111P	Basic Electrical Engineering Lab	0	0	2	1	30	20	50
4	MC	HS-122P	Holistic Health and Yoga	0	0	2	1	30	20	50
5	FC	*WXX-111P	Workshop	0	0	4	2	30	20	50
			Total	14	04	12	24			750

Legends: L - Lecture

T - Tutorial

P - Practical

CT - Class Test

IA - Internal Assessment

FC- Foundation Course

ESE - End Semester Examination

FW - Documentation/ File work and presentation

LP - Lab performance

ESVE - End Semester Exam. / Viva-voce Exam.

MC-Mandatory Course

* WXX where XX is branch code- EE (Electrical Engineering.), EEE (Electrical & Electronics Engineering.), ME (Mechanical Engineering). TE (Textile Engineering.)

Template for-Internal Assessment (IA Theory)

HIMACHAL PRADESH TECHNICAL UNIVERSITY

Award Sheet Theory Internal Assessment (IA)

Name of the Institution:			Distribution of Marks				Total Marks	
Programme:			Periodical Examinations		Teacher Assessment (Assignment discussion/ presentation/Quizzes/ Overall behavior)	Attendance		
Subject:		Sub. Code:						
Branch:		Semester:		1st Periodical Examination				2nd Periodical Examination
Max. Marks:		Min. Marks:						
Sr. No.	University Roll No.	Name of Student	10	10			15	05

Name of Internal Examiner Signature..... Date.....	Head of Dept. Signature..... Date.....
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Note: The marks of the attendance (theory and practical) in Internal Assessment(IA) should be awarded on the basis of percentage of lectures attended as per the following details:

Sr. No	Percentage of Lecture Attended	Marks Awarded
1	From 75% to 79.9%	01
2	From 80% to 84.9%	02
3	From 85% to 89.9%	03
4	From 90% to 94.9%	04
5	Above 95%	05

Template for-Internal Assessment (Practical/Project/Seminar/Viva-Voce)

HIMACHAL PRADESH TECHNICAL UNIVERSITY

Award Sheet Practical Internal Assessment (IA)

(Practical/Project/Seminar/Workshop)

Name of the Institution:			Distribution of Marks				Total Marks
Programme:			Written/ Presentation/ Demonstration	Viva-voce	Teacher Assessment: Lab Work performance/ Report/ File Work	Attendance	
Subject:		Sub. Code:					
Branch:		Semester:					
Max. Marks:		Min. Marks:					
Sr. No.	University Roll No.	Name of Student	05	05	15	05	30
Name of Internal Examiner			Head of Dept.				
Signature.....			Signature.....				
Date.....			Date.....				

Template for-External Assessment (Practical/Project/Seminar/Viva-Voce)

HIMACHAL PRADESH TECHNICAL UNIVERSITY

AWARD SHEET PRACTICAL (EXTERNAL ASSESSMENT)

(Practical/Project/Seminar/Workshop)

Name of the Institute:				
Programme:				
Subject Name:		Subject Code:		
Branch:		Semester		
Max Marks		Min. Marks:		
Sr. No.	University Roll No.	Name of Student	Marks in Figure	Marks in Words
Name of Internal Examiner:				
Signature.....		Name of External Examiner:		
Date.....		Signature.....		
Date.....		Date.....		

**Note: The distribution of marks would be on the basis of Task performance/written (10 marks) and viva-voce (10 marks), total=20 marks.*

Syllabus
for
Semester-I (Group A&B)
and
Semester-II (Group-A&B)

PHY-111 Applied Physics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
Theory of Relativity: Inertial and non- inertial frames of reference, earth as an inertial frame of reference, Michelson and Morley experiment, Postulates of special theory of relativity, Galilean and Lorentz transformations, Time dilation and length contraction, Relativistic kinematics and mass-energy equivalence. Laser: Introduction, Characteristics of lasers, Spontaneous and stimulated emission of radiation Einstein's coefficients, Population inversion, Ruby laser, Helium -Neon lasers & Semiconductor Lasers Applications of laser in industry, Scientific and medical fields.
Unit-II:
Oscillations: Simple harmonic motion (SHM), Differential equation of SHM, Energy of SHM, Damped and Forced Oscillations, Relaxation Time, Quality Factor, Resonance, Sharpness of Resonance. Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and acceptance cone, Numerical aperture, Propagation Mechanism and communication in fiber, Single and Multi-Mode Fibers, Step index and Graded index fiber, Attenuation and losses, Applications of optical fibers.
Unit-III
Quantum Mechanics: De Broglie waves, Phase and Group velocity concept, Uncertainty principle and its applications, Wave function, Postulates of quantum mechanics, Derivation of Schrodinger equation for time independent and time dependent cases and its applications viz. Particle in one dimensional box. X-rays: X-rays production, hard and soft x-rays, Continuous and characteristics x-rays, Bremsstrahlung effect
Unit-IV:
Electrodynamics: Equation of continuity, displacement current, Maxwell's equations, wave equation for electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting vector & Poynting theorem. Superconductivity: Introduction and discovery of superconductivity, Meissner effect, Type-I and type-II superconductors, Isotope effect, BCS theory (qualitative), High temperature superconductors, Applications of superconductivity.

Textbooks:

- Engineering Physics, H.K Malik & A.K Singh, Tata McGraw-Hill.
- Ajoy Ghatak, Quantum Mechanics: Theory and Applications, Tata McGraw-Hill.
- Satya Prakash and Vibhav saluja, Engineering Physics, Pragti Prakashan Meerut.
- Applied Solid State Physics, Wiley India Pvt Ltd.

Reference Books:

- Ajoy Ghatak, —Optics, Tata McGraw-Hill.
- N. Subrahmanyam, Brij Lal, M.N. Avadhanulu, —Optics, S. Chand & Co. Ltd.
- Anuradha De, —Fiber optics and laser Principles and Applications, New Age International.
- Arthur Beiser, —Concepts of Modern Physics, Tata McGraw-Hill.
- David J Griffiths, —Introduction to electrodynamics, Prentice Hall of India, New Delhi

HS-111 Communication Skills							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
Essentials of communication: The meaning, types & process of communication, Barriers to communication and removal of these barriers, Shannon & weaver model of communication, Berlos' model of communication, The Seven Cs of Effective Communication - Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness, Types of information- order, advise, suggestion, motivation, persuasion, warning and education. Mass Communication –function of mass communication – Media of mass communication, Advantages and disadvantages of social media.
Unit-II:
Essentials of Grammar: Types of sentences: Declarative Sentence, Imperative Sentence, Interrogative Sentence, Exclamatory Sentence, simple, compound & complex sentences, conversion of one type of sentence into other, Parts of speech, Tenses, articles and prepositions, Model Auxiliaries Types of diction, ways to improve diction, Paragraph writing.
Unit-III
Technical Communication: Report writing: Characteristics of a good report, parts & types of reports, drafting of reports. Business letters: planning a business letter, parts of a letter, classification of business letters – inviting and sending quotations, letter placing orders, letter of complaint, letter of adjustment, and letter of Job, letter negotiating a job offer and Resume writing, Drafting memorandum, notices, agenda and minutes of meeting, preparing effective e- mail messages and power-point presentations
Unit-IV:
Soft skills & personality development: Soft skills: Classification of soft skills, Delivering effective presentations, Capturing audience, Impromptu speech, speech initiators, telephone etiquette - Good practice when making and receiving a call; Becoming a good leader and team-player, Personal SWOT analysis., body language, Types of interviews, preparing for a job interview, Strategies for managing emotions & controlling Stress.

Textbooks:

- Communication Skills, Sanjay Kumar and Pushp Lata, Oxford University Press.
- Effective Communication and soft Skills, Nitin Bhatnagar and Mamta Bhatnagar, Pearson Publication.
- Communicative English for Engineers and professionals, Nitin Bhatnagar and Mamta Bhatnagar, Pearson Publication.
- Personality and Soft Skills by B. K. Mitra Oxford press.
- An Introduction to Professional English and Soft Skills: by Bikram K. Das, Kalyani Samantray, Cambridge Press.
- Business correspondence and Report Writing: by R. C. Sharma & Krishna Mohan

Reference Books:

- Business Communication: Theory and Application by R.W. Lesikar and John.D. Pettit , All India Traveller Bookseller.
- Speaking and Writing for Effective Business Communication by Francis Soundaraj Macmillan.
- Understanding Human Communication by Ronald B. Adler and George Rodman Oxford University

Press: New York.

- Communication Skills and soft skills- An integrated approach, Kumar, Pearson Publication
- K.K.Sinha, Business Communication, Galgotia Publishing Company, New Delhi, 1999.
- R.K.Bansal& J.B. Harrison, spoken English for India, Orient Longman.
- An Introduction to Linguistics: Language, Grammar and Semantics by Pushpinder Syal and D. V. Jindal (Author) Paperback
- Mastering Interviews and Group Discussions by Dinesh Mathur CBS
- English Conversation Practice by Grant Taylor
- Handbook of Practical Communication Skill by Chrissie Wright (Ed.) JAICO Books.
- English Conversation Practice by Grant Taylor
- Business correspondence and Report Writing: by R. C. Sharma & Krishna Mohan

EE-111 Basic Electrical Engineering							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40 Minimum Marks: 16	Maximum Marks: 60 Minimum Marks: 24	100 40	3 Hours

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
DC Circuits: Kirchhoff's voltage and current laws; power dissipation; Voltage source and current source; Mesh and Nodal analysis; Star-delta transformation; Superposition theorem. Thevenin's theorem; Norton's theorem; Maximum power transfer theorem; Millman's theorem and Reciprocity theorem; Transient response of series RL and RC circuits.
Unit-II:
Steady state analysis of DC Circuits: The ideal capacitor, permittivity; the multi- plate capacitor, variable capacitor; capacitor charging and discharging, current-voltage relationship, time-constant, rise-time, fall-time, inductor energization and de- energization, inductance current-voltage relationship, time-constant; Transient response of RL, RC and RLC Circuits.
Unit-III
AC Circuits: Sinusoidal sources, RC, RL and RLC circuits, Concept of Phasors, Phasor representation of circuit elements, Complex notation representation, Single phase AC Series and parallel circuits, power dissipation in AC circuits, power factor correction, Resonance in series and parallel circuits, Balanced and unbalanced 3-phase circuit - voltage, current and power relations, 3-phase power measurement, Comparison of single phase and three phase supply systems. Electromagnetism: Electromagnetic induction, Dot convention, Equivalent inductance, Analysis of Magnetic circuits, AC excitation of magnetic circuit, Iron Losses, Fringing and stacking, applications: solenoids and relays.
Unit-IV:
Single Phase Transformers: Constructional features of transformer, operating principle and applications, equivalent circuit, phasor analysis and calculation of performance indices. Motors and Generators: DC motor operating principle, construction, energy transfer, speed torque relationship, conversion efficiency, applications, DC generator operating principle, reversal of energy transfer, EMF and speed relationship, applications.

Textbooks:

- Ashfaq Husain and Harroon Ashfaq Fundamental of Electrical Engineering Dhanpat Rai & Co. (P) Limited; Fourth edition, 1 January 2016
- Nagrath I.J. and D. P. Kothari (2001), Basic Electrical Engineering, Tata McGraw Hill.
- Hayt and Kimberly, Engineering Circuit Analysis, Tata McGraw Hill.
- Ritu Sahdev (2019), Basic Electrical Engineering, Khanna Book Publishing Company
- Kulshreshtha D.C. (2009), Basic Electrical Engineering, Tata McGraw Hill.
- Rajendra Prasad (2009), Fundamentals of Electrical Engineering, Prentice Hall, India

Reference Books:

- Ajoy Ghatak, —Optics, Tata McGraw-Hill.
- N. Subrahmanyam, Brij Lal, M.N. Avadhanulu, —Optics, S. Chand & Co. Ltd.
- Anuradha De, —Fiber optics and laser Principles and Applications, New Age International.
- Arthur Beiser, —Concepts of Modern Physics, Tata McGraw-Hill.
- David J Griffiths, —Introduction to electrodynamics, Prentice Hall of India, New Delhi

MA-111 Applied Mathematics-I							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
Sequences and Series: Introduction to sequences and Infinite series, Tests for convergence/divergence, Limit comparison test, Ratio test, Root test, Cauchy integral test, Alternating series, Absolute convergence and conditional convergence. Series Expansions: Power series, Taylor & Maclaurin's series, Convergence of Taylor series, Taylor & Maclaurin's Theorem, Error estimates (one variable)
Unit-II:
Calculus: Rolle's theorem, Lagrange's and Cauchy mean value theorem, Application of definite integral to evaluate areas of bounded region, Arc length of a plane curve, volume of solids, surface areas of a solid revolution (Cartesian coordinates), Improper integrals, Beta and Gamma functions
Unit-III
Partial Differentiation and applications: Functions of several variables, Limits and continuity ($\delta - \epsilon$ approach), Partial derivatives, Euler's theorem (Homogeneous functions), Chain rule, change of variables, Jacobian, Maxima and minima by using second order derivatives, Lagrange's method of multipliers, Taylor's & Maclaurin's Theorem, Error estimation.
Unit-IV:
Multiple Integrals and applications: Double integral, change of order of integration in double integral, Polar coordinates, graphing of polar curves, Change of variables (Cartesian to polar), Applications of double integrals to areas and volumes, evaluation of triple integral.

Textbooks:

- B. S. Grewal, Higher Engineering Mathematics by B. S. Grewal 43rd Edition (2015)
- N. P. Bali and Manish Goyal A Textbook Of Engineering Mathematics (2016)
- Thomas, G.B. and Finney, R.L., Calculus and Analytic Geometry, Pearson Education (2007), 9th ed.
- Stewart James, Essential Calculus; Thomson Publishers (2007), 6th ed.
- R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics (2003), 2nd ed.

Reference Books:

- Wider David V, Advanced Calculus: Early Transcendentals, Cengage Learning (2007).
- Apostol Tom M, Calculus, Vol I and II, John Wiley (2003).
- Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons (2011) 9th Edition

EVS-111 Energy and Environment							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
2	1	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
Ecosystems: Structure and function of an ecosystem–ecological succession–primary and secondary succession - ecological pyramids – pyramid of number, pyramid of energy and pyramid of biomass. Conventions on Climate Change: Origin of Conference of Parties (COPs), United Nations Framework Convention on Climate Change (UNFCCC) and Intergovernmental Panel on Climate Change (IPCC); Kyoto Protocol, Montreal Action Plan; Paris Agreement and post-Paris scenario. Environmental issues: Global Environmental crisis, Current global environment issues, Global Warming, Greenhouse Effect, role of Carbon Dioxide and Methane, Ozone Problem, CFC_s and Alternatives, Causes of Climate change, Carbon footprint.
Unit-II:
Air Pollution: Origin, sources, adverse effects and preventive measures related to air pollution. Case study for air pollution (London smog, Photochemical smog, Bhopal gas tragedy). Water Pollution: Origin, sources, adverse effects and preventive measures related to water pollution. Case study for air pollution (Minamata tragedy, Arsenic pollution at Punjab/UP, The Ganga River pollution). Noise Pollution: Origin, sources, adverse effects and preventive measures related to noise pollution. Nuclear pollution: Origin, sources, adverse effects and preventive measures related to radioactive pollution, Case study. Environmental protection acts: Important environmental protection acts in India – water, air (prevention and control of pollution) act, wild life conservation and forest act.
Unit-III
Renewable and non-renewable resources: Coal, Petroleum, Solar energy, wind energy, hydrothermal energy, nuclear energy, Tidal energy, Bioenergy etc. Role of individual in conservation of natural resources for sustainable life styles. Use and over exploitation of Forest resources, Deforestation, Timber extraction, Mining, Dams and their effects on forest and tribal people. Use and over exploitation of surface and ground water resources, Floods, Drought, Conflicts over water, Dams- benefits and problems. National green hydrogen mission. FAME India Scheme.
Unit-IV:
Environment and Disaster: Introduction: Principles of Disaster Management. Natural Disasters such as Earthquake, Floods, Fire, Landslides, Tornado, Cyclones, Tsunamis, Nuclear and Chemical Terrorism. Hazards, Risks and Vulnerabilities, Vulnerability of a location and vulnerable groups, National policy on disaster Management.

Textbooks:

- Moaveni, S., Energy, Environment and Sustainability, Cengage(2018)
- Down to Earth, Environment Reader for Universities, CSE Publication(2018)
- Chapman, J.L. and Reiss, M.J., Ecology Principles and Application, Cambridge University Press (LPE) (1999).
- Eastop, T.P. and Croft, D.R., Energy Efficiency for Engineers and Technologists, Longman and Harrow (2006).
- O'Callagan, P.W., Energy Management, Mc Graw Hill Book Co. Ltd.(1993).
- Peavy H.S. and Rowe D.R. Environmental Engineering, McGraw Hill(2013)

WME-111P Workshop							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	4	2	Maximum Marks: 30 Minimum Marks: 12	Maximum Marks: 20 Minimum Marks: 8	50 20	2 Hours

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

1.	Introduction:
	Introduction to Need and importance of workshop, different materials to be utilized Applications of Ferrous and Non-Ferrous metals alloys.
2.	Carpentry Shop:
	To prepare half-lap corner joint, mortise & tennon joints
3.	Fitting Shop:
	To make a job involving fitting work -drilling, tapping or dieing
4.	Smithy Shop:
	To make a job by using smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.
5.	Welding Shop:
	To prepare a simple butt and Lap welded joints.
6.	Sheet-metal Shop:
	Fabrication of Funnel, tool-box, tray etc.
7.	Machine Shop:
	To make a job on lathe involving plane turning, step turning, taper turning and threading operations
8.	Foundry Shop:
	To prepare a Mould with the use of a core and cast it.

WCS:111P/WIT:111P Workshop							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	4	2	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

1.	Identification and study of peripherals of a PC and Laptop
2.	Assembling and disassembling the PC
3.	Identification and study the purpose of Networking concepts
4.	Study / Prepare a network cable: Straight Through Cables vs Crossover Cables
5.	Prepare a document/report using Microsoft Word, Power Point, Microsoft Excel
6.	Prepare professional pdf documents using LaTeX
7.	Develop the home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list
8.	Operating System installation
9.	Virtual Machine setup
10.	Linux Operating System commands
11.	Enabling firewall and setting router as wireless access point in the system
12.	Study of AI based tools.

WEE-111P/WEEE-111P/ WEC-111P Workshop							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	4	2	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

Electrical Workshop	
1.	a) Demonstrate the precautionary steps adopted in case of Electrical shocks. b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB with ratings.
2.	Wiring of simple light circuit for controlling light/ fan point (PVC conduit wiring)
3.	Wiring of light/fan circuit using Two-way switches. (Staircase wiring)
4.	Wiring of Fluorescent lamps and light sockets (6A) with a power circuit for controlling power device. (16A socket)
5.	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.
6.	a) Identify different types of batteries with their specifications. b) Demonstrate the Pipe and Plate Earthing Schemes using Charts/Site Visit.
7.	Activity: Assemble the wooden/plastic boards, switches and sockets in form of extension boards with proper wiring and pin top.
Electronics Workshop	
8.	Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.]
9.	Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools (such as Orcad, MultiSim or Xcircuit), Interpret data sheets of discrete components and IC's, Estimation and costing.
10.	Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, DSO etc.] [Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station etc.]
11.	Testing of electronic components [Resistor, Capacitor, Diode, Transistor and JFET using multimeter.]
12.	Overview of Arduino: Hardware and Software IDE: Installation and live projects burning such as LED Blinking, Running LEDs, Sand Glass Filling of LEDs, Decoration LEDs/LED Patterns etc.
13.	Printed circuit boards (PCB) [Types, Single sided, Double sided, PTH, Processing methods, Design and fabrication of a single sided PCB for a simple circuit]
14.	Activity: Assembling of components of a basic mobile phone system and develop an ability to repair and formulate a basic Transmission and Receiving system.

WTE-111P Workshop for Textile Engineering							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	4	2	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

1	Identification of different natural fibers.
2	Identification of different synthetic fibers.
3	Determination of linear density of yarn.
4	Analysis of various yarns structure and their basic properties.
5	Structural analysis of woven fabrics.
6	Structural analysis of knitted fabrics.
7	Dyeing of cotton fabric with natural dyes.
8	Dyeing of cotton fabric with synthetic dyes.
9	To prepare fabric sample for printing.
10	Characterization of various technical textiles and study of their application fields.

WCE-111P Workshop for Civil Engineering							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	4	2	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

1	Preparation of Technical report/document, Presentation, Data analysis by using MS office
2	Preparation of simple butt and lap welded joint (metal or other)
3	Preparation of half lap corner joint, Mortise joint and tenon joint (metal or other)
4	Fabricate a furniture using any carpentry joints (Chair/Table/any furniture)
5	Fabricate any one bar bending models for any structural element
6	Fabricate Plumbing line model from source to distribution end
7	Construct a Masonry brick wall using any masonry Bond
8	Construct an arch using brick masonry
9	Sampling of latest/ advanced construction materials
10	Generating simple 3D models in CAD and 3D printing

PHY-111P Applied Physics Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30 Minimum Marks: 12	Maximum Marks: 20 Minimum Marks: 8	50 20	2 Hours

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

Laboratory Work:

1. To determine the wavelength of monochromatic light by Newton's Ring.
2. To find the wavelength of light from a given source using Michelson's interferometer.
3. To determine the wavelength of spectral lines using plane transmission grating.
4. To find the value of Planck's constant.
5. To verify Stefan's law by electrical method.
6. To determine the numerical aperture of an optical fibre.
7. To determine the attenuation & propagation losses in optical fibre.
8. To determine the height of a tower with a Sextant.
9. To determine the refractive index of a liquid by Newton's ring.
10. To determine the hall co-efficient.
11. To determine the band gap of an intrinsic semiconductor by four probe method.
12. To study the LASER beam characteristics like wavelength using diffraction grating aperture & divergence.
13. To calculate the hysteresis loss by tracing a B-H curve for a given sample.
14. To compare the capacitances of two capacitors by De'sauty Bridge.
15. To study the variation of magnetic field with distance by Stewart and Gee's apparatus.
16. To find the value of e/m for electron by helical method.

HS-111P Communication Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30 Minimum Marks: 12	Maximum Marks: 20 Minimum Marks: 8	50 20	2 Hours

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

I	Learning correct pronunciation: Organs of speech, IPA symbols (consonant & vowel sounds), classification of consonants as per place & manner of articulation. finding out the correct pronunciation of words with the help of a dictionary, phonetic transcription of words presented orally, conversion of words presented through IPA symbols into normal orthography, syllable division and stress marking (in words presented in IPA form). Intonation (rising & falling tone).
II	Listening Skills: Listening with a focus on pronunciation (ear-training), stress and intonation; the students will be exposed, to the following varieties of English during listening practice: Standard Indian, British and American. Learning the differences between British & American pronunciation, Listening practice of the dialogues and speeches in British & American English.
III	Speaking Skills: Delivering impromptu speeches, reading aloud of dialogues, poems, excerpts from plays, Situational conversations: Introducing oneself, describing a person, place, situation and event, giving instructions, making inquiries – at a bank, post-office, air-port, hospital, reservation counter etc. Mock interviews and group discussions.
IV	Writing Skills: Identifying common mistakes made by students in written communication and improving them, writing emails: sending and responding to emails, preparing and delivering power -point presentations, answering comprehension, translation practice (Hindi to English & vice-versa).

EE-111P Basic Electrical Engineering Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of Experiments:

1. To verify Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL)
2. To study the V-I characteristics of an incandescent lamp.
3. Verification of Thevenin's theorem
4. Verification of Norton theorem
5. Verification of superposition and Maximum power theorem
6. To study series LCR circuit
7. To study parallel LCR circuit
8. Power consumption of a fluorescent lamp
9. Measurement of power and power factor by two wattmeter method.
10. To perform short circuit test on a single-phase transformer to calculate copper loss of the transformer.
11. To measure the single-phase power in a single phase a.c. circuit by using three ammeters.
12. To measure the single-phase power in a single phase a.c. circuit by using three voltmeters.

CHM-111 Applied Chemistry							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
<p>Water Technology: Introduction, Sources, common impurities, Hardness, Degree of hardness and units, water quality parameters and their analysis-Turbidity, TDS, Hardness, Chlorine, Arsenic Test, BOD and COD, Water Softening-Zeolite and Ion-exchange process, Drinking water purification and domestic water purifiers.</p> <p>Electrochemistry: Specific, equivalent and molar conductivity of electrolytic solutions, Reference Electrodes-Calomel electrode and Ag-AgCl electrode, Ion-selective electrode-Glass electrode, determination of pH of solution using glass electrode, Construction and working of Batteries-Lead acid storage battery, Ni-Cd storage cell, Lithium batteries, fuel cell and Solar cell.</p>
Unit-II:
<p>Corrosion Science: Introduction, Chemical and Electrochemical Corrosion, Theory of electrochemical corrosion, Types of Electrochemical Corrosion-Differential aeration corrosion, Pitting Corrosion. Stress Corrosion e.g., Caustic embrittlement. Factors affecting rate of corrosion-Related to metal & related to environment. Control of corrosion.</p> <p>Spectroscopy Techniques:</p> <p>UV-Visible Spectroscopy-principle, Lambert-Beer's Law, instrumentation, Electronic Transitions, Auxochromes, Chromophores, Effect of conjugation and solvents on transition of organic molecules, applications.</p> <p>IR: - Principle, Instrumentation, Fundamental vibrations, Hooke's Law, effect of masses of atoms, bond strength, nature of substituent and hydrogen bonding on Vibrational frequency, applications.</p>
Unit-III
<p>Fuels: Classification of fuels, Calorific value - Definition, HCV, LCV, determination of calorific value of solid and liquid fuels using Bomb calorimeter, Ultimate analysis of coal and numerical problems, Petroleum cracking -fluidized bed catalytic cracking. Reformation of petrol, Quality of liquid fuels- Cetane and Octane number, power alcohol-manufacture, advantages and disadvantages, Concept of hydrogen as fuel- types, synthesis by water electrolysis and natural gas reforming.</p> <p>Chemistry in ICT: Introduction and applications of metal and metal oxides like Si, Ge, Al., Ti, Ni, Cu, SiO₂, La₂O₃ and ZrO₂ in communication and Display devices (liquid crystals based, LED, CRT, alumina-silicate glass based, touch screen). Disposal of harmful chemicals used in ICT; Hg, Pb, Cd and flame retardant materials.</p>
Unit-IV:
<p>Engineering Materials</p> <p>Polymers: Introduction, Classification, Glass transition temperature, factors affecting T_g and its significances, Synthesis, properties and applications of PP, PVC, PMMA, polyurethanes, Epoxy resins, Silicon Rubber, PET, Lexan, Kevlar.</p> <p>Conducting Polymers: Introduction-Definition, applications, Mechanism of conduction in polyacetylene.</p> <p>Nano- Materials: Introduction, Properties of nanomaterials, Graphene, Fullerenes, Carbon nanotubes, nano wires, nano cones, Application of nano-materials.</p>

Textbooks:

- Ramesh, S. and Vairam S. Engineering Chemistry, Wiley India.
- Puri, B.R., Sharma, L.R. and Pathania, M.S. Principles of Physical Chemistry, Vishal Publishing Co. (2008).
- Aggarwal, S. Engineering Chemistry: Fundamentals and Applications, Cambridge University Press(2015).

Reference Books:

- Brown, H., Chemistry for Engineering Students, Thompson.
- Sivasankar, B., Engineering Chemistry, Tata Mc Graw-Hill Pub. Co. Ltd, New Delhi(2008).
- Shulz, M. J. Engineering Chemistry, Cengage Learnings (2007).

CS-111 Computer Programming							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
Introduction to C++: C++ character set, C++ Tokens (Identifiers, Keywords, Constants, Operators,), Structure of a C++ Program (include files, main function), use of I/O operators (<>), Cascading of I/O operators, compilation, linking and execution. Concept of Data types: Built-in Data types: char, int, float and double; Constants: Integer Constants, Character constants - \n, \t, \b), Floating Point Constants, String Constants; Access modifier: const; Variables of built-in-data types, Declaration/Initialization of variables, Assignment statement, Type modifier: signed, unsigned, long Operator and Expressions: Operators: Arithmetic operators (-,+,*,/,%), Unary operator (-), Increment (++) and Decrement (--) Operators, Relation operator (>,>=,<=,<), Logical operators (!,&&,), Conditional operator: ?; Precedence of Operators; Automatic type conversion in expressions, Type casting; C++ shorthands (+=-, -=, *=, /=, %=) . Conditional statements: if else, Nested if, switch case default, use of conditional operator, Nested switch case, break statement; Loops: while, do - while, for and Nested loops. Defining a function; function prototype, Invoking/calling a function: call by value, call by reference, returning values from a function, scope rules of functions and variables local and global variables
Unit-II:
Array, Structure and Class: One Dimensional Array: Declaration/initialization of One-dimensional array, inputting array elements, accessing array elements, Two dimensional Array: Declaration/initialization of a two-dimensional array, inputting array elements accessing array elements, Defining a Structure, declaring structure variables, accessing members of structure, Defining a class, declaring object and accessing class members
Unit-III
Constructor and Destructor: Constructors, Parameterized Constructors, Constructors with default arguments, Friend function, and Friend classes Inheritance: Derived Class declaration, Public, Private and Protected Inheritance, friend function and Inheritance, Forms of inheritance, virtual base class, Abstract class, Advantage and disadvantage of Inheritance.
Unit-IV:
Polymorphism: Classification of Polymorphism, Compile time and Run time Polymorphism, Virtual function, Pure virtual functions File Handling: Defining and Opening a File, closing a File, reading from a File, Writing into a File. Templates: Need of template, Function templates Exception Handling: Exception handling mechanism, Catch Blocks, Catch Throw an exception,

Textbooks:

- The C++ Programming Language (4th Edition) By Bjarne Stroustrup
- Lippman, S.B. and Lajoie, J., C++Primer, Pearson Education (2005) 4th ed..
- Stroustrup, Bjarne, The C++ Programming Language, Pearson Education (2000)3rd ed.
- Kanetkar Y., Let Us C++, BPB Publications, 2nded.
- Balaguruswamy E., Object Oriented Programming with C++, McGraw Hill, 2013.

Reference Books:

- Ajoy Eills, Margaret A. and Stroustrup, Bjarne, The Annotated C++ Reference Manual, Pearson Education (2002).

- Rumbaugh, J.R., Premerlani, W. and Blaha, M., Object Oriented Modeling and Design with UML, Pearson Education (2005) 2nd ed.
- Kanetkar, Yashvant, Let us C++, Jones and Bartlett Publications (2008) 8th ed.
- Brian W. Kernighan, Dennis M. Ritchie, The C++ Programming Language, Prentice Hall)
- Schildt H., C++: The Complete Reference, Tata Mc Graw Hill, 2

EC-111 Basic Electronics Engineering							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
Semiconductors: Energy band concept of materials, difference between metal, Insulator and semiconductor, Intrinsic and extrinsic semiconductors (n- type & p- type), current conduction in semiconductor, Photo diode, photo-transistor, LED and seven- segment display.
Semiconductor Diodes: p- n junction diode, Depletion layer, Energy diagrams of p-n junction and depletion region, Biasing of diode and V-I Characteristics; Rectifiers - half- wave, full- wave and bridge rectifiers; Filters - L, C, LC and π filters; Zener diode, V-I Characteristics and Zener diode as voltage regulator.
Unit-II:
Bipolar Junction Transistors (BJT): Transistor operation and current components in p- n- p and n- p- n transistors, input/output characteristics of CB and CE configurations, Transistor as an Amplifier, transistor cutoff, saturation and active regions, Transistor biasing and bias stabilization: Operating point, Stability factor, Analysis of fixed bias, collector to base bias, Emitter resistance bias circuit and self bias circuit
Field Effect Transistors (FET): Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics,
MOSFET: Depletion and enhancement type MOSFET- Construction, operation and characteristics.
Unit-III
Oscillators: Introduction, Criteria for oscillation, types of oscillators Hartley, Colpitt, RC Phase shift and Wein bridge oscillators.
Operational Amplifiers: Concept of ideal operational amplifiers, ideal operational amplifier parameters, inverting, non-inverting and unity gain amplifiers, adders and subtractor, Differentiator, integrator and Comparator operational Amplifiers
Unit-IV:
Number System and Logic Design: Number systems, Conversions and code, conversion of bases(decimal, binary, octal and hexadecimal numbers), addition and subtraction, Boolean algebra, logic gates (AND, OR, NAND, NOR, XOR, XNOR), concept of universal gate.
Electronic Instruments: Operation of CRO and its applications, Signal Generator, measurement of voltage, phase and frequency using CRO.

Textbooks:

- Boylestad, R. L. and Nashelsky, L., Electronic Devices & Circuit Theory, Pearson (2009).
- M. M. Mano and M. D. Ciletti, Digital Design, Pearson, Prentice Hall, 2013.

Reference Books:

- Milliman, J. and Halkias, C. C., Electronic Devices and Circuits, Tata McGraw Hill, 2007.
- Donald D Givone, Digital Principles and Design, McGraw-Hill, 2003.
- John F Wakerly, Digital Design: Principles and Practices, Pearson, (2000).
- N Storey, Electronics: A Systems Approach, Pearson, Prentice Hall, (2009).

MA-121 Applied Mathematics-II							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
Linear Algebra: Review of matrices, Row reduced echelon form, Inverse using Gauss Jordan method and rank of a matrix, Solution of system of linear equations, Linear spaces, Subspaces, Basis and dimension, rank-nullity theorem, Linear transformation and its matrix representation, Eigen values, Eigen vectors and Diagonalization, Cayley-Hamilton Theorem (without proof), and Quadratic form and Orthogonal transformation.
Unit-II:
Ordinary Differential Equations: Review of first order differential equations, Exact differential equations, Second and higher order linear differential equations with constant coefficients, Cauchy's & Legendre's homogeneous differential equations, Variation of parameters method, Cauchy - Euler equation, Method of undetermined coefficients, Engineering applications of differential equations.
Unit-III
Laplace Transform: Definition and existence of Laplace transforms and its properties, Inverse Laplace transforms using partial fraction, properties and convolution theorem (without proof), Laplace and inverse Laplace transforms of Unit step function and Impulse function, Applications to solve initial and boundary value problems.
Unit-IV:
Fourier Series: Introduction, Fourier series on arbitrary intervals, Even Odd functions, Half range expansions, Parseval's theorem, Complex Fourier series, Harmonic analysis.
Vector calculus: Introduction to vectors, Vector addition and multiplication, Directional derivatives, gradient, divergence & curl with properties, Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Green, Stokes and Gauss divergence theorem (without proof)

Textbooks:

- R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics (2003), 2nd ed.
- B.S. Grewal, —Higher Engineering Mathematics, Khanna Publishers.
- H.K. Dass and Rama Verma, —Engineering Mathematics, S. Chand Publications.

Reference Books:

- N.P. Bali and Manish Goel, —Engineering Mathematics, Laxmi Publications
- B.V. Ramana, —Higher Engineering Mathematics, Tata McGraw Hill Education Pvt. Ltd., New Delhi

UHV-111 Universal Human Values and Awareness about Himachal Pradesh							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will cover the whole syllabus.

Course Contents:

Unit-I:
Introduction to Value Education: Difference between moral and human values. Five core human values: Truth, Righteous conduct, Peace, Love and Non-violence. Classification of moral values, Value crisis in contemporary Indian society at different levels: Individual, family, Society and culture. Values in Indian constitution: Justice, liberty, equality and fraternity, Fundamental Rights under Indian constitution: Fundamental duties of Indian citizens.
Unit-II:
Harmony with the self, family & society: Understanding Human being as the Co-existence of the Self and the Body, Program to ensure the health of the body Distinguishing between the Needs of the Self and the Body, living in harmony with the self, family & society, steps to achieve self-discipline. Noble Eightfold Path: Right Understanding, Thought, Speech, Action, Livelihood, Effort, Mindfulness, and Concentration.
Unit-III
Understanding Mental health & emotional well-being: Characteristics of a mentally healthy person, causes of mental-health issues in contemporary society, possible solutions to improve mental health. Emotional intelligence: elements of emotional intelligence, Advantages of higher emotional intelligence & improving emotional intelligence, Maslow's hierarchy of needs & self-actualization.
Unit-IV:
Awareness about Himachal Pradesh: General knowledge including the knowledge of different places of historic, national and cultural importance & tourist attraction, hydro power projects, industries, highways, educational and other institutions of the state, knowledge about the famous personalities from the state, current affairs of Himachal Pradesh, history of Himachal- from medieval to present time, Geography-including the weather, borders, rivers, mountain-ranges, passes, peaks, knowledge of customs and culture of HP: including the costumes, customs, fairs and festivals etc.

Textbooks:

- The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- The Wonderland Himachal Pradesh An Encyclopedia, Jag Mohan Balokhra, H. G. Publications New Delhi

Reference Books:

- Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
- The Story of Stuff (Book).
- The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
- Slow is Beautiful - Cecile Andrews
- Economy of Permanence - J C Kumarappa
- Bharat Mein Angreji Raj – Pandit Sunderlal
- Rediscovering India - by Dharampal
- Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
- India Wins Freedom - Maulana Abdul Kalam Azad
- Vivekananda - Romain Rolland (English)

ME-111P Engineering Graphics and Design							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	4	2	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of experiments:

Practical numbers 1-6 shall be perform in the drawing hall with the help of different drawing instruments/tools and practical numbers 7-10 shall be performed in the Auto CAD laboratory.

1. Introduction to different types of lines, lettering, dimensioning and scales.
2. To draw the projection of points and lines.
3. To draw the projection of planes.
4. To draw the projection of solids and section of solids.
5. To draw the projection of development of surfaces.
6. To draw the isometric projections.
7. Introduction to Auto CAD (History, exploring GUI, Workspace, Coordinate System, Snap, Grid and Ortho modes) and basic commands for 2D drawings.
8. Introduction to file management, drawing & drafting settings.
9. Perform dimensioning and annotations in drawing arc, lines, angle etc.
10. Use of drawing & modify tools to make simple shapes of different 2D- drawings of projection of points, line, plane, solids, section of solid, development of surfaces and isometric projections.

CHM-111P Applied Chemistry Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30 Minimum Marks: 12	Maximum Marks: 20 Minimum Marks: 8	50 20	2 Hours

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

Laboratory Work:

1. To determine the pH and conductivity of five different water samples.
2. To determine total alkalinity in a given sample of water using standard acid.
3. To determine total hardness of water using complexometric titration method.
4. To determine the amount of Chlorine (residual) in given sample of water using N/20 Sodium thiosulphate solution.
5. To determine the percentage of Chlorine in sample of bleaching powder, 10 g of which are dissolved in 500ml of water.
6. To determine the amount of Chromium in given sample of water.
7. To determine dissolved oxygen in given sample of water.
8. To determine the coefficient of viscosity of the given unknown liquids by using Ostwald's Viscometer.
9. To determine the coefficient of viscosity of the given lubricating oil using Red Wood Viscometer.
10. To determine surface tension of given liquid by drop number method using Stalagmometer.
11. To determine % age of moisture, volatile matter, ash and fixed carbon in given sample of coal by proximate analysis method.
12. To verify Beer's Law and apply it to find the concentration of given unknown solution by using UV-visible spectra-photometer.
13. Estimation of Copper/Iron.
14. Preparation of any of the following polymers: Phenol formaldehyde resins/Urea formaldehyde resins /Biodegradable /conducting polymer.
15. To synthesize a polymer using synthetic monomer via free radical polymerization and characterize the polymer using FTIR spectra-photometer.
16. To synthesize a semisynthetic polymer via grafting of monomer on polymeric backbone and characterize the polymer using FTIR spectra-photometer.
17. Synthesis of nano-particles of Au/Ag/NiO/ZnO/Iron Oxide

CS-111P Computer Programming Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

Laboratory work:

1. WAP for basic input/output statement and various control statements.
2. WAP to create for function and function calling methods
3. WAP to take input and display elements of 1D and 2D array.
4. WAP for structures and display the values of structure members using structure variable.
5. WAP for creating class, defining member in class and accessing member.
6. WAP using various string functions in C++.
7. WAP for constructor and Destructor.
8. WAP for inheritance.
9. WAP for friend function and friend class.
10. WAP for polymorphism.
11. WAP for exception handling in C++.
12. WAP using template concept.
13. WAP to create function and use function calling methods.

EC-111P Basic Electronics Engineering Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

Laboratory Work:

1. Familiarization with electronics equipment (multimeters, CROs, power supply and function generators)
2. Study of the characteristics of P- N junction diode.
3. Study of the characteristics of Zener diode
4. Study of truth tables of different logic gates (AND, OR, NAND, NOR, XOR, XNOR).
5. Familiarization with CRO.
6. DSO and Electronic Components.
7. Diodes characteristics - Input- Output and Switching.
8. BJT and MOSFET Characteristics.
9. Zener diode as voltage regulator, Rectifiers.
10. Construction of an un regulated DC power supply (using a transformer, a full wave rectifier and a capacitor filter) and study of its output waveform by CRO.
11. Study of inverting and non-inverting amplifiers using op-amp
12. Study of the frequency response of any one oscillator.

HS-122P Holistic Health & Yoga							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	3 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

Following is the list of experiments/ jobs. Minimum 08 number of practicals are to be performed from following list. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of Experiments:

1. Introduction of Yoga, Different Definitions of Yoga. General Guidelines for Yogic Practices
2. Traditional Schools of Yoga: Bhakti yoga, karma yoga, Gyana yoga, Hatha yoga, Mantra yoga, Laya yoga, Raja yoga) Ashtanga Yoga of Sage Patanjali.
3. Concept of Shatkriyas: Dhauti, Basti, Neti, Nauli, Trataka and Kapalbhathi. Shatkriyas (Cleansing Process): Jala neti, Sutra neti. Kunjala, Vastra Dhauti, Danda Dhauti, kapalbhathi, Surya namaskar.
4. Concept of Surya namaskar: Introduction, Technique, benefit, precaution.
5. Concept of Asanas Introduction, Types, Technique, benefit, precaution, Asanas: Standing Poses: Tadasana, Kati chakrasana, tiryak tadasana, vrikshasana, veer bhadrasana, garudasana, trikonsana, Sitting Poses: Padmasana, Swastikasana, Vajrasana, Bhadrasana, Gomukhasana, Mandukasana, Singhasana.
6. Concept of Pranayama: Introduction, Types, Technique, benefit, precaution.
7. Meditation: Concept, technique, benefit, and precaution. Dhyana: Sthoola Dhyana, Jyoti Dhyana, Sukshama Dhyana, (According to Gheranda Samhita). Mantra Chanting- Omkar (Pranav Jaap), Gayatri Mantra, Maha Mrityunjaya Mantra, Shanti Mantr
8. Lying Down Poses: Spine Position: uttanpadasana, Pawan muktasana, Naukasana, markatasana, halasana, sarvangasana, matsyasana, setubandhasana, chakrasana and shavasana. Prone Position: Bhujangasana, Shalabhasana, Dhanurasana, Vipreet naukasana

Textbooks:

- BKS Iyengar (2012), Light on Yoga
- Basvaraddi & S.P.Pathak (2016), Yogic Suksham Vyayam Evam Sthula
- Vyayam Swami Satyananda Saraswati (2012), Asana Pranayama Mudra
- Modern Trends and Physical Education by Prof. Ajmer Singh.

Himachal Pradesh Technical University, Hamirpur (H.P.)



CURRICULUM(CBCS) ELECTRICAL ENGINEERING (3rd to 8th Semester) Teaching and Examination Scheme


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**SCHEME OF TEACHING AND EXAMINATION
B.TECH - ELECTRICAL ENGINEERING**

SEMESTER – III

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	FC	MA-301	Probability and Statistics	2	2	0	3	40	60	100
2	FC	HS – 305	Industrial Economics and Management	3	0	0	3	40	60	100
3	PC	EE-301	Electrical Machine -1	3	1	0	4	40	60	100
4	PC	EE-302	Power Electronics-I	3	1	0	4	40	60	100
5	PC	EC-302	Digital Electronics	3	0	0	4	40	60	100
6	PC	EC-303	Network Analysis & Synthesis	3	0	0	3	40	60	100
7	OE	-	Open Elective-I	2	0	0	2	40	60	100
Labs:										
1	PC	EE-311	Electrical Machine -1 Lab	0	0	2	1	30	20	50
2	PC	EE-312	Power Electronics-I Lab	0	0	2	1	30	20	50
3	PC	EE-313	Digital Electronics Lab	0	0	2	1	30	20	50
			Total	17	5	6	24+2	370	480	850

Open Elective-I

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	OE	HS-306	Sociology & Elements of Indian History for Engineers	2	0	0	2	40	60	100
2	OE	HS-307	German Language - I	2	0	0	2	40	60	100
3	OE	HS-308	French Language - I	2	0	0	2	40	60	100


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**SCHEME OF TEACHING AND EXAMINATION
B.TECH - ELECTRICAL ENGINEERING**

SEMESTER – IV

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		IA Marks	ESE Marks	Total Marks
1	FC	MA-401	Optimization and Calculus of Variations	2	2	0	3	40	60	100
2	FC	HS-409	Human Values and Professional Ethics	2	2	0	3	40	60	100
3	PC	EE-401	Electrical Machine-II	3	1	0	4	40	60	100
4	PC	EE-402	Electrical Measurement & Measuring Instruments	3	1	0	4	40	60	100
5	PC	EE-403	Transmission & Distribution of Electrical Power	3	1	0	4	40	60	100
6	PC	EE-404	Communication Engineering	3	1	0	4	40	60	100
7	OE	-	Open Elective-II	2	0	0	2	40	60	100
Labs:										
1	PC	EE-411	Electrical Machine-II Lab	0	0	2	1	30	20	50
2	PC	EE-412	Electrical Measurement & Measuring Instruments Lab	0	0	2	1	30	20	50
3	MC	EE-413	Electrical Simulation Lab-I	0	0	3	2	30	20	50
			Total	16	8	7	26+2	370	480	850

Open Elective-II

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		IA Marks	ESE Marks	Total Marks
1	OE	HS-410	Law for Engineers	2	0	0	2	40	60	100
2	OE	HS-411	German Language - II	2	0	0	2	40	60	100
3	OE	HS-412	French Language - II	2	0	0	2	40	60	100


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**SCHEME OF TEACHING AND EXAMINATION
B.TECH - ELECTRICAL ENGINEERING**

SEMESTER – V

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	PC	EE-501	Power Electronics-II	3	1	0	4	40	60	100
2	PC	EE-502	Linear Control System	3	1	0	4	40	60	100
3	PC	EE-503	Electrical Power Generation	3	0	0	3	40	60	100
4	PC	EE-504	High Voltage Engineering	2	2	0	3	40	60	100
5	PC	EE-505	Electromagnetic Field Theory	3	1	0	4	40	60	100
6	PC	EE-506	Flexible AC Transmission System	3	1	0	4	40	60	100
7	OE	-	Open Elective-III	2	0	0	2	40	60	100
Labs:										
1	PC	EE-511	Power Electronics-II Lab	0	0	2	1	30	20	50
2	PC	EE-512	Linear Control System Lab	0	0	2	1	30	20	50
3	MC	EE-513	Electrical Simulation Lab-II	0	0	2	1	30	20	50
			Total	18	4	6	25+2	370	480	850

Open Elective-III (For Students of Other Departments)

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	OE	EE-507	Non-Conventional Electrical Power Generation	2	0	0	2	40	60	100
2	OE	EE-508	Energy Assessment & Audit	2	0	0	2	40	60	100
3	OE	EE-509	Robotics	2	0	0	2	40	60	100


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**SCHEME OF TEACHING AND EXAMINATION
B.TECH - ELECTRICAL ENGINEERING**

SEMESTER – VI

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I. A Marks	ESE Marks	Total Marks
1	PC	EE-601	Switchgear & Protection	3	0	0	3	40	60	100
2	PC	EE-602	Microprocessors & Applications	2	2	0	3	40	60	100
3	PC	EE-603	Power System Analysis	3	1	0	4	40	60	100
4	PC	EE-604	Electrical Drives	3	1	0	4	40	60	100
5	PC	EE-605	Digital Signal Processing	3	1	0	4	40	60	100
6.	PC	EE-606	Electrical Energy Utilization	3	0	0	3	40	60	100
7	PE	-	Programme Elective-I	3	0	0	3	40	60	100
Labs:										
1	PC	EE-611	Switchgear & Protection Lab	0	0	2	1	30	20	50
2	PC	EE-612	Microprocessors & Applications Lab	0	0	2	1	30	20	50
3	MC	EE-613	Seminar	0	0	2	1	50	50	100
			Total	18	3	6	24+3	370	480	850

PROGRAMME ELECTIVE - I

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	PE	EE-607	Advanced Control System	3	0	0	3	40	60	100
2	PE	EE-608	Illumination Engineering	3	0	0	3	40	60	100
3	PE	EE-609	Neural Network & Fuzzy Logic	3	0	0	3	40	60	100

Industrial /Practical Training after VIth Semester of six weeks duration


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**SCHEME OF TEACHING AND EXAMINATION
B.TECH - ELECTRICAL ENGINEERING**

SEMESTER – VII

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I. A Marks	ESE Marks	Total Marks
1	PC	EE-701	Energy Management	3	0	0	3	40	60	100
2	PC	EE-702	Electrical Power Quality	3	0	0	3	40	60	100
3	PC	EE-703	Non-conventional Electrical Power Generation	3	0	0	3	40	60	100
4	PC	EE-704	Electrical Machine Design	2	2	0	3	40	60	100
5	PE	-	Programme Elective-II	3	0	0	3	40	60	100
Labs:										
6	MC	EE-711	Project Work -I	0	0	4	2	50	50	100
7	PC	EE-712	Industrial /Practical Training(Viva-Voce)	0	0	0	2	50	50	100
8	MC	EE-713	Electrical Simulation Lab-III	0	0	2	1	30	20	50
			Total	12	0	10	17+3	290	360	650

PROGRAMME ELECTIVE-II

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	PE	EE-705	Hydro Power Station Design	3	0	0	3	40	60	100
2	PE	EE-706	Testing & Commissioning of Electrical Equipments	3	0	0	3	40	60	100
3	PE	EE-707	High Voltage DC Transmission System	3	0	0	3	40	60	100

**SCHEME OF TEACHING AND EXAMINATION
B.TECH - ELECTRICAL ENGINEERING**

SEMESTER – VIII

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I. A Marks	ESE Marks	Total Marks
1	PE		Programme Elective - III	3	0	0	3	40	60	100
2	PE		Programme Elective - IV	3	0	0	3	40	60	100
3	MC	EE-801	Project Work - II	0	0	16	8	50	50	100
			Total	6	0	16	8+6			
OR										
4	MC	EE-802	Industrial Project	0	0	16	8	50	50	100
			Total	0	0	16	8			

PROGRAMME ELECTIVE-III

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	PE	EE-803	Power System Planning	3	0	0	3	40	60	100
2	PE	EE-804	Direct Energy Conversation	3	0	0	3	40	60	100
3	PE	EC-804	Digital Image Processing	3	0	0	3	40	60	100

PROGRAMME ELECTIVE-IV

S. N.	Cat.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	PE	EE-806	Power System Stability	3	0	0	3	40	60	100
2	PE	EE-807	Optimization Techniques	3	0	0	3	40	60	100
3	PE	EE-808	Advanced Power Electronics	3	0	0	3	40	60	100

Note: Industrial Project of Fourmonths duration is to be carried out by the student exclusively in industry under the joint supervision of faculty advisers from institution as well as from the industry.


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SEMESTER-III
MA 301: PROBABILITY AND STATISTICS

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Probability and Random Variables: Introduction, Basic concepts–Sample space, Events, Counting sample space, Conditional Probability and Independence, Permutations and Combinations, Rules of Probability, Bayes' Theorem. Random Variables – Concept of Random Variable, Percentiles, Probability Distributions – Discrete & Continuous, Mean, Variance and Covariance of Random Variables, Chebychev's inequality.	6
II	Standard Probability Distributions: Discrete distributions - Uniform, Binomial, Multinomial, Hypergeometric, Poisson, Negative Binomial, Poisson; Continuous distributions - Normal, Exponential, Gamma, Weibull and Beta distributions and their properties -Function of Random variables.	6
III	Sampling Distributions: Random sampling, Sampling Distributions of Means, Estimation, Properties of point estimators, Confidence interval, Maximum likelihood and Bayes estimators, Prediction intervals.	6
IV	Testing of Hypothesis: Sampling distributions – testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions, tests for independence of attributes and Goodness of fit. Linear Correlation and Regression Analysis: Introduction, Linear Regression model, Regression coefficient, Lines of correlation, Rank correlation.	6

Text Books:

1. Gupta, S.C, and Kapur, J.N., “Fundamentals of Mathematical Statistics”, Sultan Chand, Ninth Edition, New Delhi, 1996.
2. Johnson. R. A., “Miller & Freund's Probability and Statistics for Engineers”, Sixth Edition, Pearson Education, Delhi, 2000.
3. Douglas C. Montgomery and George C. Runger, “Applied Statistics and Probability for Engineers”, 5th Edition, 2011.

Reference books:

1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, “Probability and Statistics for Engineers and Scientists”, Seventh Edition, Pearson Education, Delhi, 2002.
2. Lipschutz. S and Schiller. J, “Schaum’s outlines - Introduction to Probability and Statistics”, McGraw-Hill, New Delhi, 1998.
3. S. M. Ross, “Introduction to Probability and Statistics for Engineers and Scientists” 4th edition.

HS 305: INDUSTRIAL ECONOMICS AND MANAGEMENT

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Introduction to Engineering Economics - Technical efficiency, economic efficiency - cost concepts: elements of costs, opportunity cost, sunk cost, private and social cost, marginal cost, marginal revenue and profit maximization.</p> <p>Supply and Demand: Determinants of demand, law of demand, determinants of supply, law of supply, market equilibrium - elasticity of demand - types of elasticity, factors affecting the price elasticity of demand.</p> <p>National Income Concepts: GDP and GNP, per capita income, methods of measuring national income. Inflation and deflation.</p>	8
II	<p>Value Analysis - Time value of money - interest formulae and their applications: single-payment compound amount factor, single-payment present worth factor, equal-payment series compound amount factor, equal-payment series sinking fund factor, equal-payment series present worth factor, equal-payment series capital recovery factor, effective interest rate.</p> <p>Investment Analysis: Payback period—average annual rate of return, net present value; Internal rate of return criteria, price changes, risk and uncertainty.</p>	8
III	<p>Principles of Management: Evolution of management theory and functions of management organizational structure - principle and types - decision making - strategic, tactical & operational decisions, decision making under certainty, risk & uncertainty and multistage decisions & decision tree.</p> <p>Human Resource Management: Basic concepts of job analysis, job evaluation, merit rating, wages, incentives, recruitment, training and industrial relations.</p>	8
IV	<p>Financial Management: Time value of money and comparison of alternative methods; costing – elements & components of cost, allocation of overheads, preparation of cost sheet, break even analysis - basics of accounting - principles of accounting, basic concepts of journal, ledger, trade, profit & loss account and balance sheet.</p> <p>Marketing Management: Basic concepts of marketing environment, marketing</p>	8

	mix, advertising and sales promotion.	
	Project Management: Phases, organization, planning, estimating, planning using PERT & CPM.	

Text Books:

1. PanneerSelvam, R, “*Engineering Economics*”, Prentice Hall of India Ltd, New Delhi.
2. Dwivedi, D.N., “*Managerial Economics, 7/E*”, Vikas Publishing House.

Reference Books:

1. Sullivan, W.G, Wicks, M.W., and Koelling. C.P., “*Engg. Economy 15/E*”, Prentice Hall, New York, 2011.
2. Chan S. Park, “*Contemporary Engineering Economics*”, Prentice Hall of India, 2002.
3. F. Mazda, *Engg. Management*, Addison Wesley, Longman Ltd., 1998.
4. O. P. Khanna, *Industrial Engg. and Management*, Dhanpat Rai and Sons, Delhi, 2003.
5. P. Kotler, *Marketing Management, Analysis, Planning, Implementation and Control*, Prentice Hall, New Jersey, 2001.
6. Venkata Ratnam C.S & Srivastava B.K., *Personnel Management and Human Resources*, Tata McGraw Hill.
7. Prasanna Chandra, *Financial Management: Theory and Practice*, Tata McGraw Hill.
8. Bhattacharya A.K., *Principles and Practice of Cost Accounting*, Wheeler Publishing.
9. Weist and Levy, *A Management guide to PERT and CPM*, Prentice Hall of India.
10. Koontz H., O'Donnel C., & Weihrich H, *Essentials of Management*, McGraw Hill.

EE-301: ELECTRICAL MACHINES-I

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Single-Phase Transformers: principle of transformer operation, emf equation, voltage ratio and turns ratio, construction of single-phase transformers, ideal transformer, transformer on no load: phasor diagram and equivalent circuit, practical transformer: phasor diagram and equivalent circuit, voltage regulation, losses, open circuit, short circuit, back to back test, transformer efficiency, condition for maximum efficiency, per unit transformer values, all day efficiency.</p> <p>Single-phase auto transformer, volt ampere relation, step up auto transformer, auto transformer efficiency, saving in conductor material, conversion of a winding transformer to an auto transformer, advantages & disadvantages of auto transformer, applications of auto transformer.</p>	8
II	<p>Three- phase Transformer: Three-phase transformer, Comparison between three phase transformer bank and three phase transformer units, three-phase transformer construction, three-phase transformer groups, three-phase transformer connections, factors affecting the choice of connections, delta-delta connection, star-star connection, star-delta connection, delta-star connection, open delta connection, scott three-phase/ two phase connection, Comparison of Distribution and Power Transformer, application of transformers</p> <p>Three winding transformers: equivalent circuit, determination of parameters, voltage regulation, polarity of the transformers, parallel operation of single-phase transformers and Three-phase transformers, wave shape of no load (exciting) current, inrush of magnetizing current, construction of current transformers and voltage transformers, transformer cooling.</p>	8
III	<p>DC Machines-I: Basic structure of electric machine, dc generator construction, equivalent circuit of dc machine, type of dc machine, emf equation of dc machine, armature reaction in dc generators, commutation, methods of improving commutation, demagnetizing and cross magnetizing ampere turns, characteristics of dc generator.</p>	8

IV	DC Machine-II: Motor principle, significance of back emf, equivalent circuit of a dc motor, torque equation of dc motor, types of dc motor, characteristics of shunt, series & compound motors, speed control of dc motors, starting of dc motors & starters, losses in dc machine, efficiency of a dc machine, testing of a dc machines, application of dc machines.	8

Recommended Books:

1. "Electrical Machinery" by P.S. Bimbhra, Khanna Publishers, Delhi.
2. "Generalized theory of electrical machines" by P. S. Bimbhra, Khanna Publishers, Delhi.
3. "Electric Machinery" by Fitzgerald & Kingsley, MGH.

EE-302: POWER ELECTRONICS-I

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs
I	Power electronics devices: Role of power electronics, construction and characteristics of power diode, power transistor, power MOSFET, SCR, GTO, TRIAC & DIAC. SCR: two transistor model, methods of turn-on, R, RC and UJT firing circuit, commutation techniques, series and parallel operation.	6
II	Phase-controlled converters (AC to DC converters): One, two, three, six pulse converters, fully and half controlled converters, load voltage waveforms with different types of loads, output voltage equations, continuous and discontinuous modes of operation, input power factor of converter, reactive power demand, effect of source inductance, introduction to four quadrant/dual converter.	10
III	Cycloconverters (AC to AC converters): basic principle of frequency conversion, types of cyclo converter, principle of operation of step up and step down cyclo converter, single-phase to single-phase cyclo converter with resistive and inductive load. Three-phase to single-phase cyclo converter, three-phase to three-phase cyclo converter, output voltage equation of cyclo converter	8
IV	Choppers (DC to DC converter): classification of choppers, principle of operation, steady state analysis of class-a choppers, step up chopper: steady state analysis, current commutated and voltage commutated chopper, output voltage control techniques, one, two and four quadrant choppers.	8

Recommended

Books:

1. "Power Electronics: Circuits, Devices & Applications" by M.H. Rashid, Prentice Hall of India Ltd, 2004.
2. "Power Electronics" by P.S. Bimbhra, Khanna Publishers, 2006.
3. "Power Electronics" by M.D. Singh and K.B. Khanchandani, Tata McGraw Hill Pub, 2005.
4. "Power Electronics: Converters, Applications and Design" by Ned Mohan, T.M. Undeland.


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EC-302: DIGITAL ELECTRONICS

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Number system & codes:- Binary arithmetic (Addition, Subtraction, Multiplication and Division), Floating point numbers. Diminished radix and radix compliments, BCD codes, 8421 code, Excess-3 code, Gray code, Error detection and correction: Parity code, Hamming code.</p> <p>Logic Gates:- Positive & negative logic, Tristate logic gates, Schmitt gates, Totem pole output and open collector output; Fan in and Fan out of logic gates, Buffer & trans-receivers, IEEE/ANSI standards symbols.</p>	8
II	<p>Boolean algebra simplification techniques:- Sum of products and product of sums simplification, NAND and NOR implementation, Incompletely specified functions, Ex-OR functions, The map method: Two, Three, Four and Five variable maps; The tabulation method, Determination of prime implicants, Selection of essential prime implicants.</p> <p>Logic families:- Classification of digital IC's, Significance & types, Characteristics parameters, TTL, ECL, CMOS logic families, NMOS & PMOS logic, Interfacing between TTL & CMOS.</p>	9
III	<p>Combinational logic circuits: Implementing combinational logic, Arithmetic circuits: Half adder, Full adder, Half subtractor, Full subtractor; Multiplexer, Encoder, Demultiplexer & Decoder.</p> <p>Flip flops:- Introduction, S-R flip-flops, Level & edge triggered flip flops, JK flip-flop, D flip-flop, T flip-flop, Master slave JK flip-flop, Flip flop timing parameters & applications.</p>	8
IV	<p>Shift Registers:- Shift register, Ring counter, Universal shift registers, SISO, PISO, SIPO & PIPO.</p> <p>Counters:- Asynchronous ripple counter, Synchronous counter, Modulus of a counter, Binary ripple counter, Up & down, Decade counter.</p> <p>Semiconductor Memories:- Classification of memories, ROM, RAM, Static memory and Dynamic memory. Programmable logic arrays, Charged-coupled device memory.</p>	8

Text Books

1. Digital Electronics -Principle & Integrated circuits, Anil K Maini, Wiley India edition
2. Modern Digital Electronics, R.P.Jain, TMH
3. M. Morris Mano, Digital Design, Prentice Hall of India.

Reference Books

1. Digital Principle and Applications, Malvino and Leach, TMH
2. Digital Electronics, Kharate, Oxford University Press

EC-303 : NETWORK ANALYSIS & SYNTHESIS

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Analysis of coupled circuits and application of network theorem in AC circuits: Active element conventions: Modelling of coupled circuits, Dot convention in coupled circuits; Network theorems in AC circuits: Thevenin's and Norton's theorems, Superposition theorem, Reciprocity and maximum power transfer theorem.</p> <p>Graph theory and network equations: Introduction and graph of a network, The incidence matrix, Fundamental cut set matrix, Fundamental tie set matrix and loop currents, Relation between various matrices. Network equilibrium equations: using KVL and KCL; Networks with mutual inductance, Duality.</p>	9
II	<p>Application of Laplace transform in circuit analysis: Review of Laplace transform: Definition of Laplace transform and its inverse, Laplace transform of basic functions, Properties of Laplace transform; Application of Laplace transforms in circuit analysis: Transformation of time domain circuit components to s- domain, Laplace transform to solution of network problems.</p> <p>Transient response: Transient response of R-L, R-C, R-L-C circuits(series combinations only) for DC and sinusoidal excitations.</p>	9
III	<p>Two port networks: Concept of two port networks, Classification of parameters: Open circuit and Short circuit parameters, Transmission and inverse transmission parameters, Hybrid and inverse hybrid parameters; Condition for reciprocity and symmetry, Inter-relationship between the parameters. Interconnection of two port networks: Series, Parallel, Cascade and series-parallel connection. T and pi representations.</p>	8
IV	<p>Fundamentals of network synthesis: Network functions, Concept of poles and zeros, Necessary condition of a stability of a network function. Hurwitz polynomial and its properties, Positive real function, Properties of positive real functions, Testing a positive real function, Synthesis of R-L, R-C and L-C driving point functions: Foster and Cauer forms.</p>	8

Text Books

1. Fundamentals of Electric circuits, Charles K Alexander, Matthew N O Sadiku, TMH
2. Circuit Theory -Analysis and synthesis, A. Chakrabarti, Dhanpat Rai & co.
3. Network analysis and synthesis, Franklin F. Kuc, PHI.

Reference Books

1. Networks and Systems, D.Roy Choudhury, New Age International.
2. Network Analysis, Van Valkenberg, PHI
3. Engineering Circuit Analysis, William Hayt and Jack Kemmerly, TMH
4. Circuits and Networks- Analysis and Synthesis, A. Sudhakar and S.P. Shyam Mohan, TMH

HS 306: SOCIOLOGY AND ELEMENTS OF INDIAN HISTORY FOR ENGINEERS

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE OBJECTIVE:

- To familiarize the students with elements of Indian history and sociological concepts and theories by which they could understand contemporary issues and problems in Indian society.
- To enable the students to analyse critically the social processes of globalization, modernization and social change.
- To help the students imbibe such skills that will enable them to be better citizens and human beings.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Introduction to sociological concepts: structure, system, organization, social institution, Culture social stratification (caste, class, gender, power). Understanding social structure and social processes: Perspectives of Marx and Weber.	6
II	Political economy of Indian society: Industrial, Urban, Agrarian and Tribal society. Social change in contemporary India: Modernization and globalization, Secularism and communalism.	6
III	Introduction to Elements of Indian History: What is history? ; History Sources - Archaeology, Numismatics, Epigraphy and Archival research. Indian history and periodization: evolution of urbanization process: first, second and third phase of urbanization.	6
IV	From feudalism to colonialism: The coming of British; Modernity and struggle for independence. Issues and concerns in post-colonial India (upto 1991): Issues and concerns in post-colonial India 2nd phase (LPG decade post 1991)	6

Text Books:

1. Desai, A.R. (2005), Social Background of Indian Nationalism, Popular Prakashan.
2. Giddens, A (2009), Sociology, Polity, 6th Edition.
3. Chandoke, Neera & Praveen Priyadarshi (2009), contemporary India: Economy, Society and Politics, Pearson.

Reference Books:

1. Guha, Ramachandra (2007), India After Gandhi, Pan Macmillan.
2. Haralambos M, RM Heald, M Holborn (2000), Sociology, Collins.
3. Sharma R. S. (1965), Indian feudalism, Macmillan.
4. Gadgil, Madhab & Ramchandra Guha (1999) - This Fissured Land: An Ecological History of India, OU Press.

HS 307: GERMAN LANGUAGE – I

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE OBJECTIVES:

- To read and write short, simple texts.
- To understand a dialogue between two native speakers and also take part in short, simple conversations using the skills acquired.
- To offers opportunities for students of engineering for higher studies, research and employment in Germany.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Wichtige Sprachhandlungen: Phonetics – Sich begrüßen – Sich und andere vorstellen formell / informell – Zahlen von 1 bis 1 Milliarde – verstehen & sprechen.</p> <p>Grammatik: regelmäßige Verben im Präsens – “sein” und haben im Präsens – Personalpronomen im Nominativ.</p>	6
II	<p>Wichtige Sprachhandlungen: Telefonnummern verstehen und sprechen Uhrzeiten verstehen und sagen Verneinung “nicht und kein” (formell und informell)</p> <p>Grammatik: Wortstellung – Aussagesatz – W-Frage und Satzfrage (Ja/Nein Frage) Nomenbuchstabieren und notieren bestimmter und unbestimmter Artikel und Negativartikel im Nom. & Akkusativ</p>	6
III	<p>Wichtige Sprachhandlungen: Tageszeiten verstehen und über Termine sprechen – Verabredungen verstehen – Aufgaben im Haushalt verstehen</p> <p>Grammatik: Personalpronomen im Akkusativ und Dativ – W-Fragen “wie, wer, wohin, wo, was usw.-Genitiv bei Personennamen – Modalverben im Präsens “können, müssen, möchten”</p>	6
IV	<p>Wichtige Sprachhandlungen: Sich austauschen, was man kann, muss – Bezeichnungen Lebensmittel – Mengenangaben verstehen – Preise verstehen und Einkaufszettel schreiben</p>	6

	Grammatik: Wortstellung in Sätzen mit Modalverben – Konnektor "und" – "noch"-kein-----mehr – "wieviel, wieviele, wie alt, wie lange" – Possessivartikel im Nominativ.	
V	Wichtige Sprachhandlungen: Freizeitanzeigen verstehen – Hobbys und Sportarten Anzeigen für Freizeitpartner schreiben bzw. darauf antworten – Vorlieben und Abneigungen ausdrücken Grammatik: Verben mit Vokalwechsel im Präsens – Modalverben im Präsens "dürfen, wollen und mögen" - "haben und sein" im Präteritum – regelmäßige Verben im Perfekt – Konnektoren "denn, oder, aber."	6

Text Book

1. Studio d A1. Deutsch als Fremdsprache with CD. (Kursbuch und Sprachtraining).

References

1. German for Dummies
2. Schulz Griesbach

HS 308: FRENCH LANGUAGE - I

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE OBJECTIVES:

- To read and write short, simple texts.
- To understand a dialogue between two native speakers and also take part in short, simple conversations using the skills acquired.
- To offers opportunities for students of engineering for higher studies, research and employment in French.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Grammar and Vocabulary: Usage of the French verb “se presenter”, a verb of self- introduction and how to greet a person- “saluer”.</p> <p>Listening and Speaking: The authentic sounds of the letters of the French alphabet and the accents that play a vital role in the pronunciation of the words.</p> <p>Writing: Correct spellings of French scientific and technical vocabulary.</p> <p>Reading: Reading of the text and comprehension – answering questions.</p>	6
II	<p>Grammar and Vocabulary: Definite articles, “prepositions de lieu” subject pronouns.</p> <p>Listening and Speaking: Pronunciation of words like Isabelle, presentez and la liaison – vous êtes, vous appelez and role play of introducing each other – group activity.</p> <p>Writing: Particulars in filling an enrolment / registration form.</p> <p>Reading Comprehension: reading a text of a famous scientist and answering questions.</p>	6
III	<p>Grammar and Vocabulary: Verb of possession “avoir” and 1st group verbs “-er”, possessive adjectives and pronouns of insistence- moi, lui..and numbers from 0 to 20.</p> <p>Listening and Speaking: Nasal sounds of the words like feminine, ceinture, parfum and how to ask simple questions on one’s name, age, nationality, address mail id and telephone number.</p> <p>Writing: Conjugations of first group verbs and paragraph writing on self – introduction and introducing a third person.</p> <p>Reading Comprehension: reading a text that speaks of one’s profile and answering questions</p>	6

IV	<p>Grammar and Vocabulary: Negative sentences, numbers from 20 to 69, verb “aimer” and seasons of the year and leisure activities.</p> <p>Listening and Speaking: To express one’s likes and dislikes and to talk of one’s pastime activities (sports activities), je fais du ping-pong and nasal sounds of words – janvier, champagne.</p> <p>Writing: Conjugations of the irregular verbs: faire and savoir and their usage. Paragraph writing on one’s leisure activity- (passé temps favori).</p> <p>Reading: a text on seasons and leisure activities – answering questions.</p>	6
V	<p>Grammar and Vocabulary: les verbes de direction- to ask one’s way and to give directions, verbes- pouvoir and vouloir and 2nd group verbs, à droite, à gauche and vocabulary relating to accommodation.</p> <p>Listening and Speaking: To read and understand the metro map and hence to give one directions – dialogue between two people.</p> <p>Writing: Paragraph writing describing the accommodation using the different prepositions like en face de, derrière- to locate.</p> <p>Reading Comprehension: A text / a dialogue between two on location and directions- ouest la poste/ la pharmacie, la bibliothèque?.....</p>	6

Text Book

1. Tech French

References

1. French for Dummies.
2. French made easy-Goyal publishers
3. Panorama

EE-311: ELECTRICAL MACHINES-I LAB

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 hrs

LIST OF EXPERIMENTS:

TRANSFORMERS

1. To find turns ratio & polarity of single-phase transformer.
2. To perform open & short-circuit tests on single-phase transformer.
3. To perform Sumpner's (Back to Back) test on two identical $1-\Phi$ transformers.
4. Parallel operation of two single-phase transformers & to study the load shared by each transformer.
5. To convert three-phase to Two-phase by Scott-connection of transformers.

DC MACHINES

6. To plot the magnetizing characteristics of a DC generator running at rated speed.
7. To obtain and plot the external characteristics of a DC shunt generator & to deduce the internal characteristics from the above.
8. To perform load test on DC shunt generator.
9. Speed control of DC shunt motor.
10. Swinburne's tests of DC shunt motor.
11. To obtain and plot the characteristics of DC series motor.
12. To perform load test on DC series motor.

NOTE: At least eight experiments are to be performed in this semester from the above list.

Recommended Books:

1. "Experimentation and viva voce on electrical machines" by V.N. Mittal & A. Mittal, Standard Publications.

EE-312: POWER ELECTRONICS-I LAB

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 hrs

LIST OF EXPERIMENTS:

1. Experiment to study characteristics of diode, SCR and TRIAC.
2. Experiment to study characteristics of transistor and MOSFET.
3. Experiment to study R and R-C firing circuits.
4. Experiment to study UJT firing circuit.
5. Experiment to study AC phase control.
6. To study three-phase full-wave uncontrolled rectifier operation with R and R-L load and observe its input/output Wave form.
7. Experiment to study dc chopper.
8. Experiment to study single-phase cycloconverter characteristics.
9. To study single-phase full-wave controlled rectifier using SCR and UJT with R and R-L load and observe its input/output Waveform with and without freewheeling (commutating) diode.
10. Experiment to study Lamp-Dimmer circuit using Diac & Triac with lamp load.

Note: At least eight experiments have to be performed in the semester from the above list.

EE-313: DIGITAL ELECTRONICS LAB

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 hrs

LIST OF EXPERIMENTS

1. Verify truth tables of AND, OR, NOT, NAND, NOR and XOR gates.
2. Implement (i) half adder (ii) full adder using AND-OR gates.
3. Implement full adder using NAND gates as two level realizations.
4. Implement full subtractor using 8 to 1 multiplexer.
5. Verify truth tables of RS & JK flip flops and convert JK flip flops into D type & T type flip flops.
6. Use 555 timer as (i) monostable (ii) as astable multivibrator.
7. (a) Use of 4-bit shift register for shift left and shift right operations.
(b) Use 4-bit shift register as a ring counter.
8. Implement mod-10 counter and draw its output wave forms.

9. Implement 4-bit DAC using binary weighted resistance technique/R-2R ladder network technique.
10. Implement 8-bit ADC using IC(ADC0800/0801).
11. a) Implement (i) Single level clipping circuit (ii) Two level clipping circuit.
b) Implement clamping circuit to clamp, at peak +ve voltage/peak -ve voltage of an input signal.

ADDITIONAL EXERCISES:

1. Construct bounce less switch.
2. Construct a pulser of 1Hz and 10Hz, 1kHz and manual.
3. Construct logic state detector.
4. Construct op to - sensor based.
 - a. Measurement rotational speed of motor.
 - b. Measurement time elapse between two events.
 - c. Measurement of linear velocity.
 - d. Measurement of acceleration.
5. Construct a memory using TTL Circuits. Read and write data on to a memory from bus.
6. Construct a security latch that can be operated by an identity card.

Note: At least eight experiments have to be performed in the semester from the above list.

SEMESTER IV

MA 401: OPTIMIZATION AND CALCULUS OF VARIATIONS

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE OBJECTIVES:

The objective of this course is to present different methods of solving optimization problems in the three areas of linear programming, nonlinear programming, and classical calculus of variations. In addition to theoretical treatments, there will be some introduction to numerical methods for optimization problems.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Introduction: A survey of some simplified examples of common real world situations leading to optimization problems, basic formulation and theory of optimization problems. Linear programming: Linear programming (optimization of linear functions	6

	subject to linear constraints): basic theory; simplex method; duality, practical techniques.	
II	<p>Linear programming: Basic LPP - solution techniques (Simplex, Artificial Basis), Complementary Slackness Theorem, Fundamental theorem of Duality, degenerate solutions, cycling; Applications - elements of dynamic programming including Hamiltonian, Bellman's optimality principle.</p> <p>Transportation and Assignment Problems: Solution of a balanced transportation problem, degeneracy in transportation problems and alternate solutions, Mathematical problems in formulation of assignment problems.</p>	6
III	<p>Nonlinear programming: Nonlinear programming (optimization of nonlinear functions subject to constraints) with Lagrange multipliers, Karush-Kuhn-Tucker optimality conditions, convexity, duality.</p> <p>Approximation methods for nonlinear programming: Line search methods, gradient methods, conjugate gradient methods; Networking techniques – PERT and CPM.</p>	
IV	<p>Calculus of Variations: Basic definitions - functionals, extremum, variations, function spaces; Necessary conditions for an extremum, Euler-Lagrange Equation, convexity and its role in minimization, minimization under constraints; Existence and nonexistence of minimizers; Applications - Isoperimetric problems, Geodesics on the surface.</p>	

Text Books:

1. C. B. Gupta, "Optimization Techniques in Operation Research," I. K. International Publishing House Pvt. Ltd.
2. A. S. Gupta, Calculus of Variations and Applications, PHI Prantice hall India.
3. Mukesh Kumar Singh, "Calculus Of Variations" Krishna Prakashan Media (P) Ltd.
4. J. K. Sharma, Operations Research – Problems and Solutions, Macmillian Pub.

Reference books:

1. I. M. Gelf and S. V. Fomin, "Calculus of Variations" Dover Publications Inc Mineola, New York.
2. Purna Chand Biswal, "Optimization in Engineering, Scitech Publications India Pvt. Ltd.
3. B. S. GREWAL, Higher Engineering Mathematics, Krishna Publications.
4. G. Hadly, Linear Programming, Narosa Publishing House.
5. Kanti Swarup, P. K. Gupta and Manmohan, "Operations Research," Sultan Chand & Sons.

HS 409: HUMAN VALUES AND PROFESSIONAL ETHICS

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE OBJECTIVES:

- To enable students to explore the purpose of value education.
- To understand the purpose of harmony with oneself, family, society and nature.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Introduction –Need and Basic Guidelines 1. Understanding the need , basic guidelines, content and process of value Education 2. Self-Exploration – purpose, content and process, ‘Natural Acceptance’ and Experiential Validation – as the mechanism for self-explanation.	6

II	Process for Value Education <ol style="list-style-type: none"> 1. Continuous Happiness and Prosperity – A look at basic Human Aspirations. 2. Right Understanding, Relationship and Physical Facilities – basic requirements for fulfillment of aspirations of every human being with their correct priority 3. Understanding Happiness and prosperity – A critical appraisal of the current scenario. 4. Method to fulfill the human aspirations; understanding and living in harmony at various levels 	7
III	Harmony in Human Beings <ol style="list-style-type: none"> 1. Understanding human being as a co-existence of the self and the body. 2. Understanding the needs of Self ('I') and 'Body' – Sukh and Suvidha. 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 	7
IV	Harmony in Myself and body <ol style="list-style-type: none"> 1. Understanding the characteristics and activities of 'I' and harmony in 'I' 2. Understanding the harmony of I with the Body: Sanyam and Swasthya: correct appraisal of Physical needs, meaning of Prosperity in detail. 	6
V	Harmony in Family, Society and Nature <ol style="list-style-type: none"> 1. Understanding harmony in the family, society and nature. 2. Understanding values in human relationship; meaning of Nyaya and Program for its fulfillment to ensure Ubhay-tripti. 3. Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. 	6

Text Books

1. R R Gaur, RSangal and GP Bagaria, A Foundation Course in value Education, Published by Excel Books (2009).
2. R R Gaur, R Sangal and G P Bagaria, Teacher's Manual (English), 2009.

Reference Books

1. E.F. Schumacher, Small is Beautiful; a study of economics as if people mattered, Blond & Briggs, Bratain, 1973.
2. PL Dhar, RR Gaur, Science and Humanism, common wealth publishers, 1990.
3. A.N. Tripathy, Human values, New Age International Publishers, 2003.

4. E.G. Seebauer & Robert, L BERRY, Foundational of Ethics for Scientists & Engineers, Oxford University Press, 2000.
5. M. Govindarajan, S. Natrajan & V.S. Senthikumar, Engineering Ethics (including human Values), Eastern Economy Edition, Prentice hall of India Ltd.
6. B.L. Bajpai, 2004, Indian Ethos and Modern Management, New Royal book Co; Lucknow, 2004, Reprinted 2008.

EE-401: ELECTRICAL MACHINES-II

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Three-phase Induction machine: Constructional features, Rotating magnetic field, production of torque, phasor diagram, equivalent circuit, performance analysis, torque slip characteristics, no-load and blocked rotor test, load test, effect of rotor resistance, induction Generator.</p> <p>Deep bar and double cage induction motor, starting method of squirrel cage and wound rotor induction motor, various methods of speed control of squirrel cage and wound rotor induction motor.</p>	8
II	<p>Single phase induction motors: Introduction, production of rotating fields, principle, double revolving field theory, rotor slip, equivalent circuit, determination of equivalent circuit parameters, starting methods, types of single-phase induction motors, characteristics and applications of single-phase motors.</p>	7

III	<p>Synchronous generators: Introduction, construction of 3-phase synchronous machines, emf equation, armature winding, coil span factor, distribution factor, actual voltage generated, armature leakage reactance, armature reaction, synchronous impedance, equivalent circuit & Phasor diagram, voltage regulation, measurement of synchronous impedance.</p> <p>Two reaction theory, salient pole synchronous machine- two reaction model, torque angle characteristic of salient pole synchronous machine, maximum reactive power for a synchronous generator, determination of X_d and X_q, parallel operation of alternators, synchronizing power and synchronizing torque coefficient, transient conditions of alternators.</p>	8
IV	<p>Synchronous motors: Introduction, construction, principle of operation, main features, equivalent circuit and phasor diagram of a cylindrical rotor synchronous motor, different torques in synchronous motor, effect of varying excitation and load changes, synchronous motor V curves and inverted V curves, starting of synchronous motors, hunting, synchronous condenser, applications of synchronous motors.</p>	7

Recommended

Books:

1. "Electrical Machinery" by P.S. Bimbhra, Khanna Publishers, Delhi.
2. "Generalized theory of electrical machines" by P.S. Bimbhra, Khanna Publishers, Delhi.
3. "Electric Machinery" by Fitzgerald & Kingsley, MGH.

EE-402: ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Measuring System fundamentals: Classification of Instruments (Absolute & Secondary Instruments; Indicating, Recording & Integrating instruments; Based upon Principle of operation), three forces in Electromechanical Indicating Instrument (Deflecting, controlling & damping forces), Comparison between gravity & spring controls, Comparison of damping methods & their suitability.</p> <p>Units Standards & Errors: S.I. units, Absolute standards (International, Primary, Secondary & Working Standards), True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold).</p> <p>Transducers: Classification of transducers (Active, Passive, Primary & secondary), Basic construction and principle of LVDT, Strain gauge and Thermocouple transducers.</p>	8
II	<p>Measuring instruments: Construction, operating principle, Torque equation, Shape of scale, use as Ammeter or As Voltmeter (Extension of Range), Use on AC/DC or both, Advantages & disadvantages, Errors (Both on AC/DC) of PMMC types, Electrodynamics Type, Moving iron type (attraction, repulsion & combined types), Hotwire type, Induction type & Electrostatic type Instruments.</p> <p>Wattmeter & Energy Meters: Construction, operating principle, Torque equation, Shape of scale, Errors, Advantages & Disadvantages of Electrodynamics & Induction type Wattmeter & single phase induction type Energy meter, Compensation & Creep in energy meter.</p>	8
III	<p>Power Factor & Frequency Meters: Construction, operation, principle, Torque equation, advantages & disadvantages of Single-phase power factor meters (Electrodynamics & Moving Iron types) & Frequency meters (Electrical Resonance, Ferro dynamic & Electro dynamic types).</p> <p>Resistance Measurement Low & High Resistance Measurements: Limitations of Wheatstone bridge; Kelvin's double bridge method, Difficulties in high resistance measurements, Measurement of high resistance by direct deflection, loss of charge method, Megohm bridge & Meggar.</p>	8
IV	A.C. Bridges: General balance equation, Circuit diagram, Phasor diagram,	8

	advantages, disadvantages, applications of Maxwell's inductance, inductance-capacitance, Hays, Anderson, Owens, De-Sauty's, Schering & Weinsbridges, Shielding & earthing.	
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Recommended books

1. A Course in Elect. & Electronic Measurement & Instrumentation by A.K. Sawhney; Khanna Pub.
2. Electronic & Elect. Measurement & Instrumentation by J.B. Gupta; Kataria & Sons.
3. Electrical Measurements by E.W. Golding
4. Electronic Measurement and Measuring technique by W.D. Cooper & A.D. Helfrick.
5. Measuring Systems by E.O. Doebelin; TMH Publishers.

EE-403: TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Introduction: Structure of a power system, indoor and outdoor substations, equipment for substation layout, auxiliary supply. Distribution Systems: Radial, ring mains and network distribution system, comparison of various types of Supply systems (overhead).	8
II	Transmission Lines Parameters: Introduction: inductance of a conductor due to internal flux and external flux, inductance of a single phase two-wire line, inductance of three phase line, capacitance of three phase line, charging current due to capacitance, skin effect, Ferranti effect, proximity effect. Performance of Lines: Models of short, medium and long transmission lines, performance of transmission lines, capacity of synchronous condenser, tuned lines, voltage control.	8
III	Corona: Corona phenomenon, formation, Calculation of potential gradient, corona loss, factor effecting corona, method of reducing corona. Insulators: Types of insulator and application, voltage distribution over insulator string, Method of equalizing the potential gradient, String efficiency, insulator failures, testing of the insulators.	8
IV	Mechanical Design: Sag and stress calculations, effect of ice and wind, string chart, line supports, conductor material, dampers. Cables: Types of cables, construction of cables, grading of cables, capacitance, ratings, power factor in cables, thermal characteristics and applications.	8

Recommended Books:

1. Power System Engg: by I.J. Nagrath and D.P. Kothari (TMH)
2. A Course in Electrical Power by Gupta, Soni & Bhatnagar (Dhanpat Rai & Sons).
3. Power system by Aqshaf Hussain, Dhanpat Rai, Delhi

4. Elements of power system analysis by W.D.Stevenson(MGH)
5. Electric Power by S.L.Uppal(KhannaPub.)
6. Electrical power by J.B.Gupta(S.K.Kataria&Sons).
7. Power System Engineering by B.R. Gupta.
8. Electric Power System by B.M.Weedy,JohnWiley &Sons.
9. Transmission &Distribution of Electrical Engineering by H.Cotton.



Dean
H.P. Technical University
Hamirpur - 177001

EE-404: COMMUNICATION ENGINEERING

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Frequency Bands And Signals: Various frequency bands used for communication and their special features, Need for wireless communication, Types of communication based on modulation systems, types of various signals.</p> <p>Modulation Techniques: Introduction to AM, FM, PM, PCM, PPM, DSBSC, SSB, vestigial side band system. Comparison between analog and digital modulation, frequency division multiplexing and time division multiplexing.</p>	8
II	<p>Amplitude Modulation: Representations of AM, Frequency spectrum of AM Waves, need and descriptions of SSB, suppression of carrier.</p> <p>AM Transmitters: generation of AM, Low Level and High-level modulation, Comparison of levels, AM transmitter block diagram, collector class C modulator, and Base modulator, DSBSC/C Modulator.</p> <p>AM Receiver: Tuned radio frequency (TRF) receiver, Super heterodyne receiver, RF section and characteristics, mixers, frequency changing and tracking, IF rejection and IF amplifiers, detection and automatic gain control (AGC), AM receiver characteristics.</p>	9
III	<p>Frequency Modulation: Mathematical representation of FM, Frequency spectrum of the FM waves, wideband and narrow band FM.</p> <p>FM Transmitters: Basic requirements and generation of FM, FM Modulation methods: Direct methods, varactor diode methods, FET reactance modulator, Transistor reactance modulation, Pre-emphasis, direct FM modulator, AFM in reactance modulation, RC Phase Shift modulation, Armstrong FM systems.</p> <p>FM Receiver: Limiters, single and double tuned demodulator, balanced slope detector, Foster's phase discriminator, de-emphasis, ratio detector, block of FM receiver, RF amplifiers, FM receiver characteristics.</p>	8
IV	<p>Digital Modulation: Broad overview of PCM, DM, and ADM. Review of sampling, flat top sampling, quantization, Analog to digital conversion, overview of performance of analog modulations in presence of noise. Digital modulation techniques (ASK, FSK, BPSK, QPSK, M-ary PSK).</p> <p>An introduction to satellite Communication.</p>	9

Recommended Books:

1. Electronic communications systems by Kennedy/TMH
2. Communications systems by Taub & Schilling/TMH
3. Communication systems by Simon Haykins/John Wiley & sons
4. Communication systems by Bruce Carlson
5. Communication systems by Singh & Sapre/TMH



Dean
H.P. Technical University
Hamirpur - 177001

HS 410: LAW FOR ENGINEERS

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE OBJECTIVE:

- To familiarize students (Prospective engineers) with elementary knowledge of laws that would be of utility in their profession.
- To familiarize students with the constitution of India and laws in new areas viz. IPR, ADR, Human Rights, Right to Information, Corporate law, Law relating Elections and Gender Studies.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p>Constitutional Law: Nature of Indian Constitution (features), fundamental rights, duties and directive Principles of State Policy (DPSP's), forms of Governments, structure of Government of India, role and responsibility of executive, legislature/parliament and judiciary, nature of Indian federal system, center state and relations.</p> <p>Basic structure of the Indian constitution, basic features of the Indian, constitutional amendments - GolakNath, KeshwanandaBharti, Maneka Gandhi (1978) and S.R. Bommai case (1994), (floor test).</p>	6
II	<p>Law of contract: General principles of Indian Contract Act, 1862, kinds of Government contracts and dispute settlement, standard and printed form of contract, essential elements of valid contract proposal, acceptance communication and revocation thereof, relevance of time in contractual obligation.</p> <p>Main objectives of Arbitrates and Conciliation Act-1996, tort and law of tort, general principles of tort law, classifications of torts: property vs. person.</p>	6
III	<p>Administrative Law: Evolution, nature and its scope, conceptual objection against growth of administrative rule of law and separation of power, clarification of administrative actions, judicial review of administrative actions, exclusion of judicial review and concept of "Ombudsman"; Right to Information Act, 2005 (Sub Section 1 - 20)</p> <p>Environmental Law: Definition, meaning and its nature, environmental (Protection) Act-1986, Water (Preservation and Control of Pollution) Act-1974,</p>	6

	Air (Prevention and Control of Pollution) Act-1981; Environmental pollution, overall remedies and procedures.	
IV	Human Rights: Legality of human rights, universal declaration of human rights, 1948, difference between civil and political rights, individual and human rights - human rights of child, weaker section of society, prisoners, and refugees, International Human Rights Commission.	6

Text Books:

1. D.D. Basu, *Shorter Constitution of India*, Prentice Hall of India, (1996)
2. MeenaRao, *Fundamental concepts in Law of Contract*, 3rd Edn. Professional Offset, (2006)
3. H.O.Agarwal, *International Law and Human Rights*, Central Law Publications, (2008)

Reference Books:

1. H.M. Seervai, *Constitutional Law of India*, Tripathi Publications, (1993).
2. S.K. Kapur, *Human Rights under International Law and Indian Law*, Central Law Agency, (2001)
3. NeelimaChandiramani, *The Law of Contract: An Outline*, 2nd Edn. Avinash Publications Mum, (2000)
4. Avtarsingh, *Law of Contract*, Eastern Book Co., (2002).
5. Anson W.R.(1979), *Law of Contract*, Oxford University Press

HS 411: GERMAN LANGUAGE – II

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs
Prerequisite							
HS 302: GERMAN LANGUAGE - I							

COURSE OBJECTIVES:

- To enable the students to speak and understand about most of the activities in the day to day life.
- The students will be able to narrate their experiences in Past Tense.
- The students will be able to understand and communicate even with German Nationals.
- By the end of Phase – II the students will have a reasonable level of conversational skills.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Wichtige Sprachhandlungen: Zimmersuche, Möbel Grammatik: Verben mit trennbaren Vorsilben im Präsens und Perfekt. Verben mit trennbaren Vorsilben und Modalverben im Präsens. Verben mit untrennbaren Vorsilben im Perfekt. Unregelmäßige und gemischte Verben im Perfekt.	6
II	Wichtige Sprachhandlungen: Kleidung, Farben, Materialien. Grammatik: formelle Imperativsätze mit "Sie" informelle Imperativsätze Vorschläge mit "wir" – "sollen/wollen wir" - Soll ich? Modalpartikeln "doch" "mal" "doch mal".	6
III	Wichtige Sprachhandlungen: Sehenswürdigkeiten (Prater, Brandenburger Tor, Kolosseum, Eifelturm). Grammatik: Ortsangaben mit Akk. Und Dativ "alle", "man" Indefinite Pronomen "etwas",	6

	"nichts".	
IV	Wichtige Sprachhandlungen: Essen und Trinken im Restaurant, Partyvorbereitung und Feier. Grammatik: Nomen aus Adjektiven nach "etwas" und "nichts" Nomen aus dem Infinitiv von Verben, zusammengesetzte Nomen und ihre Artikel. Adjektive im Nom. und Akk. nach unbestimmten Artikel, Negativartikel und Possessivartikel	6

Text Books

1. Studio d A1. Deutsch als Fremdsprache with CD. (Kursbuch und Sprachtraining).

References

1. German for Dummies
2. Schulz Griesbach

HS 412: FRENCH LANGUAGE - II

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs
Prerequisite							
HS 303: FRENCH LANGUAGE - I							

COURSE OBJECTIVES:

- To enable the students communicate effectively with any French speaker
- To enable students to access information on the internet, send e mails, pass level 1 exam conducted by Alliance Française de Madras.
- To enable students to enhance their lexical and technical competence and have a competitive edge in the international market. By the end of Phase – II the students will have a reasonable level of conversational skills.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Grammar and Vocabulary: The second group verbs: Finir, rougir, grossir, grandir. “Les preposition de temps”: à, en, le, de 7h à 8h, jusqu’ à, vers. Listening and Speaking – the semi- vowels: Voilà, polluant. Writing - the days of the week, months, technical subjects, time, “les spécialitésscientifiques et l’ année universitaire, paragraph writing about time table. Reading: Reading of the text and comprehension – answering questions.	6
II	Grammar and Vocabulary – The adjectives, the nationality, feminine & masculin noun forms “les métiers scientifiques”. Listening and Speaking – Vowels: soirée, année, près de, très. Writing: Countries name, nationality, “les métiers scientifiques”, numbers from: 69 to infinitive and some measures of unit. Reading Comprehension: reading a text.	6
III	Grammar and Vocabulary – near future, The demonstrative adjectives, Express the aim by using the verb, Listening and Speaking – “La liaison interdite – enhaut”. Writing – some scientific terms, French expressions to accept an invitation. Sentence framing. Reading Comprehension – reading a text.	6

IV	Grammar and Vocabulary –the verbs: manger, boire, the partitive articles Listening and Speaking – “le ‘e’ caduc Writing- the food, the ingredients, fruits,vegetables, expression of quantity, paragraph writing about food habits. Reading –reading a text.	6
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Text Books

1. Tech French

References

1. French for Dummies.
2. French made easy: Goyal publishers.
3. Panorama.

EE-411: ELECTRICAL MACHINES-II LAB

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 hrs

LIST OF EXPERIMENTS: INDUCTION MOTORS

1. To perform no load test & block rotor test on three-phases squirrel cage induction motor.
2. To perform no load test & block rotor test on three-phase slip ring induction motor.
3. To study the starting methods of three-phase induction motors.
4. To study the cascading of two induction motors.
5. To conduct the load test to determine the performance characteristics of the induction motor.
6. To study speed changing by pole changing method.

SYNCHRONOUS MACHINES

1. To draw characteristics of alternator under different loading condition.
2. To find out regulation by synchronous impedance method.
3. To find out regulation by ZPF method.
4. To draw characteristics of alternator under different loading condition.
5. To plot V-Curves of asynchronous motor.
6. To measure steady state reactances (X_d, X_q) of asynchronous machine.

NOTE: At least eight experiments are to be performed in the semester from the above list.

Recommended Books:

1. "Experimentation and viva voce on electrical machines" by V.N. Mittal & A. Mittal, Standard Publications

EE-412: ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS LAB

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 hrs

LIST OF EXPERIMENTS

1. To identify meters from the given lot.
2. To calibrate an energymeter with the help of a standard wattmeter & a stopwatch.
3. To measure power & power factor by 3-Ammeter method.
4. To measure power & power factor by 3-Voltmeter method.
5. To measure power & power factor in 3-phase circuit by 2-Wattmeter method.
6. To measure capacitance by DeSauty's bridge.
7. To measure inductance by Maxwell's bridge.
8. To measure frequency by Wein's bridge.
9. To measure the power with the help of C.T & P.T.
10. To measure low resistance by Kelvin's double bridge.

Note: At least eight experiments to be performed from above list

EE-413:- ELECTRICAL SIMULATION LAB-1

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	3	2	30	20	50	3 hrs

List of Experiments

Software to be used: SimPower Systems (MATLAB Simulink)

1. At least eight computer simulation based electrical models to be studied on SimPower Systems.
2. To verify Kirchhoff's Current and Voltage laws in ac circuit.
3. To verify Superposition and Maximum-Power transfer theorem for a linear electrical system.
4. To study voltage and current relations in a balanced three-phase electrical system for star and delta Load.
5. To simulate no-load and open circuit tests of a two-winding transformer.
6. To simulate speed-torque characteristics of a dc shunt motor
7. To simulate variation of power factor and efficiency of a 3-phase induction motor with load.
8. To simulate ABCD constants of a transmission line.
9. To simulate performance of a long line at various loading conditions.
10. To study the dynamic characteristics of an SCR.
11. To simulate string efficiency of series and parallel connected SCRs.

SEMESTER-V
EE-501: POWER ELECTRONICS-II

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3hrs

COURSE OBJECTIVE:

After learning the course the students should be able to analyse, operate and design dc-to-ac inverters, ac-to-ac converters. Also simulate power electronic converters and their control scheme.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Inverter: Single phase and three phase voltage source inverter, its operating principle, working (steady state analysis derivation not required) Forced-commutated thyristor inverters, Voltage control in single-phase inverters. Pulse-width modulated inverters.	12
II	Single phase current source inverter with ideal switch, capacitor commutated CSI with RL load, series inverter, basic series inverter, half bridge series inverter and modified series inverter, single phase parallel inverter, design specification like turn off time, source current, commutating capacitance(derivation not required).	11
III	Utility application of power electronics: Distributed general application, introduction of wind electrical system, photo voltaic system, fuel cell system, micro turbine system, energy storage system, thyristor protection scheme.	8
IV	Power electronics solution: Uninterruptable power supplies, dynamic voltage restorer, dual feeder, static switches, static circuit breaker, solid state relay.	8

Text books:

1. ***“Power Electronics: Circuits, Devices & Applications”*** by M.H. Rashid, Prentice Hall of India Ltd, 2004.
2. ***“Power Electronics”*** by P.S. Bimbhra, Khanna Publishers, 2006.
3. ***“Power Electronics”*** by M.D. Singh and K.B. Khanchandani, Tata McGraw Hill Pub, 2005.

EE-502: LINEAR CONTROL SYSTEM

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3hrs

COURSE OBJECTIVE:

The objective of this course is to emphasize the importance of control and empower the students with basic concepts on modelling, analysis and design of control systems restricted to linear continuous time system. The specific objectives of each unit are to introduce the classical way of modelling systems, commonly used control components and their mathematical models from physical laws. Also to educate on drawing of specification, choosing of control structures and methods of designing the controllers.

UNIT	CONTENT	NO. OF HOURS
I	<p>Introduction: General schematic diagram of control system. Open loop and closed loop control systems, feedback, effects of feedback, linear and non-linear control system. Block diagrams, examples of various control systems. Basic concept of automatic control.</p> <p>Modelling: Formulation of differential equations of linear electrical and mechanical system, electrical and mechanical analogies, use of Laplace transform and transfer function, block diagram algebra, signal flow graphs, characteristic equation.</p>	10
II	<p>Time domain analysis: Standard test signals, transient response of the first order, second order systems, time domain specifications, dominant closed loop poles of higher order systems, steady state error and error coefficients.</p> <p>Stability: Concept of absolute and relative stability, pole - zero location, Routh – Hurwitz criterion.</p>	9
III	Frequency domain analysis: Closed loop frequency response,	10

	correlation between time and frequency response, Bode diagram, polar plots, log magnitude vs. phase plot. Stability in frequency response: Nyquist stability criterion, stability analysis relative stability.	
IV	Compensation design: Necessity of compensation, compensating network, phase margin, gain margin, lag and lead compensation. Control system components: Error detectors – potentiometers and synchronous, stepper motor, servo motor.	10

Text book:

1. ***“Linear Control System with MATLAB”*** by B.S. Manke, Khanna publishers
2. ***“Control System Engineering”*** by I.J. Nagrath & M. Gopal fifth edition, New Age International Publishers

Reference books:

1. ***“Automatic Control System”*** by Dr. F. Golnaraghi, B.C. Kuo ninth edition, Wiley Publication
2. ***“Control System Components”*** by J.F. Gibsen, F.B. Tuteur, TATA Mc-Graw Hill publishers (MGH)

EE-503: ELECTRICAL POWER GENERATION

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This course will provide understanding of power generation technology using conventional and nonconventional energy sources which will be useful for understanding the operation and working of power plants.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Conventional Methods Of Generation: Hydro Stations- Location, Layout, types and selection of prime mover, Thermal stations- Location, Layout, calculation of energy generated, nuclear stations- Principle of nuclear generation, Location, Layout, calculation of energy generated.	10
II	Load Curves: Energy Requirements, Maximum demand, Group Diversity Factor, Peak Diversity Factor, Types of load, Variation in Demand, Load Duration Curve, Energy Load Curve, Load Factor, Capacity Factor, utilization Factor, Base Load, Peak Load and Stand By Stations, Stand By Capacity in Power Plants.	9
III	Optimal System Operation: Introduction, optimal operation of generator on a bus bar. Optimal unit commitment. Reliability consideration, optimum generation scheduling, optimum load flow solution, optimum scheduling of hydrothermal system.	10
IV	Economic Load Dispatch Of Thermal System: The economic dispatch problem, thermal system dispatching neglecting network losses and considering network losses. Economic dispatch by gradient search, base point and participation factor.	10

Text book:

1. *“Generation of electrical energy”* by Dr.B.R.Gupta
2. *“A course in electrical power”* by A.K. Chakrabathi, Soni Gupta
Bhatnagar, Dhanpat Rai Publisher

Reference book:

1. *“Elements of electrical power station design”* by M.V. Deshpande

EE-504: HIGH VOLTAGE ENGINEERING

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

From this course students will understand the basic generation and measurement of high voltage and high current for testing purposes. Also test the high voltage electrical equipment with various testing devices.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Introduction: Insulation system, types of insulation system. Discharges in gases: General characteristics of gaseous insulation, basic processes of ionization in a gas, discharges in uniform and non-uniform fields, Paschen's law, commonly used gases for insulation and their properties. Breakdown of solids and liquids: Different mechanisms of breakdown of solids, Intrinsic breakdown, theories of intrinsic breakdown, different theories of breakdown in liquids, commonly used solid and liquid insulating materials and their properties.	9
II	Lightning phenomenon: Charge accumulation in clouds – formation and characteristics of lightning stroke, current and voltage magnitudes, protection of transmission lines and substations against lightning, lightning arrestors, switching surges, Insulation co-ordination.	10
III	Impulse generator: Definition of impulse wave, single stage and multistage impulse generators and their equivalent circuits, determination of front and tail resistance to produce a given wave shapes.	11

IV	Measurement of high voltages: Measurement of direct, alternating and impulse voltages by electrostatic voltmeters, sphere gap, uniform field gap, ammeter in series with high voltage resistors and voltage divider.	9
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Text book:

1. *“High Voltage Engineering”* by M.S.Naidu&V.Kamaraju, Mc-Graw Hill Education.
2. *“An introduction to high voltage engineering”* by Subir Ray, PHI Publisher

Reference books:

1. *“High Voltage Engineering”* – by C.L.Wadhwa , New Age Publication.
2. *“A course in Electrical power”* by A. Chakrabarti,M.L.Soni, P.V.Gupta, U.S.Bhatnagar, DhanpatRai Publication.

EE-505: ELECTROMAGNETIC FIELD THEORY

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3hrs

COURSE OBJECTIVE: To impart knowledge on the concepts and the computation of Electromagnetic field which is essential for understanding the working principle, design and analysis of Electrical machines and Systems.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	<p>Introduction: Review of vector analysis, scalar and vector product, gradient, divergence and curl of a vector and their physical interpretation, transformation amongst rectangular, cylindrical and spherical co-ordinate system.</p> <p>Electrostatic Field: Coulomb's law, electric field intensity from point charges, Electric field due to continuous field distribution of charges, gauss's law, electric displacement and displacement density, potential functions, potential field of a charge, Laplace's and Poisson's equation, capacitance and electrostatic energy.</p>	10
II	<p>Steady Magnetic Fields: Faraday Induction law, Ampere's Work law in the differential vector form, Ampere's law for a current element, magnetic field due to volume distribution of current. Ampere's Force Law, vector potential (Alternative derivation), equation of continuity.</p>	10
III	<p>Time Varying Fields: Equation of continuity for time varying fields, inconsistency of Ampere's law, Maxwell's field equations and their interpretation; solution for free space conditions, electromagnetic waves in a homogeneous medium, propagation of uniform plane wave, relation between E & H in a uniform plane-</p>	10

	wave, wave equations for conducting medium, Maxwell's equations using phasor notation, wave propagation in a conducting medium, conductors, dielectrics, wave propagation in good conductor and good dielectric.	
IV	<p>Reflection And Refraction of EM Waves: Reflection and refraction of plane at the surface of a perfect conductor & perfect dielectric (both normal incidence as well as oblique incidence), Brewster's angle and total internal reflection, reflection at the surfaces of a conductive medium, surface impedance, transmission-Line analogy, pointing theorem.</p> <p>Transmission Line Theory: Transmission line as a distributed circuit, transmission line equation, travelling & standing waves, characteristic impedance, input impedance of terminated line, reflection coefficient, Smith's chart and its applications.</p>	9

Text book:

1. *“Electromagnetic field theory and transmission lines”*: G.S.N. Raju.
2. *“Electromagnetic field theory”* PV Gupta.

Recommended books:

1. *“Electro-magnetic Waves and Radiating System”*: Jordan & Balmain, PHI.
2. *“Engineering Electromagnetic”*: Hayt; TMH.
3. *“Electro-Magnetics”*. Krauss J.DF; McGraw Hill.

EE-506: FLEXIBLE AC TRANSMISSION SYSTEM

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3hrs

COURSE OBJECTIVE:

To understand the concept of flexible ac transmission and the associated problems. Also to review the static devices for series and shunt control and the operation of controllers for enhancing the transmission capability.

UNIT	CONTENT	NO. OF HOURS
I	Introduction: The concept of flexible AC transmission, reactive power control in electrical power transmission lines, uncompensated transmission line, series and shunt compensation, Overview of FACTS devices - Static Var Compensator (SVC), Thyristor Switched Series capacitor (TCSC), Unified Power Flow controller (UPFC), Integrated Power, Flow Controller (IPFC).	10
II	Static var compensator (svc) and applications: Voltage control by SVC, influence of SVC on system voltage. Applications, steady state power transfer, enhancement of power system damping, prevention of voltage instability.	10
III	Thyristor controlled series capacitor (tcsc) and applications: Operation of the TCSC, Different modes of operation, Applications, Improvement of the system stability limit, enhancement of system damping, voltage collapse prevention. Emerging facts controllers- Static Synchronous Compensator (STATCOM), operating principle, V-I characteristics, Unified Power Flow Controller (UPFC), Principle of operation - modes of operation, applications.	10
IV	Co-ordination of facts controllers: FACTs Controller interactions,	9

	SVC–SVC interaction, co-ordination of multiple controllers using linear control techniques, Quantitative treatment of control co-ordination.	
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Text book:

1. Mohan Mathur, R., Rajiv. K. Varma, *“Thyristor: Based Facts Controllers for Electrical Transmission Systems”*, IEEE press and John Wiley & Sons, Inc.
2. *“Flexible ac Transmission System: Modelling and Control”* by Xiao Ping zhang, Christian Rehtanz, Bikash Pal.

OPEN ELECTIVE-III
EE-507: NON CONVENTIONAL ELECTRICAL POWER GENERATION

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3hrs

COURSE OBJECTIVE:

It introduces solar energy, its radiation, collection, storage and application. It also introduces the wind energy, bio-mass energy, geothermal energy and ocean energy as energy sources.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Introduction To Energy Sources: energy consumption as a measure of prosperity, future of world energy, energy sources and their availability (commercial and non-commercial energy sources).	7
II	Wind Energy: Introduction, Origin of wind, Basic principles of wind energy, site selection consideration, and Basic components of wind energy conversion system, Classification of WEC system, Advantages and Disadvantages of WEC system. Solar Energy: Introduction, solar constant, solar radiation, solar energy collector, applications of solar energy.	7
III	Energy From Biomass: Introduction, biomass definition, Biomass conversion technologies, Photosynthesis, factors effecting the Bio-digestion or generation of gas.	5
IV	Geo-Thermal Energy: Introduction, Geothermal sources development of geothermal power in India. Advantages and disadvantages of geothermal energy over other energy form.	7

Text book:

1. *Non-Conventional Energy Resources* by G.D Rai.

Reference books:

1. *An Introduction To Power Plant Technology* by G.D.Rai.
2. *Renewable Energy Sources* by MaheshwarDyal.

OPEN ELECTIVE-III
EE-508: ENERGY ASSESSMENT AND AUDIT

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3hrs

COURSE OBJECTIVE: This subject will give the student overall idea about energyscenario, supply and demand side verification, methodology for their improvement in current scenarios and energy auditing practice.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Introduction: Review of different Energy Sources, Need and objectives of Energy Conservation, Significance of Energy Assessment, Supply and Demand Side Management.	6
II	Energy Audit: Need for Energy Audit, Types of Energy Audits, National Energy Plan and its impact on Energy Conservation, Energy audit team, Energy Audit Reporting format, Energy Audit Instruments.	7
III	Energy Efficient Technologies: Life cycle assessment, Energy efficient Motors, BIS Specifications for Energy Efficient Motors, Energy Efficient lighting sources.	6
IV	Energy Audits Practice: Energy Audits of building systems, electrical systems, maintenance and Energy Audits.	5

Text Book:

1. *Handbook of Energy Audits* by Albert Thuman – Fairman Press Inc.
2. *Energy basis for man and nature* by Howard T.Odum&ElisbethC.Odum.
3. *Energy Management* by UmeshRathore, Kataria Publications

OPEN ELECTIVE-III
EE-509: ROBOTICS

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3hrs

COURSE OBJECTIVE:

After learning this course, the students should be able to:

4. Learn the mathematics of rigid motions, rotations, translations, velocity kinematics.
5. Evaluate the various parts of mechanical and electronic system of robots.
6. familiar with computer vision, visual servo control problems and applications in the industry.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Basic Concepts: Definition and origin of robotics, different types of robotics, various generations of robots, degrees of freedom, Asimov's laws of robotics, dynamic stabilization of robots.	5
II	Power Sources: Hydraulic, pneumatic and electric drives, determination of HP of motor and gearing ratio, variable speed arrangements, path determination, micro machines in robotics.	7
III	Manipulators, Actuators And Grippers Construction Of Manipulators: manipulator dynamics and force control, electronic and pneumatic manipulator control circuits, end effectors, various types of grippers, design considerations.	7
IV	Sensors And Intelligent Robots: Introduction to robotic sensors, vision systems, Range detectors, assembly aid devices, force and torque sensors, machine vision, ranging, laser, acoustic, magnetic fiber optic and tactile sensors.	7

Text books:

1. *Robot Modeling and Control* by Spong, M.W., Hutchinson, H., & Vidyasagar, M., John Wiley (Wiley India Ed.), 2006, ISBN-13: 978-0471649908.

2. ***Robotics Engineering – An integrated approach*** by R.D. Klafter, T.A. Chimielewski, Negin M., Prentice Hall of India, 1994, ISBN-13: 978-0134687520.
3. ***Introduction to Robotics*** by SAHA, Tata McGraw-Hill Education, 2008, ISBN 9781259083204.
4. ***Control in Robotics and Automation Sensor Based Integration (Engineering)*** by B. Ghosh, T. J. Tarn, Ning Xi, Academic Press, ISBN: 978-0122818455.

EE-511: POWER ELECTRONICS-II LAB

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3hrs

Practicals as per the topics in the syllabus for the course will be conducted in the laboratory. Following is the suggested list of practicals out of which a minimum of 7-8 experiments must be performed by a student during the semester.

LIST OF THE EXPERIMENTS TO BE PERFORMED:

1. To study triggering circuits for thyristor: Resistor triggering circuit; R-C triggering circuit.
2. To Study of 1- pulse and 2- pulse converter with R and R L load.
3. To Study of three phase full converter with R and R-L load.
4. To study SCR Half Wave and Full Wave Bridge Controlled Rectifier Output characteristics.
5. To study three Phase Full-Wave Uncontrolled Rectifier Operation with R and R-L Load and observe its input/output Characteristics.
6. To study Single Phase Cycloconverter output characteristics.
7. Series operation of SCR's.
8. Parallel operation of SCR's.
9. Lamp-Dimmer Using diac&triac with Lamp Load.
10. Speed Control of DC motor using SCR's

EE-512: LINEAR CONTROL SYSTEM LAB

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3hrs

Practicals as per the topics in the syllabus for the course will be conducted in the laboratory. Following is the suggested list of practicals out of which a minimum of 6-7 experiments must be performed by a student during the semester.

LIST OF THE EXPERIMENTS TO BE PERFORMED:

1. To plot speed torque characteristics of a 2 phase AC servomotor.
2. To plot speed torque characteristics of a 2 phase DC servomotor.
3. To study the close loop control of a three phase AC motor
4. To study the step response of a second order system for different damping factors.
5. To study the magnetic amplifier.
6. To study the microcontroller based stepper motor controller circuit.
7. To study various lag-lead compensation network.
8. To study the synchro transmitter rotor position versus stator voltage for three phase.

EE-513: ELECTRICAL SIMULATION LAB-II

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3hrs

Practicals as per the topics in the syllabus for the course will be conducted in the laboratory. Following is the suggested list of practicals out of which a minimum of 6-7 experiments must be performed by a student during the semester.

List of the experiments to be performed:

1. Study of matlab code for calculation of efficiency and voltage regulation of transformer.
2. Study of matlab code for calculation of efficiency and voltage regulation of dc motor.
3. Study of matlab code for calculation of efficiency and voltage regulation of poly phase induction motor.
4. Study of matlab code for calculation of efficiency voltage regulation of single phase induction motor.
5. Study of matlab code for calculation of efficiency voltage regulation of synchronous generator.
6. Plot 1st order and 2nd order open loop and closed loop system by matlab Simulink.
7. Find time domain analysis of 1st and 2nd order system and represent their parameters on graph itself.
8. Matrix operations like multiplication, inverse, transpose, conjugate, determinant, Eigen values.
9. Matrix to system gain and vice versa conversion by programming.
 - A. Stability checking methods: Root locus technique method
 - B. Polar plot
 - C. Bode Plot
 - D. Nyquist criteria
10. Compensation by lag, lead, compensator by both Simulink and programming method.
11. Cascade speed control of dc motor drive.

SEMESTER-VI
EE-601: SWITCHGEAR AND PROTECTION

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This subject gives descriptive and analytical idea about relays and different types of protection schemes of power system network.

COURSE CONTENT:

UNIT	CONTENT	NO.OF HRS
I	Protective relays: Introduction, Operating Principle of relay, Classification of relay, electromagnetic attraction relays. Electromagnetic induction relays, over current relays, Induction type directional power relay, Induction type directional over current relay, Universal relay torque equation, distance protection, Differential relay.	9
II	Feeder protection: Introduction, Over current protection and earth fault protection, time graded protection, current graded protection, differential Pilot wire protection, merz price voltage balance system, pilot protection, Bus Bar protection. Transformer Protection: Introduction, types of faults on transformer, bucholtz protection, Differential protection for power transformer, biased differential protection, Restricted earth fault protection, motor protection.	10
III	Generator protection: Introduction, generator faults, stator protection, rotor protection, motor protection. Static Relays: Basic concepts, Input Output devices, amplitude and Phase comparator, Over current relays, directional static over current relay, static differential relay.	10
IV	Theory of arc interruption: Arc Phenomenon, arc interruption, arc interruption theories. Circuit Breakers: Air break circuit breaker, oil circuit breaker, Air blast circuit breaker, Vacuum circuit breaker, SF6 circuit breaker Testing and	10

	maintenance of circuit breakers.	
	Fuses: Types, characteristics and construction of HRC fuses.	

Text book:

1. A course in Electrical Power by J.B Gupta: S K Kataria & Sons Publishing Company
2. A course in Electrical Power by A. Chakrabarti, M.L.Soni, P.V.Gupta, U.S.Bhatnagar, Dhanpat Rai Publishing Company (P) Limited.

Reference book:

1. Principle of power system by V.K Mehta
2. Power System Protection and Switchgear by B. Ravinder Nath & M.Chander, Wiley Eastern

EE-602: MICROPROCESSORS & APPLICATIONS

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

- To study the Architecture of 8085, 8086 & 8051.
- To introduce commonly used peripheral/ interfacing ICs.
- To study the addressing modes & instruction set of 8085 & 8051 and to develop skills in simple program writing.
- To study and understand typical applications of micro-processors and micro-controllers.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HRS
I	Introduction: Introduction, Evolution of microprocessor, 8085 microprocessor architecture and its functional blocks, 8085 pin diagram, address, data and control buses, 8085 features. Addressing Modes: Direct addressing, indirect addressing, indexed, register direct, register Indirect, implicit addressing mode, Timing diagrams, typical instruction set of 8085 microprocessor.	10
II	Programming: Development of Assembly language program. Interrupts: hardware & software & data transfer: Interrupt system of 8085 Types of memory and memory interfacing Decoding techniques – absolute and partial.	8
III	Mapping Techniques: I / O mapped I / O and memory mapped I / O, Serial I/O lines of 8085 and the implementation asynchronous serial data communication using SOD and SID. Peripheral Devices & Applications Of Microprocessor: Description of 8251, 8255, 8253, 8257, 8259, 8279. Cycle stealing and burst mode of DMA controller. Synchronous and asynchronous data transfer 8251.	8

IV	8086 Microprocessor: Main features, Architecture-the execution unit and bus interface unit, Memory segmentation, Memory addressing, 8086 hardware pin signals, 8086 minimum and maximum modes of operation.	5
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Text book:

1. *Microprocessor & Architecture, programming and application* by Gaonkar.
2. *“Microprocessors and Digital Systems”*, D.V.HALL, McGraw Hill
3. *“Microprocessor and Microcontrollers”*, Senthil, Saravanam (Oxford University Press)

Reference books:

- 1 *“An introduction to microprocessor”*, A.P.Mathur.
- 2 *“The 8086 Microprocessor –Kenneth”*, J Ayala
3. *“Fundamentals of microprocessor & microcomputers”*, – B.Ram

EE-603: POWER SYSTEM ANALYSIS

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3hrs

COURSE OBJECTIVE:

This subject is useful to get an comprehensive idea about economic aspect of power generation, its reliability, frequency and voltage stability and design of controller.

COURSE CONTENT:

Unit	Content	No. Of hours
I	Power System Components: Introduction, single phase solution of balanced three phase networks, single line diagram, per unit system, complex power, synchronous machine, representation of loads.	10
II	Load Flow Studies: Network model formulation, Formation of Y-Bus by singular transformation, load flow problem, gauss-siedel method, Newton-Raphson method, decoupled load flow method.	10
III	Fault Analysis: symmetrical component phase shift in star delta transformer, sequence impedance of transmission lines, sequence impedance of power system, symmetrical component analysis of unsymmetrical component. L-G fault, L-L fault, L-L-G fault, L-L-L fault.	10
IV	Stability: Dynamics of synchronous machine, power angle equation, nodal elimination technique, steady state stability, transient stability, equal area criteria, numerical solution of swing equation, factors affecting transient stability.	10

Text Books:

1. *Power System Engineering* by D. P. Kothari and I. J. Nagrath , TMH publication.
2. *Power system Analysis* J.J. Grainger, W.D. Stevenson jr, Mc-Graw Hill Education Publisher Company.
3. *Electrical Power System* by B.M. Weedy, B.J.Coryu, N.Jenkins , John Willey & sons Publisher Company.
4. *Electrical Power System* by C.L.Wadhwa.
5. *Power System Analysis Design* by B. R. Gupta S. Chand and Company.

EE-604: ELECTRICAL DRIVES

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3hrs

COURSE OBJECTIVE:

This subject is all about steady state transient state dynamics of motor load system and also study of different types of motor drive application.

COURSE CONTENT:

UNIT	CONTENTS	NO. OF HRS
I	Introduction To An Electric Drive System: Dynamic equations of an electric drive, torque equations, multi-quadrant operation, type of loads, energy loss during transients and load equalization.	10
II	Control Of Electric Drives: Speed control, closed loop position and speed control. Selection of motor rating thermal model of motor, classes of duty and determination of motor rating for different classes duty.	10
III	Dc Motor Drives: Starting, braking, speed control, controlled rectifier converters for DC drives and chopper fed DC drives.	10
IV	Induction Motor Drives: Starting, braking, speed control, ac controller fed induction motor, voltage source inverter. Current source inverter and cyclo-converter fed induction motor drive.	10

TEXT BOOK:

1. *“Electrical Drives”*, G.K. Dubey, Narosa Publishing House.

EE-605: DIGITAL SIGNAL PROCESSING

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3hrs

COURSE OBJECTIVE:

After study of this subject student should be comfortable with design of filter and their design consideration by different techniques.

COURSE CONTENTS:

UNITS	CONTENTS	NO. OF HRS
I	Continuous and Discrete Time Signal Analysis: Basic elements of a digital signal processing system advances of digital over analog signal processing Signal analysis, signal characteristics, some elementary analog and discrete time signals, simple manipulations of discrete time system signals, properties of linear time, invariant digital systems and interconnection of LTI systems, sampling of analog signals and sampling rate conversion. Z-transform. Properties of Z-transform, inverse Z-transform, analysis of continuous and discrete time systems, properties of convolution, correlation of discrete time signals.	14
II	Frequency domain analysis of continuous and discrete Time signals: Fourier series for periodic signals, Fourier transform, discrete Fourier series, Discrete Fourier transform (DFT) and inverse Discrete time Fourier Transform properties, circular convolution, Fast Fourier Transform (FFT), Decimation-in-Time (DIT) algorithm, decimation in-frequency algorithm FFT, Radix-2 DIT and DIF implementation, applications of FFT algorithms.	10
III	Filter Structures: FIR filter structures and IIR filter structures, frequency sampling structure for FIR filter, direct form I and II, cascade structure, parallel structure, lattice structure.	6

IV	Digital Filters: FIR Filters, design of linear phase filters, linear phase properties, design using window method, frequency sampling design, IIR filters, Pole-zero representation, Chebyshev and Butterworth filter, IIR filter design using approximation of derivative method, Impulse invariance method, Bilinear transform method, Matched z-transform method, Frequency transformations.	10
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Text books:

1. John G. Proakis, Dimitris G. Manolakis, ***“Digital Signal Processing: Principles, Algorithms and Applications,”*** Prentice Hall of India Pvt. Ltd., 2008.
2. ***“Digital Signal Processing,”*** S. Salivahanan, A. Vallavaraj, C. Gnanapriya.
3. ***Digital Signal Processing,”*** Shaila D. Apte- 2nd Edition Wiley India edition.

Recommended books:

1. Emmanuel C. Ifeachor, ***“Digital Signal Processing a practical approach”***. Prentice Hall India.
2. Boaz Porat, ***“A Course in Digital Signal Processing,”*** Prentice Hall Inc, 1998.
3. Oppenheim A. V., Schaffer R. W., ***“Discrete-Time Signal Processing,”*** Prentice Hall India, 1996.
4. Chi-Tsong Chen, ***“Digital Signal Processing: Spectral Computation and Filter Design,”*** Oxford University Press, 2001

EE-606: ELECTRICAL ENERGY UTILIZATION

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

- To analyze the various types of traction system and their application.
- To introduce the energy saving concept by different ways of illumination.
- To understand the refrigerator and air conditioning system and its electrical energy conversion process.

COURSE CONTENTS:

UNITS	CONTENTS	NO. OF HRS
I	Electric Traction: Introduction, requirement, different systems traction, comparison of dc and ac systems of railways electrification, power supply, ac locomotive.	9
II	Electric Heating: Methods of electric heating, Constructional details and performance of resistance heating furnaces, direct and indirect induction and arc furnaces, estimation of power and energy requirement, power supply problems.	10
III	Electrical Welding: welding and its classification, resistance arc and atomic hydrogen welding, inert gas metal arc welding , carbon arc welding , electric supply for arc welding , ultrasonic welding, laser welding , different types of control equipment used for controlling temperature and pressure in arc and resistance welding , welding transformer.	10
IV	Refrigeration And Air Conditioning: Applications of refrigeration, Systems of refrigeration, vapor compression cycle, absorption and thermos electric refrigeration, unit of refrigeration, types of refrigerant, domestic refrigerator, water cooler, air conditioning.	10

Text Books

1. *“Art and Science of Utilization of Electrical Energy”* by H.Partab.
2. *“Utilization of Electrical Energy”* by Openshaw Taylor.

Reference Book

1. "*Utilization of Electrical Energy*" by R.K Rajput.

PROGRAMME ELECTIVE-I
EE-607: ADVANCED CONTROL SYSTEM

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

- To gain knowledge in design of state variable systems, analysis of non-linear systems and introduction of optimal control.
- To study the state variable design.
- To provide adequate knowledge in the phase plane analysis.
- To study describing function analysis.
- To analyze the stability of the systems using different techniques.
- To introduce the concepts on design of optimal controller.

COURSE CONTENT:

UNITS	CONTENTS	NO. OF HRS
I	State Variable Analysis: Introduction, concept of state, state variable and state model, state space representation of systems, block diagram for state equation, Transfer function decomposition, direct, parallel and cascade decomposition, solution of state equations, concept of controllability and observability.	10
II	Sampled Data Control Systems: Introduction, digital control systems, quantization concept, data acquisition, conversion and distribution system, z-transform, important properties, inverse z transform, difference equation and solution using z-transform.	9
III	Analysis of Discrete Time Systems: Impulse sampling and data hold, reconstruction of original signals from the sampled version, pulse transfer function for open loop and closed loop systems, mapping between z-plane and s-plane, stability analysis using Jury's test, bilinear transformation, state space representation of discrete time systems and solution of discrete time state equations.	10

IV	Non Linear Systems: Introduction, different non-linearity's, phase plane method, singular points, stability of nonlinear systems, phase plane method, concepts of describing function method, stability analysis using describing function method, jump resonance phenomena, Liapunov and Popov stability criterion.	10
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Text books:

1. “*Linear control system*” by Prof. B.S. Manke
2. “*Control System Engineering*” by Nagrath and Gopal, “New Age International”.

Recommended books:

1. “*Discrete time Control Systems*” by K. Ogata, “Prentice Hall International”.

PROGRAMME ELECTIVE-I
EE-608: ILLUMINATION ENGINEERING

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This subject is about illumination principle, classification and design of different types of lighting system applications.

COURSE CONTENTS:

UNITS	CONTENTS	NO. OF HRS
I	Introduction: Laws of illumination - Inverse Square law and Lambert's Cosine law, their application in lighting calculations by point-by-point method. General principles of illumination: Definitions, units of light, definitions of flux, solid angles, luminous intensity and brightness, glare, polar curves.	9
II	Electric light sources: Brief description of characteristics of starting and application of incandescent lamp, sodium vapour lamp, mercury vapour lamp, fluorescent lamp, neon lamp, compact fluorescent lamp, led lamp. General illumination design (lumen method): Selection of equipment, equipment efficiency, room index and utilization factor, maintenance factor, computation for lamp size, core lighting design, optical design methods, Louver design.	10
III	Elementary idea of the special features required and minimum level of illumination required for (i) Domestic. (ii) Commercial (iii) Educational. (iv) Health (v) Industrial buildings. Architectural lighting concepts in above buildings.	10
IV	Design of lighting system for a stadium, theatre hall, indoor play hall, External and internal lighting of historical building, hospital lighting, airport lighting, tunnel lighting, underwater lighting.	10

Text books:

1. “*Electric Illumination*” by John O.Kraehenbueshl, John Wiley & Sons.
2. “*Lamps and lighting*” by H.Howitt&A.S.Vause.
3. “*Load lighting*” by Ir. W.J.M. Van Bommel

EE 609: NEURAL NETWORKS AND FUZZY LOGIC

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This course introduces the basics of neural network and its types and also about fuzzy set and fuzzy logic system component and its effectiveness in real world application.

COURSE CONTENT:

UNIT	CONTENT	NO. OF Hrs.
I	ANN Model And Architecture: Biological foundations, ANN models, types of activation function, introduction to network architecture, multilayer feed forward network (MLFFN), radial basis function network (RBFN), recurring neural network.	10
II	Learning Processes: Supervised and unsupervised learning, error-correction learning, Hebbian learning, Boltzmann learning, single layer and multilayer perception model, least mean square algorithm, back propagation algorithm, Application in forecasting and pattern recognition and other power engineering problems.	10
III	Fuzzy Setss And Theory: Fuzzy sets, fuzzy set operations, properties, membership functions, fuzzy to crisp conversion, measures of fuzziness, fuzzification and defuzzification methods.	8
IV	Hybrid Intligent System: Genetic algorithm, neuro fuzzy system, adaptive neuro-fuzzy inference system, evolution of neural network, fuzzy evolutionary system.	9

Text Books :

1. M. T. Hagon, Howard B. Demuth and Mark Beale, “*Neural Network Design*, PWS Publishing Company” 1995.
2. Jacek M Zurada, “*Introduction to Artificial Neural Systems*”, Jaico Publishing House, Bombay, 1994

3. Wasserman, “*Neural Computing: Theory and Practice*, Van Nastrand Reinhold, 1989”.
4. Freeman, J. A. and D. M. “*Neural Networks – Algorithms, application and programming techniques*, Addison Weley, 1991”.

EE-611: SWITCHGEAR & PROTECTION LAB

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3hrs

Practicals as per the topics in the syllabus for the course will be conducted in the laboratory. Following is the suggested list of practicals out of which a minimum of 6-7 experiments must be performed by a student during the semester.

LIST OF EXPERIMENTS:

1. To plot time-current characteristics of an IDMT relay.
2. To plot time current characteristics of Electromagnetic type over-current relay.
3. Study of the performance and operation of a three phase over-current and earth fault static relay.
4. Symmetrical fault level analysis on a d.c. network analyzer.
5. Unsymmetrical fault level analysis on a d.c. network for various type of faults.
6. To study transformer differential protection.
7. To study the magnetization characteristics of C.T
8. To study the problems associated with C.T. magnetization.
9. Performance and study of Merz-Price protection.

Note: At least six experiments to be done from above list.

EE-612: MICROPROCESSORS & APPLICATIONS LAB

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3hrs

Practicals as per the topics in the syllabus for the course will be conducted in the laboratory. Following is the suggested list of practicals out of which a minimum of 6-7 experiments must be performed by a student during the semester.

LIST OF EXPERIMENTS:

8085 Based

7. Addition and subtraction of two 8-bit numbers with programs based on different addressing modes of 8085A.
8. Addition and subtraction of two 16-bit numbers. (Using 2's complement method, also programs which access numbers from specified memory locations.).
9. Multiplication of two 8-bit numbers using the method of successive addition and Shift & add.
10. Division of two 8-bit numbers using the method of successive subtraction and shift & subtract.
11. Block transfer and block exchange of data bytes.
12. Finding the smallest and largest element in a block of data.
13. Generation of Fibonacci Series.

Application Based (Max 2)

6. Program controlled data transfer using 8255 PPI.
7. To INPUT data bytes from peripheral port and to store them in memory.
8. To OUTPUT data bytes from memory to peripheral port.
9. To Study of interrupts by enabling them in main line program and then executing different subroutines when TRAP, RST 7.5, RST 6.5 & RST 5.5 are activated.

EE 613: SEMINAR

Evaluation Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Evaluation
L	T	P/D	C	Sessional	End Semester Evaluation/ Viva	Total	
0	0	2	1	50	50	100	-

OBJECTIVE:

To measure as well as flourish the ability of the student to study a topic, in Electrical Engineering, of current relevance, from technical literature and present a seminar on that topic.

PROCEDURE:

Individual students should be asked to choose a topic in any field of Electrical Engineering, preferably from outside the B.Tech syllabus and give a seminar on that topic for about thirty minutes. It enables the students to gain knowledge in any of the technically relevant current topics and acquire the confidence in presenting the topic. The student will undertake a detailed study on the chosen topic under the supervision of a faculty member, by referring papers published in reputed journals and conferences. Each student has to submit a seminar report (in two copies), based on these papers; the report must not be reproduction of any original paper. A committee consisting of three/four faculty members (preferably specialized in various sub-fields of Electrical Engineering) will evaluate the seminar. One of the two copies submitted by the student should be returned to him/her after duly certifying it by the staff in charge of the seminar and Head of the department and the other copy shall be kept in the departmental library.

Internal Continuous Assessment

As per ordinance

SEMESTER-VII

EE-701: ENERGY MANAGEMENT

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This subject will give the student overall idea about energy scenario, security reliability, optimization method cost effective methods.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs
I	Energy Scenario: 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.	8
II	Energy Management: Definition, Energy audit- need, types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, optimizing the input energy requirements, Fuel and energy substitution.	10
III	Financial Management : Investment-need, Appraisal and criteria, Financial analysis techniques, Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis, Financing options, Energy performance contracts and role of ESCOs.	9
IV	Electrical System: Electricity tariff, Load management and maximum demand control, Power factor improvement, Distribution and transformer losses. Losses in induction motors, Motor efficiency, Factors affecting motor performance, Rewinding and motor replacement.	9

Text books:

- 1) *“Handbook on Energy Audit and Environment Management”* by Abbi, Y.P. and Jain, S.Teri Press, 2006.
- 2) *“Energy Conservation”* by P.Diwan and P. Dwivedi, Pentagon Press, 2008.
- 3) *“Handbook of Energy Audits”*, by A.Thumann, W.J.Younger, T.Niehus, CRC Press, 8th Edition, 2008.

EE-702: ELECTRICAL POWER QUALITY

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This subject solely belongs to maintain power quality degradation causes and their reduction to a certain permissible limit such that it will benefit the manufacturer and customer of power usage. Hence students learn about basic fundamental techniques of maintaining such quality of power and create awareness in the society.

COURSE CONTENT:

UNIT	CONTENT	No. of hrs
I	Power Frequency Disturbance: Introduction, common power frequency disturbances, cures for low frequency disturbances, voltage tolerance criteria.	10
II	Power Factor: Active Power and reactive power, displacement and true power factor, power factor improvement, power factor correction, power factor penalty, other advantages of power factor correction, voltage rise due to capacitance, application, svc.	10
III	Measuring And Solving Power Quality Problems: measuring devices and procedure for power quality, number of test locations and duration, instrument set up and guidelines.	9
IV	Grounding And Bonding: Shock and fire hazards, essentials of a grounded system, ground electrode, earth resistance test, earth ground grid system, power ground system, signal reference ground and methods, single point and point grounding, ground loops.	10

Text books:

1. **“Power Quality”** by C. Shankaran
2. **“Power Quality in Electrical System”** by Alexander Kusko McGraw-Hill Companies.
3. **“Electrical Power System Quality”** by Roger C. Dugan, Mark F. Mcgranaghan, Surya Santoso, H. Wayne Beaty Tata McGraw-Hill Publishing company limited

EE-703: NON CONVENTIONAL ELECTRICAL POWER GENERATION

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

It introduces solar energy, its radiation, collection, storage and application. It also introduces the wind energy, bio-mass energy, geothermal energy and ocean energy as energy sources.

COURSE CONTENT:

UNIT	CONTENT	NO.OF HRS
I	Introduction: energy sources, energy consumption as a measure of prosperity, future of world energy, energy sources and their availability (commercial and non-commercial energy sources).	8
II	Wind Energy: Introduction, Origin of wind, Basic principles of wind energy, site selection consideration, and Basic components of wind energy conversion system, Classification of WEC system, Advantages and Disadvantages of WEC system. Solar Energy: Introduction, solar constant, solar radiation, solar energy collector, applications of solar energy.	10
III	Energy From Biomass: Introduction, biomass definition, Biomass conversion technologies, Photosynthesis, factors effecting the Bio digestion or generation of gas. Geo-Thermal Energy: Introduction, Geothermal sources development of geothermal power in India. Advantages and disadvantages of geothermal energy over other energy form.	10
IV	Energy From The Oceans, Tidal, Wave: Introduction, Basic principle of tidal power, Wave energy, Ocean Thermal Energy Conversions System. Small And Mini Hydro Power: Introduction, site selection, classification of small hydro power stations, advantages and limitations of small scale hydroelectric power system	10

Text book:

1. “Non-Conventional Energy Resources” by G.D Rai

Reference books:

1. *“An Introduction To Power Plant Technology”*, By G.D.Rai.
2. *“Renewable Energy Sources”*, Maheshwar Dyal.

EE-704: ELECTRICAL MACHINE DESIGN

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3hrs

COURSE OBJECTIVES:

After studying this subject students should be able to understand the intention of special design features of different machine such that they are able to design them.

COURSE CONTENT:

Unit	Content	No. of Hrs
I	Classification of insulating material, classification of magnetic material, super conductivity, methods of cooling of transformer, types of enclosure, hydrogen cooling, direct water cooling. Types of ventilation. Temperature rise, calculation, heating curve, cooling curve, methods used for selection of motor rating for variable drives power rating.	10
II	Output equation, Choice of Specific magnetic loading, choice of specific electric loading, output equation, variation of output and losses with linear dimension. Specific slot presence for parallel sided slot, leakage reactance calculation of poly phase machines, leakage reactance of cylindrical coils and sandwiching coils of equal width.	9
III	Transformer: Single phase and three phase, core and shell, power and distribution of transformer, core construction of modern core type transformer, transformer winding, output equation, ratio of iron loss to copper loss, relation between core area, weight of iron and copper. Simplified steps for transformer design, no-load current, magnetising volt-ampere, regulation, efficiency.	9
IV	Induction Motor: Area of stator slot, length of air gap, rotor design of squirrel cage and wound rotor induction motor, area, shape and size of rotor bar, design of end ring, area of end ring, methods of improving	10

	starting torque, losses, efficiency.	
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Text books:

1. *“A Course in Electrical Machine Design”* by A K Sawhney Dhanpat Rai Publication.
2. *“Principle of Electrical Machine Design”* by Dr. H M Rai.

Recommended book:

1. *“Electrical Machine Design”* by L.K. Khera

EE-705: HYDRO POWER STATION DESIGN

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This course will empower the students to with the basic requirement, fundamental, principles, classification according to the specifications and to design a hydro power station.

COURSE CONTENT:

UNIT	CONTENT	NO.OF HRS
I	Introduction, hydrology, stream flow, Hydrographs, flow duration curve, mass curve, storage, investigation of site.	8
II	Types of dams, arrangement and location of hydro- electric station, types of hydroelectric plant and their field of use, principle of working of hydroelectric plant.	9
III	Developed power, size of plant and choice of units, types of turbine and their characteristics, design of main dimensions of turbine.	9
IV	Draft tubes, turbine setting and penstock dimensions, scroll case, preliminary design of penstock, characteristics of generators.	9

Text book:

1. “*Power station design*” by M.V. Deshpande PHI Publication.

PROGRAMME ELECTIVE-II

EE-706: TESTING & COMMISSIONING OF ELECTRICAL EQUIPMENTS

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This course will enable the students to understand the concepts, principles and acquired basic skills of installation, commissioning and maintenance of electrical equipments in power stations, substations, and industry.

COURSE CONTENT:

UNIT	CONTENT	NO.OF HRS
I	Earthing: Introduction to earthing, Station earthing, neutral grounding and equipment grounding, step potential, touch potential, pipe earthing and plate earthing, material used in earthing, General requirement of earthing as per Indian Electricity Rules for buildings and industrial premises.	9
II	Testing And Commissioning Of Transformers: Type, routine and commissioning tests on power and distribution transformers, Filtering and drying out of transformer oil, information required for ordering a transformer, recommended maintenance schedule of transformers, testing, commissioning of C.T/P.T	10
III	Testing And Commissioning Of Rotating Machines: Type, routine and commissioning tests, Selection, location and mounting of machines, Frame sizes, Degree of protection, standard IP and IC code, type of enclosures, Foundation and civil work, Checks before commissioning of machines of d.c., induction and synchronous machines, Recommended maintenance schedule of rotating machines (d.c., induction and synchronous), covering: - Mechanical and electrical maintenance. - Preventive maintenance, overhauling and safety precautions. - Permissible temperature rise limits. - Idea of MTBF and MTTR.	10

IV	Commissioning And Maintenance Of L.T. Panels: Type and rating of bus-bars, A.C.B.s, MCCBs, ELCBs and MCBs etc, Location and rating of power factor improvement apparatus. Safety Precautions: Safety precautions for testing, commissioning and maintenance of electrical equipments (low and medium voltage apparatus).	9
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Text book:

1. *“Testing, Commissioning, Operation and Maintenance of Electrical Equipment”* by S.Rao, Khanna Publishers.

Reference book:

1. *“Handbook of Electrical Engineering”* by S.L.Bhatia, Khanna Publishers.

PROGRAMME ELECTIVE-II
EE-707: HIGH VOLTAGE DC TRANSMISSION SYSTEM

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

OBJECTIVES:

- To understand the concept, planning of DC power transmission and comparison with AC
- Power transmission.
- To analyse HVDC converters.
- To study about the HVDC system control.
- To analyse harmonics and design of filters.
- To model and analysis the DC system under study state.

COURSE CONTENT:

UNIT	CONTENT	NO.OF HRS
I	<p>Introduction: Insulation system, types of insulation system.</p> <p>Discharges In Gases: General characteristics of gaseous insulation, basic processes of ionization in a gas, discharges in uniform and non-uniform fields, Paschen's law, commonly used gases for insulation and their properties.</p> <p>Breakdown Of Solids And Liquids: Different mechanisms of breakdown of solids, Intrinsic breakdown, theories of intrinsic breakdown, different theories of breakdown in liquids, commonly used solid and liquid insulating materials and their properties.</p>	10
II	<p>Lightning Phenomenon: Charge accumulation in clouds – formation and characteristics of lightning stroke, current and voltage magnitudes, protection of transmission lines and substations against lightning, lightning arrestors, switching surges, Insulation co-ordination</p>	9
III	<p>Impulse Generator: Definition of impulse wave, single stage and multistage impulse generators and their equivalent circuits, determination of front and tail resistance to produce a given wave shapes.</p>	10
IV	<p>Measurement Of High Voltages: Measurement of direct, alternating and impulse voltages by electrostatic voltmeters, sphere gap, uniform field gap, ammeter in series with high voltage resistors and voltage divider.</p>	9

Text book:

1. *“An introduction to high voltage engineering”* by Subir Ray.
2. *“High Voltage Engineering”* by M.S.Naidu&V.Kamaraju

Recommended books:

1. *“High Voltage Engineering”* by C.L.Wadhwa
2. *“A course in Electrical power”* by Soni, Gupta, Bhatnagar.

EE -711: PROJECT WORK - I

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	4	2	50	50	100	-

COURSE OBJECTIVE:

To expose students to simulate real life situations related to electrical engineering and carry out a design project in one of the specializations of electrical engineering with substantial multidisciplinary component.

EE - 712: INDUSTRIAL PRACTICAL TRAINING
(Training to be undergone after VI semester)

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	0	2	50	50	100	-

COURSE OBJECTIVE:

To expose students to simulate real life situations related to electrical engineering in different organizations.

EE-713: ELECTRICAL SIMULATION LAB-III

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3hrs

Practicals as per the topics in the syllabus for the course will be conducted in the laboratory. Following is the suggested list of practicals out of which a minimum of 6-7 experiments must be performed by a student during the semester. Experiments can be performed by means of mat lab software or E-Tap software (Mi-Power).

LIST OF THE EXPERIMENTS TO BE PERFORMED:

1. This Programme illustrates the use of different line model sending end voltage, sending end current calculation for short medium and long transmission line by taking examples.
2. Y-bus by Singular Transformation from a y-bus primitive matrix
3. Gauss-Siedel method of load flow analysis.
4. Newton-Raphson, optimum loading for generator.
5. Optimum unit commitment by Brute Force technique method.
6. Economic load dispatch by γ -iteration method.
7. Economic load dispatch by dynamic programming method.

Use Mi-Power software to perform the experiments given below:

8. Study of shunt faults of Single line diagram of power system
9. Study of load flow technique methods of power system network.

Text book:

1. ***“Matlab - Modelling, Programming and Simulations”***, Published by Sciyo, Croatia Edited by Emilson Pereira Leite.
2. ***“Modern power system analysis”*** by D.P. Kothari and I.J. Nagrath.

SEMESTER-VIII

EE-803: POWER SYSTEM PLANNING

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

After the learning of course students should be able to design transmission line, to design primary and secondary distribution also the basic concepts of generation planning. Transmission planning and distribution planning.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Objectives Of Planning: Long and short term planning. Load forecasting, characteristics of loads, methodology of forecasting energy forecasting, peak demand forecasting, total forecasting annual and monthly peak demand forecasting.	9
II	Load Forecasting Objectives Of Forecasting: Load growth patterns and their importance in planning, load forecasting Based on discounted multiple regression technique, weather sensitive load forecasting, determination of annual forecasting, use of AI in load forecasting.	10
III	Expansion Planning: Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.	10
IV	Distribution System Planning Overview: Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.	10

Text Books:

1. R.L. Sullivan, *“Power System Planning”*, Tata McGraw Hill Publishing Company Ltd, 2012.
2. X. Wang & J.R. McDonald, *“Modern Power System Planning”*, McGraw Hill Book Company, 1994.
3. T. Gonen, *“Electrical Power Distribution Engineering”*, McGraw Hill Book Company, 1986.

EE-804: DIRECT ENERGY CONVERSATION

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

To analyse the working principle, pros and cons of conventional energy conversion techniques, direct energy conversion system, need of energy storage system and fuel cell.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Introduction to Conventional generation, alternative generation processes, criteria for central power generation. Thermionic Generation: The basic thermionic diode generator and its analysis, Cross held devices, Anode and cathode materials, Experimental thermionic generator.	10
II	Mhd Generation: Principles of MHD generation, electrical conditions, Faraday Generator, Hall generator, comparison of generators. Experimental Mhd Generation: Open cycle working, closed cycle Operation, Liquid metal systems, and alternating current system.	10
III	Fuel Cells: Principles of fuel cells, Thermodynamics of the fuel cell, Choice of fuels and operating condition, Polarization and its effect, Practical Fuel cells – various types. Further Conversion Process: Miscellaneous techniques – radiation cell, ferromagnetic generation, ferroelectric generation, controlled thermo nuclear reactions, Practical devices.	10
IV	Thermoelectric Generation: See back effect, Peltier effect, Thomson effect, EMF relationship, Generator analysis, Material selection, Experimental Thermoelectric generation.	10

Text Books:

1. “*Direct Energy Conversion*”, by R.A.Coombe.

EC-804: DIGITAL IMAGE PROCESSING

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To learn and understand the fundamentals of digital image processing, and various image transforms, image enhancement techniques, image restoration techniques and methods, image compression and segmentation used in digital image processing.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Fundamentals: Introduction, origin, areas of image processing, steps in digital image processing, components of image processing system, basic concepts of sampling and quantization, representing digital images, spatial and gray level resolution, aliasing, zooming & shrinking digital images, neighboring of pixels, some basic relationships between pixels.	8
II	Image Enhancement: Histogram equalization, histogram specification, local enhancement, image subtraction, image averaging, basics of spatial filtering, smoothing spatial filters, sharpening of filters. Image Restoration: A model of the image degradation/ restoration process noise models.	9
III	Wavelets: Wavelet functions, wavelet transformations in one and two dimensions, wavelet series expansions, discrete wavelet transform, continuous wavelet transform, series expansion, scaling functions, wavelet functions, haar transform, sub band coding.	9

IV	<p>Image Compression:Need for data compression, image compression models, error free compression-variable length coding, LZW-coding,bit plane coding,lossless predictive coding, lossy compression-lossy predictive coding,transform coding,wavelet coding.</p> <p>Image Segmentation:Point detection,link detection,edge detection, ,local processing ,global processing via hough transform ,thresholding foundation ,the role of illumination,basic global thresholding,basic adaptive thresholding, region based segmentation.</p>	8
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Text Books:

- 1.Rafael C. Gonzalez, Richard E. Woods,*Digital Image Processing*, Pearson.
2. Pratt, W. K. *Digital Image Processing*, John Wiley.

Reference Books:

1. Jain, A.K. Englewood Cliffs,*fundamentals of Digital Image Processing*, Prentice Hall.
2. Rosenfield, A and Kak, A.C., *Picture Processing*, Academic Press N. Y.

EE-806: POWER SYSTEM STABILITY

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This course deals with the development detailed models of power system components and their application in the analysis of the dynamic behaviour of inter-connected power system in response to small and large disturbance.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Load Flow Studies: Network model formulation, Formation of Y-Bus by singular transformation, load flow problem, gauss-siedel method, Newton-Raphson method, decoupled load flow method.	10
II	Fault Analysis: symmetrical component phase shift in star delta transformer, sequence impedance of transmission lines, sequence impedance of power system, symmetrical component analysis of unsymmetrical component. L-G fault, L-L fault, L-L-G fault, L-L-L fault.	9
III	Stability: Dynamics of synchronous machine, power angle equation, nodal elimination technique, steady state stability, transient stability, equal area criteria, numerical solution of swing equation, factors affecting transient stability.	10
IV	Voltage Stability: Comparison of angle and voltage stability, reactive power flow and voltage collapse, voltage stability problem and its prevention.	10

Text Books :

1. ***“Power Generation, Operation and Control”*** by A. J. Wood and B. F. Woolenberg, Willey & son’s publication.
2. ***“Power System Engineering”*** by D. P. Kothari and I. J. Nagrath TMH publication.
3. ***“Electrical Power System”*** by C.L.Wadhwa.

Reference Books:

1. ***“Power System Analysis Design”*** By B. R. Gupta.

EE-807: OPTIMIZATION TECHNIQUES

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

Students should be educated the importance of optimal use of resources using mathematical programming methods considering all constraints and fulfilling objective of the customer.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Introduction: Engineering Application, Statement of the Optimal Problem, Classification, Optimization Techniques. Classical Method: Single Variable Optimization; Multivariable Optimization without any constraints with equality and inequality constraints.	10
II	One-Dimensional Minimization Methods: Uni-modal Function; Elimination Method, Dichotomous Search, Fibonacci and Golden Method, Interpolation Method, Quadratic and Cubic Interpolation Method. Unconstrained Minimization Method: Uni-variate, Conjugate Directions, Gradient and Variable Matrix Method.	10
III	Constrained Minimization Method: Characteristics of a constrained problem, Direct Method of feasible directions, Indirect Method of interior and exterior penalty functions. Geometric Programming: Formulation and Solutions of Unconstrained and Constrained geometric programming problem.	10

IV	<p>Dynamic Programming: Concept of Sub-optimization and the principal of optimality: Calculus, Tabular and Computational Method in Dynamic Programming: An Introduction to Continuous Dynamic Programming.</p> <p>Integer Programming: Gomory's Cutting Plane Method for Integer Linear Programming; Formulation & Solution of Integer Polynomial and Non- Linear problems.</p>	9
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Text Books:

1. *“Optimization (Theory & Application)-* S.S. Rao, Wiley Eastern Ltd, New Delhi.
2. *“Optimization Concepts and Applications in Engineering”* – Ashok D.Belegundu and Tirupathi R Chandrupatla – Pearson Education 1999, First India Reprint 2002

Reference Books:

1. *Optimization: Theory andPractice*, C.S.G. Beveridge and R.S. Schechter, McGraw Hill, New York.
2. Kalyanamoy Deb, *“Optimization for Engineering design algorithms and Examples”*, Prentice Hall of India Pvt. Ltd. 2006.
3. Rao, Singaresu, S., *“Engineering Optimization – Theory & Practice”*, New Age International (P) Limited, New Delhi, 2000.

EE-808: ADVANCED POWER ELECTRONICS

Teaching and Examination Scheme:

Teaching Scheme			Credit	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3hrs

COURSE OBJECTIVE:

This subject introduces about inverter application and different types of dc and ac single phase and three phase drive operation by power electronics devices.

COURSE CONTENT:

UNIT	CONTENT	NO. OF HOURS
I	Inverters: voltage control of single phase inverter, reduction of harmonics output voltage, Switched mode power supply.	10
II	DC Drive: Single phase & three phase half wave, semi convertor, full wave dual convertor three phase. Chopper Drives: Power control or motoring control, regenerative braking control, two quadrant chopper drives, four quadrants chopper drives.	10
III	Speed Control Of Three-Phase Induction Motors: Stator voltage control, Stator frequency control, stator voltage and frequency control, stator current control, stator rotor resistance control, slip power recovery schemes.	9
IV	Synchronous Motor Drives: Cylindrical rotor motors, salient pole motors, reluctance motors.	9

Text Books:

1. ***“Power Electronics: Circuits, Devices & Applications”*** by M.H. Rashid, Prentice Hall of India Ltd, 2004.
2. ***“Power Electronics”***, by P.S. Bimbhra, Khanna Publishers, 2006.
3. ***“Power Electronics”***, by M.D. Singhand K.B. Khanchandani, TataMC-GrawHillPub, 2005.

EE-801: PROJECT WORK - II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	16	8	50	50	100	3 hrs

COURSE OBJECTIVE:

To simulate real life situations related to electrical engineering and impart adequate training so that confidence to face and tackle any problem in the field is developed in the college itself.

PROCEDURE:

1. The project work started in the seventh semester will continue in this semester. The students should complete the project work in this semester and present it to the assessing committee (as constituted in the seventh semester). The performance of the students in the project work shall be assessed on a continuous basis by the project evaluation committee through progress seminars and demonstrations conducted during the semester.
2. Each project group should maintain a log book of activities of the project. It should have entries related to the work done, problems faced, solution evolved etc. There shall be at least an Interim Evaluation and a final evaluation of the project in the 8th semester.
3. Each project group has to submit an interim report in the prescribed format for the interim evaluation. Each student is expected to prepare a report in the prescribed format, for final evaluations based on the project work. Members of the project group will present the relevance, design, implementation, and results of the project to the project evaluation committee. Each group will submit the copies of the completed project report signed by the guide to the department.
4. The head of the department will certify the copies and return them to the students. One copy will be kept in the departmental library and one by the respective guide. The assessment committee and project guides will award the marks for the individual students in a project as follows:

50% of the marks is to be awarded by the guide and
50% by the evaluation committee.

Internal Continuous Assessment:

- 40% - Data collection, Planning/ Design and detailing/Simulation and analysis
- 30% - Presentation & demonstration of results
- 20% - Report
- 10% - Regularity in the class

EE-802: INDUSTRIAL PROJECT

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	16	8	50	50	100	3 hrs.

Note: Industrial Project of Four months duration is to be carried out by the student in industry under the joint supervision of faculty advisers from institution as well as from the industry

Suggested List of projects:

1. Any productive project involving application of engineering fundamentals to solve problems encountered by human kind, in collaboration with industry, R&D institutes, institutes of international/national/state importance as deemed fit by the faculty members/concerned supervisor.