SCHEME OF EXAMINATION

and

SYLLABUS

for

Bachelor of Technology
Electrical and Electronics Engineering

Offered by

University School of Engineering and Technology

1st SEMESTER TO 8th SEMESTER

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

Guru Gobind Singh Indraprastha University
Dwarka, Delhi – 110078 [INDIA]
www.ipu.ac.in

BACHELOR OF TECHNOLOGY
(COMMON TO ALL BRANCHES)
FIRST SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
ETMA-101		Applied Mathematics-I	3	1	4	M
ETPH-103		Applied Physics-I	2	1	3	M
ETME-105		Manufacturing Processes	3	0	3	M
ETEE-107		Electrical Technology	3	0	3	M
ETHS-109		Human Values and Professional Ethics-I#	1	1	1	--
ETCS-111		Fundamentals of Computing	2	0	2	--
ETCH-113		Applied Chemistry	2	1	3	M
PRACTICAL/VIVA VOCE						
ETPH-151		Applied Physics Lab-I	------	2	1	
ETEE-153		Electrical Technology Lab	------	2	1	M
ETME-155		Workshop Practice	------	3	2	M
ETME-157		Engineering Graphics Lab	------	3	2	
ETCS-157		Fundamentals of Computing Lab	------	2	1	--
ETCH-161		Applied Chemistry Lab	------	2	1	--
		NCC/NSS*#	------	------	------	--
TOTAL			**16**	**18**	**27**	

M: Mandatory for award of degree

**#NCC/NSS can be completed in any one semester from Semester 1 – Semester 4. It will be evaluated internally by the respective institute. The credit for this will be given after fourth Semester for the students enrolled from the session 2014-15 onwards. The camps/classes will be held either during Weekends/Holidays or Winter/Summer Vacations.*

#NUES (Non University Examination System)

BACHELOR OF TECHNOLOGY
(COMMON TO ALL BRANCHES)
SECOND SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
ETMA-102		Applied Mathematics-II	3	1	4	M
ETPH-104		Applied Physics-II	2	1	3	
ETEC-106		Electronic Devices	3	0	3	M
ETCS-108		Introduction to Programming	3	0	3	M
ETME-110		Engineering Mechanics	2	1	3	--
ETHS-112		Communication Skills	2	1	3	--
ETEN-114		Environmental Studies	2	1	3	--
PRACTICAL/VIVA VOCE						
ETPH-152		Applied Physics Lab-II	-------	2	1	
ETCS-154		Programming Lab	-------	2	1	M
ETEC-156		Electronic Devices Lab	-------	2	1	M
ETME-158		Engineering Mechanics Lab	-------	2	1	--
ETEN-160		Environmental Studies Lab	-------	2	1	--
		NCC/NSS*#	-------	------	------	--
TOTAL			**17**	**15**	**27**	

M: Mandatory for award of degree

**#NCC/NSS can be completed in any one semester from Semester 1 – Semester 4. It will be evaluated internally by the respective institute. The credit for this will be given after fourth Semester for the students enrolled from the session 2014-15 onwards. The camps/classes will be held either during Weekends/Holidays or Winter/Summer Vacations.*

#NUES (Non University Examination System)

BACHELOR OF TECHNOLOGY
(ELECTRICAL AND ELECTRONICS ENGINEERING)
THIRD SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
ETMA-201		Applied Mathematics – III	3	1	4	
ETEC-203		Analog Electronics-I	3	1	4	
ETEE-205		Materials in Electrical Systems	3	0	3	M
ETEE-207		Circuits and Systems	3	1	4	M
ETCS-209		Data Structures	3	1	4	
ETEE-211		Electrical Machines-I	3	1	4	M
PRACTICAL/VIVA VOCE						
ETEC-251		Analog Electronics – I Lab.[@]	0	2	1	
ETEE-253		Electrical Machines-I Lab[@]	0	2	1	
ETCS-255		Data Structures Lab.	0	2	1	
ETEE-257		Circuits and Systems Lab.[@]	0	2	1	
ETEE-259		Scientific Computing Lab[@]	0	2	1	
		NCC/NSS*	-	-	-	
TOTAL			**18**	**15**	**28**	

M: Mandatory for the award of degree.
**NCC/NSS can be completed in any one semester from Semester 1 – Semester 4. It will be evaluated internally by the respective institute. The credit for this will be given after fourth Semester for the students enrolled from the session 2014-15 onwards.*
@A few lab experiments must be performed using any circuit simulation software e.g. PSPICE/MATLAB/Scilab/R/Octave.

BACHELOR OF TECHNOLOGY
(ELECTRICAL AND ELECTRONICS ENGINEERING)
FOURTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
ETEE 202		Electrical Machines-II	3	1	4	M
ETEC 204		Analog Electronics–II	3	1	4	M
ETEE 206		Power System– I	3	1	4	M
ETEE 208		Electrical and Electronics Measuring Instruments	3	1	4	
ETEE 210		Electromagnetic Field Theory	3	0	3	
ETEE 212		Control Systems	3	1	4	M
PRACTICAL/VIVA VOCE						
ETEE 252		Electrical Machines-II Lab[@]	0	2	1	
ETEC 254		Analog Electronics-II Lab[@]	0	2	1	
ETEE 256		Power System-I Lab.[@]	0	2	1	
ETEE 258		Electrical and Electronics Measuring Instruments Lab.[@]	0	2	1	
ETEE 260		Control Systems Lab.[@]	0	2	1	
ETSS 250		NCC/NSS*	-	-	1	
TOTAL			**18**	**15**	**29**	

M: Mandatory for the award of degree.
**NCC/NSS can be completed in any one semester from Semester 1 – Semester 4. It will be evaluated internally by the respective institute. The credit for this will be given after fourth Semester for the students enrolled from the session 2014-15 onwards.*
NOTE: 4 weeks Industrial / In-house Workshop will be held after fourth semester. However, Viva-Voce will be conducted in the fifth semester (ETEE 359).
@ A few lab experiments must be performed using any circuit simulation software e.g. PSPICE/MATLAB/ETAP.
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BACHELOR OF TECHNOLOGY
(ELECTRICAL AND ELECTRONICS ENGINEERING)
FIFTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
ETHS 301		Communication Skills for Professionals	2	0	1	
ETEE-303		Power Electronics	3	1	4	M
ETEE 305		Sensors and Transducers	3	1	4	M
ETEE 307		Switching Theory and Logic Design	3	1	4	M
ETEE 309		Communication Systems	3	1	4	
ETMS 311		Industrial Management	3	0	3	
PRACTICAL/VIVA VOCE						
ETEE 351		Sensors and Transducers Lab[@]	0	2	1	
ETEE 353		Power Electronics Lab. [@]	0	2	1	
ETEE 355		Switching Theory and Logic Design Lab	0	2	1	
ETEE 357		Communication Systems Lab. [@]	0	2	1	
ETEE 359		#*Electrical and Electronic Workshop	0	0	1	M
ETHS 351		Communication Skills for Professionals Lab	0	2	1	
TOTAL			**17**	**14**	**26**	

NUES
M: Mandatory for the award of degree.
*Viva-Voce for evaluation of Industrial Training / In-house Workshop will be conducted in this semester.
@ A few lab experiments must be performed using any circuit simulation software e.g. PSPICE/Scilab/ETAP.

BACHELOR OF TECHNOLOGY
(ELECTRICAL AND ELECTRONICS ENGINEERING)
SIXTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
	THEORY PAPERS					
ETEE 302		Power System – II	3	1	4	M
ETEE 304		Utilization of Electrical Energy and Electric Traction	3	1	4	M
ETEC 306		Digital Signal Processing	3	1	4	
ETEC 308		VLSI Design	3	1	4	
ETEE 310		Microprocessor and Microcontroller	3	1	4	
ETEE 312		Power Station Practice	3	1	4	M
	PRACTICAL/VIVA VOCE					
ETEE 352		Power System – II Lab[@]	0	2	1	
ETEE 354		Utilization of Electrical Energy Lab[@]	0	2	1	
ETEC 356		Digital Signal Processing Lab[@]	0	2	1	
ETEE 358		Microprocessors and Microcontrollers Lab	0	2	1	
TOTAL			**18**	**14**	**28**	

M: Mandatory for award of degree
#NUES (Non University Examination System)
Note: Minimum of 4-6 weeks of industrial training related to EEE will be held after 6th semester; however, viva-voce will be conducted in 7th Semester (ETEE 459).
Imp:- Elective Paper will be floated in 7th Semester, if one-third of the total students opt for the same. It is advised that the decision about the elective subject for 7h Semester is done before the 15th April every year before end of 6th semester.
@ A few lab experiments must be performed using any circuit simulation software e.g. PSPICE/Scilab/ETAP.

BACHELOR OF TECHNOLOGY
(ELECTRICAL AND ELECTRONICS ENGINEERING)
SEVENTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETEE 401		Electrical Drives	3	1	4
ETEE 403		Advanced Control Systems	3	1	4
ETEE 405		EHV AC and HVDC Transmissions	3	0	3
ELECTIVE- SELECT ANY TWO (ONE FROM EACH GROUP) $					
GROUP-A					
ETEE 419		Renewable Energy Resources	3	0	3
ETEE 409		Power Distribution System	3	0	3
ETEE 411		Telemetry and Data Acquisition Systems	3	0	3
ETEE 413		PLC and SCADA Systems	3	0	3
ETAT 403		Mechatronics	3	0	3
ETEE 417		High Voltage Engineering	3	0	3
ETEE 421		Selected topics in EEE**	3	0	3
GROUP-B					
ETEC-403		Optoelectronics and Optical Communication	3	0	3
ETCS 425		Database Management Systems	3	0	3
ETIC 403		Biomedical Instrumentation	3	0	3
ETEC 427		Digital System Design	3	0	3
ETEE 431		Power line Carrier Communication	3	0	3
ETEL 405		Electrical Machines Design	3	1	4
ETHS 419		Sociology and Elements of Indian History for Engineers	3	0	3
PRACTICALVIVA VOCE					
ETEE-451		Electrical Drives Lab	0	2	1
ETEE-453		Advanced Control Systems Lab[@]	0	2	1
ETEE-455		Practical Based on Electives Group A or B	0	2	1
ETEE-457		#Seminar	0	2	1
ETEE-457		Minor Project[+]	0	6	3
ETEE-459		^Industrial Training	0	0	1
TOTAL			**15**	**16**	**25**

NON UNIVERSITY EXAMINATION SYSTEM

@ A few lab experiments must be performed using any circuit simulation software e.g. Scilab/LABVIEW.

+ The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports.

$ Elective Paper will be offered if one-third of the total students opt for the same. It is mandatory that the decision about the elective subject is made before the 15th April every year before end of sixth semester. New Electives may be added as per requirement after getting it duly approved by BOS and AC respectively.

^Industrial training was conducted after sixth semester. However, Viva-Voce for evaluation of Practical Training will be conducted in this semester.

**Syllabus may be revised every 2 years.

BACHELOR OF TECHNOLOGY
(ELECTRICAL AND ELECTRONICS ENGINEERING)
EIGHTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETEE 404		Neuro-Fuzzy Systems	3	1	4
ETEE 406		Power System Operation and Control	3	0	3
ETHS-402		Human Values and Professional Ethics-II	1	0	1
ELECTIVE- SELECT ANY TWO (ONE FROM EACH GROUP) $					
GROUP-A					
ETEE 408		Application of Power Electronics to Power Systems	3	0	3
ETIT418		Digital Image Processing	3	0	3
ETEE 412		Reliability Engineering and Application to Power System	3	0	3
ETEE 414		Electrical Machine - III	3	0	3
ETEE 416		Electrical Energy Conservation	3	0	3
ETEL 402		Power System Analysis and Stability	3	1	4
ETEE 418		Electrical System Design	3	0	3
GROUP-B					
ETIC 410		Embedded Systems	3	0	3
ETEC-420		Data Communication and Networks	3	0	3
ETCS 430		Object Oriented Programming Using C++	3	0	3
ETEE 426		Power Plant Instrumentation	3	0	3
ETEE 428		Intelligent and Smart Instrumentation	3	0	3
ETEC 430		Digital Communication	3	0	3
ETEE 432		Electrical Power Quality	3	0	3
PRACTICAL/VIVA VOCE					
ETEE 452		Neuro and Fuzzy Systems Lab[@]	0	2	1
ETEE 454		Practical Based on Elective	0	2	1
ETEE 456		Major Project[+]	0	12	8
TOTAL			**13**	**18**	**24**

@ A few lab experiments must be performed using any circuit simulation software e.g. MATLAB/LABVIEW

+ The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to major project should be delivered one month after staring of Semester.

$ Elective Paper will be float if one-third of the total students opt for the same. It is advice that the decision about the elective subject is done before the 15th November every year before end of seventh semester. New Electives may be added as per requirement after getting it duly approved by BOS and AC respectively.

NOTE:

1. The total number of the credits of the B.Tech. (EEE) Programme = 214.
2. Each student shall be required to appear for examinations in all courses. However, for the award of the degree a student shall be required to earn a minimum of 200 credits, including mandatory papers (M).

FOR LATERAL ENTRY STUDENTS:

1. The total number of the credits of the B.Tech. (EEE) Programme = 160.
2. Each student shall be required to appear for examinations in all courses Third Semester onwards. However, for the award of the degree a student shall be required to earn a minimum of 150 credits, including mandatory papers (M).

NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF

B.TECH AND M.TECH

1. **ET** stands for Engineering and Technology.
2. **PE** stands for Power Engineering.
3. **ME** stands for Mechanical Engineering.
4. **MT** stands for Mechatronics.
5. **AT** stands for Mechanical and Automation Engineering.
6. **EE** stands for Electrical and Electronics Engineering.
7. **EL** stands for Electrical Engineering.
8. **IT** stands for Information Technology
9. **CS** stands for Computer Science and Engineering
10. **CE** stands for Civil Engineering
11. **EC** stands for Electronics and Communications Engineering.
12. **EN** stands for Environmental Engineering
13. **TE** stands for Tool Engineering
14. **MA** stands for Mathematics
15. **HS** stands for Humanities and Social Sciences
16. **SS** stands for Social Services

APPLIED MATHEMATICS-III

Paper Code: ETMA-201	**L**	**T/P**	**C**
Paper: Applied Mathematics-III	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives: The objective of this course is to teach the students the applications of fourier series, fourier transform, difference equation and numerical methods to solve various engineering problems.

UNIT-I

Fourier series: Definition, Euler's formula, conditions for Fourier expansion, functions having points of discontinuity, change of intervals, even and odd functions ,half range series, Harmonic analysis. Fourier Transforms: Definition, Fourier integral, Fourier transform, inverse Fourier transform, Fourier sine and cosine transforms, properties of Fourier transforms (linearity, scaling, shifting, modulation), Application to partial differential equations.

[T2][No. of hrs 11]

UNIT-II

Difference equation: Definition, formation, solution of linear difference equation with constant coefficients ,simultaneous difference equations with constant coefficients, applications of difference equations .Z- transform: Definition, Z- transform of basic functions, properties of Z-transform (linearity, damping, shifting, multiplication),initial value theorem, final value theorem, convolution theorem, convergence of Z- transform, inverse of Z- transform, Application to difference equations.

[T2][No. of hrs 11]

UNIT-III

Numerical Methods: Solution of algebraic and transcendental equations using bisection method, Regula-Falsi method and Newton – Raphson method. Solution of linear simultaneous equations using Gauss-Jacobi's iteration method and Gauss-Seidal's iteration methods.Finite differences: Forward differences, backward differences and Central differences. Interpolation: Newton's interpolation for equi-spaced values. Stirling's central difference interpolation formula, Divided differences and interpolation formula in terms of divided differences , Lagrange's interpolation formula for unequi-spaced values.

[T1,T2] [No. of hrs 11]

UNIT-IV

Numerical Differentiation, maxima and minima of a tabulated function. Numerical Integration: Newton-Cote's quadrature formula, Trapezoidal rule, Simpson's one-third rule and Simpson's three-eighth rule .Numerical solution of ordinary differential equations: Picard's method, Taylor's method,Euler's method, modified Euler's method, Runge-Kutta method of fourth order.

[T1,T2][No. of hrs 11]

Text Books:

[T1] R.K. Jain and S.R.K. Iyengar," Numerical methods for Scientific and Engineering Computation", New Age Publishing Delhi-2014.

[T2] B. S. Grewal,"Higher Engineering Mathematics" Khanna Publications, 2014 Edition.

Reference Books:

[R1] E. kresyzig," Advance Engineering Mathematics", Wiley publications

[R2] P. B. Patil and U. P. Verma, " Numerical Computational Methods", Narosa

[R3]. Partial Differential Equations" Schaum's Outline Series, McGraw Hill.

[R4] Michael Greenberg, " Advance Engineering mathematics" , Pearson.

[R5] Schaum's Outline on Fourier Analysis with Applications to Boundary Value Problem, Tata McGraw-Hill

ANALOG ELECTRONICS-I

Paper Code: ETEC-203	**L**	**T/P**	**C**
Paper: Analog Electronics-I	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective: The objective of teaching this subject is to impart in depth understanding of the concepts of biasing in active circuits and employing simple models to represent nonlinear and active elements in circuits. It also includes the operation of the circuits at high frequencies and effects of feedback. The analysis of power amplifier & tuned amplifiers is also dealt with.

UNIT – I

Review of diode and BJT, Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self-bias, bias stability with respect to variations in I_{co}, V_{BE} & β, Stabilization factors, thermal stability. Bias compensation techniques.

Small signal amplifiers: CB, CE, CC configurations, hybrid model for transistor at low frequencies, RC coupled amplifiers, mid band model, gain & impedance, comparisons of different configurations, Emitter follower, Darlington pair(derive voltage gain, current gain, input and output impedance). Hybrid-model at high frequencies (π model).

[T1,T2,T3][No. of Hours: 11]

UNIT – II

Multistage Amplifiers: Cascade and cascode amplifiers, Calculations of gain, impedance and bandwidth. Design of multistage amplifiers.

Feedback Amplifiers: Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different configurations. Analysis of feedback Amplifiers.

[T1,T2,T3][No. of Hours: 11]

UNIT – III

Field Effect Transistor: Introduction, Classification, FET characteristics, Operating point, Biasing, FET small signal Model, enhancement & Depletion type MOSFETS, MESFET, FET Amplifier configurations (CD,CG and CS).

Introduction to UJT, SCR, Triac and Diac (working, construction, characteristics and application),UJT relaxation oscillator.

[T1,T2,T3][No. of Hours: 11]

UNIT – IV

Power Amplifiers: Power dissipations in transistors, Amplifiers Classification, (Class-A, Class-B, Class-C, Class-AB) Efficiency analysis, Push-pull and complementary Push-pull amplifiers,cross over distortion and harmonic distortion in push pull amplifier. Tuned amplifiers(single,double & stagger tuned amplifier).

[T1,T2,T3][No. of Hours: 11]

Text Books:

[T1] Boylestad & Nashelsky, "Electronic Devices & Circuit Theory" PEARSON PUBLICATION.
[T2] Salivahanan, Suresh Kumar, Vallavaraj, "Electronic devices and circuits" TMH, 1999.
[T3] J. Millman and Halkias, "Integrated Electronics, Analog & Digital Circuits & Systems" TMH – 2000.

Reference Books:

[R1] Sedra & Smith, "Micro Electronic Circuits" Oxford University Press, 2000
[R2] B.Kumar & Shail Bala Jain, "Electronic Devices And Circuits" PHI
[R3] David A Bell, "Electronic Devices and Circuits" , Oxford University Press, 2000.
[R4] Albert Malvino, David J.Bates, "Problems and Solutions in Basic Electronics" ,TMH.

MATERIALS IN ELECTRICAL SYSTEMS

Paper Code: ETEE-205	**L**	**T/P**	**C**
Paper: Materials in Electrical Systems	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS	**MAXIMUM MARKS: 75**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks. 2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks	

Objective: Explain the basic concepts regarding the difference in behavior of different materials used in electrical and electronics industry, explaining the various properties of different materials and their application to devices, equipments and systems selection of proper materials for given application.

UNIT I

Conducting Materials:

Energy band diagram of conductors, semiconductors and insulators. Conductivity and Resistivity, factors affecting the resistivity, classification of conducting materials, electrical, mechanical and thermal properties and applications of low resistance materials like copper, aluminium, steel, silver, gold, platinum, brass and bronze. Electrical, mechanical and thermal properties and applications of high resistance materials like manganin, constantan, nichrome, mercury, tungsten and carbon. Introduction of super conductors.

[T1, T2][No. of Hrs. 10]

UNIT II

Insulating Materials :

Classification of insulating materials, electrical, physical, thermal, chemical, mechanical properties of insulating materials. Thermoplastic and natural insulating materials, Gaseous and liquid insulating materials, properties and applications of ceramics and synthetic insulating materials.

[T1,T2][No. of Hrs. 10]

UNIT III

Magnetic Materials :

Introduction and classification of magnetic materials, permeability, B-H curve, magnetic saturation, hysteresis loop, coercive force and residual magnetism, concept of eddy current and hysteresis loss, curie temperature, magnetostriction effect. Soft and hard magnetic materials, ferro and ferri magnetic materials, special purpose magnetic materials.

[T1, T2][No. of Hrs. 10]

UNIT IV

Special Materials and components:

Properties and applications of different materials used in electrical systems like – thermocouples, bimetallic, fusing, and soldering. Introduction to different types of materials used in electromagnetic and electromechanical systems, resistors, capacitors, inductors, special semiconductors used in electrical engineering.

[T1, T2][No. of Hrs. 10]

Text Books:

[T1] Electrical properties of materials by L. Solymer, Oxford University Press, 2014

[T2] An Introduction to Electrical Engineering Materials, C.S. Indulkar, S.Thiruvengadam, S. Chand Publishing, 4th edition, 2004

Reference Books:

[R1] Electronic Engineering Materials and Devices,J. Allison, Tata McGraw Hill Education,1973

[R2] Electrical Materials, Rob Zachariason, Delmar Cengage Learning, 2nd Revised edition 2011

[R3] Electrical Engineering Materials, Dekker Adrianu., PHI,1st edition, 2011

[R4] A Course In Electrical Engineering Materials, Seth S P, Dhanpat Rai, 3rd edition, 2011

[R5] Electrical and Electronic Engineering Materials by S.K. Bhattacharya, Khanna Publishers, New Delhi.

CIRCUITS & SYSTEMS

Paper Code: ETEE-207	**L**	**T/P**	**C**
Paper: Circuits & Systems	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No.1 rest of the paper shall consist of four units as per the syllabus, every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective: *The purpose of this course is for each student to learn and further explore the techniques of advanced circuit analysis. The concepts and analytical techniques gained in this course (e.g., signals, Laplace transformation, frequency response) will enable students to build an essential foundation of many fields within electrical engineering, such as control theory, analog electronic circuits, signal processing.*

UNIT-I

Introduction to signals, their classification and properties, different types of systems, LTI systems and their properties, periodic waveforms and signal synthesis, properties and applications of Laplace transform of complex waveform.

[T1,T2][No. of Hrs: 10]

UNIT-II

System modeling in terms of differential equations and transient response of R, L, C, series and parallel circuits for impulse, step, ramp, sinusoidal and exponential signals by classical method and using Laplace transform.

[T1,T2][No. of Hrs: 12]

UNIT-III

Graph theory: concept of tree, tie set matrix, cut set matrix and application to solve electric networks.

Two port networks – Introduction of two port parameters and their interconversion, interconnection of two 2-port networks, open circuit and short circuit impedances and ABCD constants, relation between image impedances and short circuit and open circuit impedances. Network functions, their properties and concept of transform impedance, Hurwitz polynomial.

[T1,T2][No. of Hrs: 10]

UNIT IV

Positive real function and synthesis of LC, RC, RL Networks in Foster's I and II, Cauer's I& II forms, Introduction of passive filter and their classification, frequency response, characteristic impedance of low pass, high pass, Band Pass and Band reject prototype section.

[T1,T2][No. of Hrs: 10]

TEXT BOOKS:

[T1] W H Hayt "Engineering Circuit Analysis" TMH Eighth Edition
[T2] Kuo, "Network analysis and synthesis" John Weily and Sons, 2nd Edition.

REFERENCE BOOKS

[R1] S Salivahanan "Circuit Theory " Vikas Publishing House 1st Edition 2014
[R2] Van Valkenburg, " Network analysis" PHI, 2000.
[R3] Bhise, Chadda, Kulshreshtha, " Engineering network analysis and filter design" Umesh publication, 2000.
[R4] D. R. Choudhary, "Networks and Systems" New Age International, 1999
[R5] Allan H Robbins, W.C.Miller "Circuit Analysis theory and Practice"Cengage Learning Pub 5th Edition 2013
[R6] Bell "Electric Circuit" Oxford Publications 7th Edition.

DATA STRUCTURES

Paper Code: ETCS-209	**L**	**T**	**C**
Paper: Data Structures	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, the student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective: To understand the programming and the various techniques for enhancing the programming skills for solving and getting efficient results.

UNIT – 1:

Introduction to programm ing methodologies and design of algorithms. Abstract Data Type, array, array organization, sparse array. Stacks and Stack ADT, Stack Manipulation, Prefix, infix and postfix expressions, their interconversion and expression evaluation. Queues and Queue ADT, Queue manipulation. General Lists and List ADT, List manipulations, Single, double and circular lists.

[T1,T2][No. of hrs. 12]

UNIT – II:

Trees, Properties of Trees, Binary trees, Binary Tree traversal, Tree manipulation algorithms, Expreession trees and their usage, binary search trees, AVL Trees, Heaps and their implementation.

[T1,T2][No. of hrs. 12]

UNIT – III:

Multiway trees, B-Trees, 2-3 trees, 2-3-4 trees, B* and B+ Trees. Graphs, Graph representation, Graph traversal.

[T1,T2][No. of hrs. 12]

UNIT – IV:

Sorting concept, order, stability, Selection sorts (straight, heap), insertion sort (Straight Insertion, Shell sort), Exchange Sort (Bubble, quicksort), Merge sort (only 2-way merge sort). Searching – List search, sequential search, binary search, hashing concepts, hashing methods (Direct, subtraction, modulo-division, midsquare, folding, pseudorandom hashing), collision resolution (by open addressing: linear probe, quadratic probe, pseudorandom collision resolution, linked list collision resolution), Bucket hashing.

[T1,T2][No. of hrs. 12]

Text Books:

[T1] R. F. Gilberg, and B. A. Forouzan, "Data structures: A Pseudocode approach with C", Thomson Learning.
[T2] A .V. Aho, J . E . Hopcroft, J . D . Ulman "Data Structures and Algorithm", Pearson Education.

Reference Books:

[R1] S. Sahni and E. Horowitz, "Data Structures", Galgotia Publications.
[R2] Tanenbaum: "Data Structures using C", Pearson/PHI.
[R3] T .H . Cormen, C . E . Leiserson, R .L . Rivest "Introduction to Algorithms", PHI/Pearson.
[R4] A.K.Sharma, "Data Structures", Pearson
[R5] Ellis Horowitz and Sartaz Sahani "Fundamentals of Computer Algorithms", Computer Science Press.

ELECTRICAL MACHINES-I

Paper Code: ETEE-211	**L**	**T**	**C**
Paper: Electrical Machines-I	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: Providing sound knowledge about the principles of operation of various electrical machines, their constructional features, and their behavior and characteristics under various condition of operation.

UNIT I

Principles of EMEC: Energy in Electro-Magnetic Systems, Flow of Energy in Electro-Mechanical Devices, Energy and co-energy in Magnetic field, Singly and doubly excited systems, Electromagnetic and Reluctance Torque.

DC Generators: Constructional features, Armature winding details, lap & wave connections, EMF equation, separately excited, shunt, series and compound connected D.C. generators process of voltage build up in shunt generators, Characteristics and applications of separately/self-excited generators.

[T1, T2][No. of Hrs. 11]

UNIT II

DC Generators (Contd.): Armature Reaction, Demagnetizing and Cross-magnetizing armature MMF, Interpoles and compensating windings, commutation process and its improvement.

D.C. Motors: Speed and Torque Equation of D.C. motors, Characteristics of D.C. series, shunt and compound motors and their applications, Starting and speed control of D.C. motors, Braking of D.C. motors, Efficiency and testing of D.C. Machines, Introduction of D.C. servo motor and permanent magnet / brushless D.C. motors.

[T1, T2][No. of Hrs. 11]

UNIT III

Single phase Transformers: Transformer construction and practical considerations. Equivalent circuit(Exact and approximate), per unit values, Phasor diagram, Transformer testing : open circuit test, Short Circuit test, Sumpner's test, Efficiency and voltage regulation, All day efficiency.

[T1, T2][No. of Hrs.11]

UNIT IV

3 phase Transformers: Three-phase Bank of Single-phase Transformers, Parallel operations of 1-phase and 3-phase transformers, load division between transformers in parallel. Three winding transformers, Zigzag connections, vector grouping with clock convention, tertiary winding, tap changing, phase conversions-3phase to 2 phase and 3phase to 6 phase.

Special Purpose Transformers: Auto-transformers. Welding, Traction, Instruments and pulse Transformers.

[T1, T2][No. of Hrs.11]

TEXT BOOKS:

[T1] Electric Machinery, A Fitzgerald, Charles Kingsley, Stephen Umans, Tata McGraw Hill Education, 6th Edition, 2002.

[T2] Electrical Machines with MATLAB, Turan Gnen, CRC Press,Taylor&Francis, 2nd edition, 1998.

REFERENCE BOOKS:

[R1] The Performance and Design of Alternating Current Machines, M.G. Say, CBS Publishers, 2005

[R2] Electro-Mechanical Energy Conversion with Dynamics of Machines, Rakosh Das Begamudre, Wiley-Blackwell, 1988.

[R3 Performance and Design of Direct Current Machines: AE Clayton and NN Hancock, CBS Publishers, 2014

[R4] Oblems in Electrical Engineering: Power engineering and electronics with answers Partly Solved in I. Units: Parker Smith , CBS Publishers, 9th edition, 2003

[R5] Electric Machines, I J Nagrath D P Kothari, Mc Graw-Hill Education, 3rd edition, 2011

[R6] Samarjit Ghosh, "Electrical Machines", Pearson

ANALOG ELECTRONICS-1 LAB

Paper Code: ETEC-251	**L**	**T/P**	**C**
Paper: Analog Electronics-1 Lab	**0**	**2**	**1**

NOTE:- At least 8 Experiments out of the list must be done in the semester.

List of Experiments:

1. Plotting input and output characteristics and calculation of parameters of a transistor in common emitter configuration.
2. Transistor biasing circuit. Measurement of operating point (Ic and Vce) for a :-
   a) fixed bias circuit
   b) potential divider biasing circuit.
3. Plot the FET characteristics & MOSFET characteristics.
   4.Two Stage R.C. Coupled Amplifier.
   To measure the overall gain of two stages at 1 KHz and compare it with gain of Ist stage,
   Also to observe the loading effect of second stage on the first stage
4. To plot the frequency response curve of two stage amplifier.
5. To study Emitter follower circuit & measurement of voltage gain and plotting of frequency response Curve.
6. Feedback in Amplifier. Single stage amplifier with and without bypass capacitor, measurement of voltage gain and plotting the frequency response in both cases.
7. To determine and plot firing characteristics of SCR by varying anode to cathode voltage,and varying gate current.
8. To note the wave shapes and voltages at various points of a UJT relaxation oscillator circuit.
9. Transistorized push pull amplifier & Measurement of optimum load,maximum undistorted power (by giving maximum allowable signal) Efficiency and percentage distortion factor.
10. To study the characteristics of single tuned & double tuned amplifier.

ELECTRICAL MACHINES–I LAB

Paper Code: ETEE-253	**L**	**T/P**	**C**
Paper: Electrical Machines–I Lab	**0**	**2**	**1**

EXP: 1 To study the construction and operation of various types of starters available in the laboratory for starting DC motors.

EXP:2 To study the magnetization characteristics of a separately excited D.C generator at different speeds and to find the critical field resistance at those speeds.

EXP:3 To perform the load test on D.C. shunt motor and to draw the performance characteristics.

EXP:4 To control the speed of a DC shunt motor by using

a) Field control
b) Armature/Rheostatic control
c) Supply voltage control

EXP: 5 To perform the Swinburne's test on a D.C. shunt Machine and to pre determine its efficiency when running as a motor as well as generator and also draw the characteristic curves.

EXP: 6 To conduct load test on DC shunt generator and obtain its internal and external characteristics.

EXP: 7 To perform O.C./S.C. tests on a single phase transformer and determine equivalent circuit parameters.

EXP: 8 To perform Sumpner's (back to back) test on two identical single phase transformers and draw the load efficiency graphs.

EXP: 9 To perform load test on a single-phase transformer and determine the following:

(a) Voltage ratio of transformer.
(b) Efficiency at different loads.
(c) Voltage regulation of the transformer.

EXP: 10 To perform Polarity test on two single-phase transformers, connect them in parallel and study the load sharing between them.

EXP: 11 To convert a three-phase supply into two phase supply using Scott-connection between two single phase transformers with suitable tapping. Verify the following:

(a) Turn ratio between windings of main and teaser transformers.
(b) Voltage of both phases of two phase supply is equal.
(c) Whether the phase angle between them is 90^0.

EXP: 12 To connect three-phase transformers in Y- Y / Y - Δ , Δ-Δ/Δ- Y connections and study line /phase voltage relationships.

Books:

[T1]. Laboratory Operations for Rotating Electric Machinery and Transformer Technology, Donald V. Richardson, Prentice Hall, 1980

[T2] Electric Machinery Experiments: Laboratory Practices and Simulation Studies, Sailendra Nath Bhadra, Alpha Science International Ltd, 2013

NOTE:- At least 8 Experiments out of the list must be done in the semester.

DATA STRUCTURES LAB

Paper Code: ETCS-255	**L**	**T/P**	**C**
Paper: Data Structures Lab	**0**	**2**	**1**

List of Experiments :

1. Perform Linear Search and Binary Search on an array.
   Description of programs:
   a. Read an array of type integer.
   b. Input element from user for searching.
   c. Search the element by passing the array to a function and then returning the position of the element from the function else return -1 if the element is not found.
   d. Display the position where the element has been found.
2. Implement sparse matrix using array.
   Description of program:
   a. Read a 2D array from the user.
   b. Store it in the sparse matrix form, use array of structures.
   c. Print the final array.
3. Create a linked list with nodes having information about a student and perform
   I. Insert a new node at specified position.
   II. Delete of a node with the roll number of student specified.
   III. Reversal of that linked list.
4. Create doubly linked list with nodes having information about an employee and perform Insertion at front of doubly linked list and perform deletion at end of that doubly linked list.
5. Create circular linked list having information about an college and perform Insertion at front perform Deletion at end.
6. Create a stack and perform Pop, Push, Traverse operations on the stack using Linear Linked list.
7. Create a Linear Queue using Linked List and implement different operations such as Insert, Delete, and Display the queue elements.
8. Create a Binary Tree (Display using Graphics) perform Tree traversals (Preorder, Postorder, Inorder) using the concept of recursion.
9. Implement insertion, deletion and display (inorder, preorder and postorder) on binary search tree with the information in the tree about the details of a automobile (type, company, year of make).
10. To implement Insertion sort, Merge sort, Quick sort, Bubble sort, Bucket sort, Radix sort, Shell sort, Selection sort, Heap sort and Exchange sort using array as a data structure.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

CIRCUITS AND SYSTEMS LAB

	L	T/P	C
Paper Code: ETEE-257			
Paper: Circuits and Systems Lab	**0**	**2**	**1**

List of Experiments

1. Study the transient response of series RLC circuit for different types of waveforms on CRO and verify using MATLAB
2. Study the time response of a simulated linear system and verify the unit step and square wave response of first order and second order, type 0,1 system
3. Using MATLAB determine current in various resistors connected in network using mesh current and node voltage analysis.
4. To determine Z and Y parameters of the given two port network.
5. To determine ABCD parameters of the given two port network.
6. To verify Reciprocity Theorem for the given two port network.
7. To determine Hybrid parameters of the given two port network.
8. To design Cascade Connection and determine ABCD parameters of the given two port network.
9. To design Series-Series Connection and determine Z parameters of the given two port network.
10. To design Parallel-Parallel Connection and determine Y parameters of the given two port network.
11. To design Series-Parallel Connection and determine h parameters of the given two port network
12. Study the frequency response of different filter circuits.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

SCIENTIFIC COMPUTING LAB

	L	T	C
Paper Code: ETEE-259			
Paper: Scientific Computing Lab	**0**	**2**	**1**

List of Experiments:

1. Introduction to MATLAB: Command Window, Figure Window, MATLAB Workspace and Workspace Browser and Related Applications like Plot of any functions, Evaluations of any function, Creation of New Directory, use of Edit Window.
2. Introduction of MATLAB Basics: Variable and Arrays, Sub-arrays, Displaying Data, Data Files, X-Y Plots, Debugging MATLAB Programmes and related applications like Formation of Matrices, Evaluation of expressions etc.
3. Basics of Programme Design: Logic Operators, Branches, Solution of quadratic equation and advance plotting features and related applications like time response of electrical networks etc.
4. MATLAB Loops and related applications: Calculations of RMS value, average value, Geometric mean, Harmonic mean.
5. Data types and plot types: Representation of complex number in rectangular and polar coordinates, Mesh plot, Contour plot, Histogram, in 2-D and 3-D.
6. Write the MATLAB program to calculate the sum of series
7. Create square matrices and perform various mathematical operations.
8. Write a program in M-file to determine the current in each resistor using the mesh current method. Any electric resistive network provided the values of voltage of resistances.
9. Write the program to find out whether a given no is 'odd' or 'even' using 'if' else structure.
10. Introduction to MATLAB SIMULINK environment and creating MAT Files. Draw simulink model to simulate any given function.
11. Obtain the step response for given transfer function and save the result in MATLAB workspace.
12. With the help of an example illustrate how the masked sub-systems are created.

Books:

T1 Stephen J. Chapman, " MATLAB(r) Programming for Engineers" Cengage Learning India 2013.
T2 Kandarpa Kumar Sharma "MATLAB Demystified" Vikas Publishing House 2009.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

ELECTRICAL MACHINES–II

Paper Code: ETEE- 202	L	T/P	C
Paper: Electrical Machines–II	3	1	4

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: Providing sound knowledge about the principles of operation of various electrical machines, their constructional features, and their behavior and characteristics under various condition of operation.

Unit I: Poly phase Induction Machines

Constructional features, production of rotating magnetic field, working of 3-phase Induction motor, phasor diagram, equivalent circuit, power and torque relations, torque and slip relations, no load and blocked rotor tests and efficiency. speed control by rotor resistance, injected e.m.f, frequency variation and pole changing, DOL, Y-Δ and autotransformer starters, deep bar and double cage rotor motors, cogging and crawling, operation of Induction machine as generator and phasor diagram.

[T1,T2][No. of Hrs. : 11]

Unit II: Synchronous Alternators

Constructional features, armature windings, E.M.F. equation, winding coefficients, harmonics in the induced E.M.F., armature reaction, O.C. and S.C. tests, voltage regulation-Synchronous impedance method, MMF Method, Potier's triangle method parallel operation, operation on infinite bus, cooling. Two reaction theory, power expressions for cylindrical and salient pole machines, performance characteristics.

[T1,T2][No. of Hrs. : 12]

Unit III :Synchronous Motors

Synchronous Motor – Principle of operation, starting methods, phasor diagram torque-angle characteristics, V-curves hunting and damping, synchronous condenser, introduction to single phase synchronous motors: Reluctance and Hysteresis motors.

[T1,T2][No. of Hrs. : 10]

Unit IV: Fractional Horse Power Motors

Single Phase Induction Motor**:** Double revolving field theory, equivalent circuit, no load and blocked rotor tests, starting methods, split phase Induction motor- capacitor start, two value capacitor motor.
Introduction and applications of single phase AC series motor, universal motor, AC servo motor, stepper motor, permanent magnet AC motors.

[T1,T2][No. of Hrs. : 10]

Text Books:

[T1] A Fitzgeral, Charles Kingsley, Stephen Umans, "Electric Machinery", Tata McGraw Hill Education, 6th Edition, 2002
[T2] I J Nagrath D P Kothari, "Electric Machines", McGraw-Hill Education**,** 3**rd** edition**,** 2011.

Reference Books:

[R1] The Performance and Design of Alternating Current Machines, M.G. Say, CBS Publishers, 2005
[R2] Direct and Alternating Current Machinery, Jack Rosenblatt, CBS Publishers,2nd edition, 2001
[R3] Fractional and Sub fractional Horse-power Electric Motors, Cyril G. Veinott, Joseph E. Martin, McGraw Hill.
[R4] Problems in Electrical Engineering: Power engineering and electronics with answers Partly Solved in S.I. Units: Parker Smith, CBS Publishers, 9th edition, 2003
[R5] Electrical Machines with MATLAB, Turan Gönen, CRC Press,Taylor&Francis, 2nd edition, 1998.
[R6] Samarjit Ghosh, "Electrical Machines", Pearson

ANALOG ELECTRONICS – II

Paper Code: ETEC-204	**L**	**T/P**	**C**
Paper: Analog Electronics – II	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks

Objective:- The objective of teaching this subject is to give students in depth knowledge of design and analysis of analog IC (OP-AMP, OTA), The internal details of OP-AMP and measurement of its parameters is elaborated. The linear and nonlinear applications, useful for practical circuits, are detailed. Some important and widely used ICs such as 555 timer IC,PLL & VCO, Voltage Regulator IC etc., are also included.

Unit – I

Introduction to Op-Amp: Differential amplifier using BJT, Block diagram of op-amp, pin diagram of 741 IC, characteristics of ideal Op-Amp, equivalent circuit of Op-Amp, ideal voltage transfer curve, Op-Amp ac and dc parameters. Building blocks of Analog ICs: Differential amplifier using single and two op-amp, virtual ground, circuit for improving CMRR, Wilson & Widlar Current mirrors, Active loads, Level shifters and output stages, instrumentation amplifier using Op-Aamp.

[T1,T2][No. of Hours: 11]

Unit – II

Linear & Non Linear Wave shaping: , Inverting and non-inverting amplifiers, voltage follower, difference amp, adders, Voltage to current with floating & grounded load, current to voltage converter, practical integrator & differentiator, Clipping & Clamping circuits, Comparators, log/antilog circuits using Op-Amps, precision rectifiers(half & full wave),peak detector, Inverting & non inverting Schmitt trigger circuit.

Waveform generations: Sine wave generator (Phase shift, Wein bridge, Hartley & Colpitts), Barkhausen criteria of oscillations, conditions for oscillation, cystal oscillator.

[T1,T2][No. of Hours: 11]

Unit – III

Waveform generators: Square and triangular waveform generators (determine period and frequency), saw tooth wave generator, Astable multi-vibrator, Monostable and Bistable Multivibrator.

Active RC Filters: Idealistic & Realistic response of filters (LPF, BPF, HPF, BRF), Butter worth & Chebyshev approximation filter functions All pass, Notch Filter.

[T1,T2][No. of Hours: 11]

Unit – IV

Introduction to 555 Timer IC: Functional and block diagram of 555 timer, Application of 555 timer as astable and monostable multivibrator. Operational transconductance amplifier (OTA)-C filters.OTA integrator & differentiator, Introduction to current conveyer. Applications of IC Analog Multiplier: IC phase locked loops, IC voltage regulators, IC VCO.

[T1,T2][No. of Hours: 11]

Text Books:

[T1] S Salivahanan, V S Kanchana Bhaaskaran, "Linear Integrated Circuits" TMH.
[T2] Op - Amps And Linear Integrated Circuits, Ramakant A Gayakwad,PHI.

Reference Books:

[R1] D. Roy Choudhary, Shail B Jain, "Linear Integrated Circuits" New Age Publisher, 1999.
[R2] M.Rashid , "Microelectronic Circuit", Cengage Learning Publication.
[R3] Sedra & Smith, "Micro Electronic Circuits" Oxford University Press, 2000
[R4] David A Bell, "Operational Amplifiers and Linear IC's", PHI.

POWER SYSTEM-I

Paper Code: ETEE-206	**L**	**T/P**	**C**
Paper: Power System-I	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to enable the Electrical Engineering students to have knowledge of Power System-I, an important aspect of overall Electricity Supply System.

UNIT I

Power System Components: Block diagram of electric power system, Single line diagram of power system, brief description of power system elements such as, synchronous machine, transformer, transmission line, bus bar and circuit breaker.

Transmission line: Configurations, type of conductors, **Mechanical Design of Transmission Line: c**atenary curve, calculation of sag and tension, effects of wind and ice loadings on sag, sag template, vibration dampers. **Overhead Lines Insulators:** Types of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential.

[T1,T2][No. of Hrs. 12]

UNIT II

Overhead Transmission Lines: Corona and Interference: Phenomenon of corona, corona loss, factors affecting corona, methods of reducing corona, bundle conductors and interference.

Calculation of resistance (skin & proximity effects), inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines. Modeling and performance analysis of short, medium and long transmission line. Ferranti effect, Transposition of transmission conductors, surge impedance loading. Introduction and analysis of travelling wave use of Bewley Diagram.

[T1,T2][No. of Hr.: 11]

UNIT III

Insulated Cables: Types of cables, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Fault Analysis: Per unit system, symmetrical component, calculation of symmetrical and unsymmetrical fault, use of current limiting reactors.

[T2][No. of Hr.: 11]

UNIT IV

Power Flow Analysis: Formulation of Y-bus Matrix, Power flow equations, Classification of buses, Data for load flow, Gauss-Seidal Method, acceleration factor of convergence; Newton Raphson Method Fast Decoupled load flow; Comparison of power Flow Methods.

[T2][No. of Hr.: 10]

Text Books:

[T1] C.L.Wadhava, "Electrical Power Systems", New Age International, 2004
[T2] Hadi Saddat, "Electric power systems", Tata McGraw Hill. 2014.

Reference Books:

[R1] S. L. Uppal, "Electrical Power", Khanna Publishers, 13th edition 2003
[R2] W. H. Stevension, "Elements of Power System Analysis", McGraw Hill, 1982
[R3] Ashfaq Hussain, "Electrical Power System" CBS Publishers and Distributors.

ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENTS

Paper Code : ETEE- 208	**L**	**T/P**	**C**
Paper: Electrical and Electronic Measuring Instruments	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: Electric and Electronic Instruments are being used in industries and in Labs. The Subject provides material for a first course on electric and electronic instruments. It details the basic working and use of different instruments. The knowledge of this subject will be helpful to students while working in industries.

UNIT I [Power and Energy Measurement]

Instrument transformers:, CT and PT, Ratio and phase angle errors.

Measurement of Power: Single phase and three phase dynamometer wattmeter, LPF and UPF, expression for deflecting and control torques, Extension of range of wattmeter using instrument transformers.

Type of P.F. Meters, dynamometer and moving iron type, Single phase and three phase meters. Frequency meters, Resonance type and Weston type, synchoroscopes.

Measurement of Energy: single phase and three phase induction type energy meter , driving and braking torques, errors and compensations , testing by phantom loading, trivector meter, maximum demand meters.

[T1 T2][No. of Hrs.: 12]

UNIT II [Potentiometers and Bridges]

Principle of operation and types of D. C. / A.C potentiometers, application of DC/AC potentiometers.Bridges for measuring low, medium and high resistance, Carey Foster's bridge, Kelvin's double bridge, Megohm bridge, Megger.

A.C. Bridges: Measurement of inductance and capacitance, Maxwell's bridge, Hay's bridge, Anaderson's bridge, Owen's bridge, Heaviside Bridge and its modifications, Desauty bridge. Wien's bridge, Schering Bridge.

[T1 T2][No. of Hrs. : 12]

UNIT III

[Display Devices and Recorders]

Introduction of various display devices, LCD, LED and plasma display, resolution, sensitivity and accuracy specifications, CRO & its applications, triggered CRO, sampling oscilloscope. Recorders: requirement of recording data, selection of recorder for a particular application, analog, graphic, strip chart, galvanometeric, circular chart, XY, digital recorders, single point and multipoint recorders.

Printers: Types of Printers, Drum type printer, dot matrix type printer ,Ink-jet and Laser jet printers

[T1 T2][No. of Hrs.: 10]

UNIT IV

[Electronic Measuring Instruments]

Electronic Voltmeter: Solid state voltmeter, RMS and average reading voltmeters, rectifier type voltmeter, vector voltmeter, A.C. voltage measurements. Current measurement using electronic instruments, multi range ammeter, Measurement of Power at Audio and Radio Frequencies, Diode Sensor based instruments, Analog and Digital Multimeters. Digital Measurement of time, frequency, phase, pH, capacitance, Counters.

Function Generator: Sine, Square and Triangular wave generator.

[T1 T2][No.of Hrs.:10]

Text Book:

[T1] E. W. Gloding and F. C. Widdis - Electrical Measurements and measuring Instruments, Wheeler Publishing, fifth Edition.

[T2] A. K. Shawney - Electrical & Electronic Measurement & Instruments, Dhanpat Rai & Sons Publications, 2000

Reference Books:

[R1] Buckingham and Price - Electrical Measurements, Prentice – Hall Harris - Electrical Measurements

[R2] Reissland, M. U. - Electrical Measurements: Fundamentals, Concepts, Applications New age International (P) Limited, Publishers.

[R3] W. D. Cooper, "Modern Electronics Instrumentation & Measurement Technique" PHI, 1998

ELECTROMAGNETIC FIELD THEORY

	L	T/P	C
Paper Code: ETEE-210			
Paper: Electromagnetic Field Theory	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: *To list Maxwell's equations and solve them for specific regular geometries, understand general electromagnetic wave propagation and its applications to engineering problems.*

UNIT I

Introduction: Review of scalar and vector field, Dot and Cross products, Coordinate Systems-Cartesian, cylindrical and spherical. Vector representation of surface, Physical interpretation of gradient divergence and curl, Transformation of vectors in different co-ordinate systems, dirac-delta function.

Electrostatics: Electric field due to point-charges, line charges and surface charges, Electrostatic potential, Solution of Laplace and Poisson's equation in one dimension, M-method of image applied to plain boundaries, field mapping and conformal transformation, Electric flux density, Boundary conditions. Capacitance: calculation of capacitance for simple rectangular, cylindrical and spherical geometries, Electrostatic energy.

[T1,T2][No. of Hrs. : 10]

UNIT II

Magnetostatics : Magnetic Induction and Faraday's Law, Magnetic Flux Density, Magnetic Field Strength H, Ampere, Gauss Law in the Differential Vector Form, Permeability, Energy Stored in a Magnetic Field, Ampere's Law for a Current Element, Volume Distribution of Current , Ampere's Law Force Law, Magnetic Vector Potential, The Far Field of a Current Distribution, Maxwell's Equations: The Equation of Continuity for Time Varying Fields, Inconsistency of Ampere's Law, Maxwell's Equations, Conditions at a Boundary Surface.

[T1,T2][No. of Hrs. : 10]

UNIT III

Electromagnetic Waves: Continuity equations, Displacement current, Maxwell's equation, Boundary conditions, Plane wave equation and its solution in conducting and non-conducting media, Phasor notation, Phase velocity, Group velocity, Depth of penetration, Conductors and dielectrics, Impedance of conducting medium. Polarization, Reflection and refraction of plane waves at plane boundaries, Poynting vectors, and Poynting theorem.

[T1,T2][No. of Hrs. : 10]

UNIT IV

Transmission Lines: Transmission line equations, Characteristic impendence, Distortion-less lines, Input impendence of a loss less line, computation of primary and secondary constants, Open and Short circuited lines, Standing wave and reflection losses, Impedance matching, Loading of lines, Input impedance of transmission lines, RF lines, Relation between reflection coefficient and voltage standing wave ratio (VSWR), Lines of different lengths – λ/2, λ/4, λ/8 lines, Losses in transmission lines, Smith chart and applications, impedance matching Single stub, Double stub..

[T1,T2][No. of Hrs. : 10]

Text Books:-

[T1] Matthew N. O. Sadiku , "Elements of Electromagnetics", Oxford University Press
[T2] E. C. Jordon, K. G. Balman, "Electromagnetic Waves & Radiation System" PHI – 2nd Edition

Reference Books:

[R1] William H. Hayt, "Engineering Electromagnetics", TMH
[R2] J.D. Kraus, "Electromagnetics", TMH
[R3] David K. Cheng," Field and Wave Electromagnetic", 2nd Edition, Pearson Education Asia,2001
[R4] John R. Reitz, "Foundations of Electromagnetic Theory". Pearson

.

CONTROL SYSTEMS

Paper Code: ETEE-212	**L**	**T/P**	**C**
Paper: Control Systems	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

***Objective**: To teach the fundamental concepts of Control systems and mathematical modeling of the system. To study the concept of time response and frequency response of the system. To teach the basics of stability analysis of the system*

UNIT I : Control Systems - - Basics & Components

Introduction to basic terms, classifications & types of Control Systems, block diagrams & signal flow graphs. Transfer function, determination of transfer function using block diagram reduction techniques and Mason's Gain formula. Control system components: Electrical/ Mechanical/Electronic/A.C./D.C. Servo Motors, Stepper Motors, Tacho Generators, Synchros, Magnetic Amplifiers, Servo Amplifiers,

[T1,T2][No. of Hrs. : 11]

UNIT II : Time – Domain Analysis

Time domain performance specifications, transient response of first & second order systems, steady state errors and static error constants in unity feedback control systems, response with P, PI and PID controllers, limitations of time domain analysis.

[T1,T2][No. of Hrs. : 10]

UNIT III : Frequency Domain Analysis

Polar and inverse polar plots, frequency domain specifications and performance of LTI systems, Logarithmic plots (Bode plots), gain and phase margins, relative stability. Correlation with time domain performance closes loop frequency responses from open loop response. Limitations of frequency domain analysis, minimum/non-minimum phase systems.

[T1,T2][No. of Hrs. : 10]

UNIT IV : Stability & Compensation Techniques

Concepts, absolute, asymptotic, conditional and marginal stability, Routh–Hurwitz and Nyquist stability criterion, Root locus technique and its application.

Concepts of compensation, series/parallel/ series-parallel/feedback compensation, Lag/Lead/Lag-Lead networks for compensation, compensation using P, PI, PID controllers.

[T1,T2][No. of Hrs. : 11]

Text Books:

[T1] B. C. Kuo, "Automatic control system", Prentice Hall of India, 7th edition 2001.
[T2] Nagraath Gopal "Control Systems Engineering -Principles and Design" New Age Publishers

Reference Books:

[R1] Norman S. Nise, "Control systems engineering" John Wiley & Sons (Asia) Singapore.
[R2] Raymond T. Stefani, Design of Feedback Control System, Oxford University Press.
[R3] K. Ogata, "Modern control engineering", Pearson 2002.
[R4] S. P.Eugene Xavier, "Modern control systems", S. Chand & Company.
[R5] M. Gopal "Control Systems-Principles and Design" TMH 4th Edition 2012

ELECTRICAL MACHINES–II LAB

Paper Code: ETEE-252	**L**	**T/P**	**C**
Paper: Electrical Machines–II Lab	**0**	**2**	**1**

List of Experiments

EXP. 1 To conduct no-load and blocked rotor test on three phase squirrel cage Induction motor and draw the equivalent circuit.

EXP: 2 To conduct the load test on three phase squirrel cage Induction motor

(a) Compute torque, output power, efficiency, input power factor and slip for various load settings.

(b) To plot the following curves on the same graph sheet from the data obtained in part (a)

(1) Efficiency vs. output power.
(2) Torque vs. output power.
(3) Line current vs. output power.
(4) Power factor vs. output power.
(5) Slip vs. output power.

(c) Also plot Torque-slip characteristic.

EXP: 3 To conduct the load test on three phase slip ring Induction motor

(a) Compute torque, output power, efficiency, input power factor and slip for various load settings.

(b) To plot the following curves on the same graph sheet from the data obtained in part (a)

(1) Efficiency vs. output power.
(2) Torque vs. output power.
(3) Line current vs. output power.
(4) Power factor vs. output power.
(5) Slip vs. output power.

(c) Also plot Torque-slip characteristic.

EXP: 4 To study the different methods available in laboratory for of starting three-phase Induction motor and compare them.

EXP: 5 To find the effect of the variation of supply voltage on the performance of three-phase Induction motor at 120%, 100%, 80%, 60%, and 50% of rated voltage and plot the variation of power factor, speed, current and input power for different voltages.

EXP: 6

a) Perform no load and short circuit test on a three-phase synchronous generator.
b) Measure the resistance of the stator windings
c) Find the voltage regulation at full load at (i) Unity power factor (ii) 0.85 power factor leading (iii) 0.85 power factor lagging by synchronous impendence method.

EXP: 7 To synchronize a three-phase synchronous generator with the infinite bus bar. (main supply)

EXP: 8 To start a synchronous motor and study the effect of variation of field current upon the stator current and power factor, hence draw V and inverted V curves of the motor for ½ load, ¾th load and full load. Also draw the unity power factor curve.

EXP: 9 To perform slip test on a 3 phase synchronous machine and find direct axix and quadrature axix synchronous reactances (Xd, Xq).

EXP: 10 To study voltage build up in isolated Induction generator and find its load characteristics using suitable terminal capacitor.

EXP: 11 To conduct no-load and blocked rotor test on single phase squirrel cage Induction motor and draw the equivalent circuit.

Reference Books:

R1. Laboratory Operations for Rotating Electric Machinery and Transformer Technology, Donald V. Richardson, Prentice Hall, 1980

R2. Electric Machinery Experiments: Laboratory Practices and Simulation Studies, Sailendra Nath Bhadra, Alpha Science International Ltd, 2013

NOTE:- At least 8 Experiments out of the list must be done in the semester.

ANALOG ELECTRONICS-II LAB

	L	T/P	C
Paper Code: ETEC-254			
Paper: Analog Electronics-II Lab	**0**	**2**	**1**

List of Experiments:

1. To study the op-amp (IC 741) as inverting and non-inverting amplifier and calculate its gain.
2. Observe and plot the output Wave shape of Op-Amp R-C differentiating circuits, R-C integrating circuits for square wave input
3. To study the op-amp (IC 741) as adder, subtractor and voltage follower, calculate its output voltage..
4. Construct biased and unbiased series and shunt clipping circuits & combinational clipper circuit for positive and negative peak clipping of a sine wave.
5. To study RC phase shift/Wien Bridge oscillator measurement of frequency and amplitude of oscillations using Op-Amp.
6. To study the waveform of square wave generator using 741 Op-Amp IC.
7. To study the waveform of Schmitt Trigger circuit & Precision Rectifier using 741 OP-AMP IC.
8. To make and test the operations of Monostable Multivibrator circuits using 555 timer.
9. To make and test the operations of Astable Multivibrator circuits using 555 timer.
10. To study the Sallen Key Voltage controlled voltage source active filters.

NOTE: - At least 8 Experiments out of the list must be done in the semester

POWER SYSTEM-I LAB

	L	T/P	C
Paper Code: ETEE-256			
Paper: Power System-I Lab	**0**	**2**	**1**

LIST OF EXPERIMENTS

1. Study of constructional features, applications, power rating of LT and HT cables
2. Measurement of Inductance, Capacitance, Resistance and Insulation Resistance of multi-core cables.
3. Study of different types of distribution systems by physical inspection of these systems.
4. Study and calculation of ABCD parameters for a Transmission Line.
5. Study of Ferranti Effect for Transmission Line.
6. Study of different types of insulators with rating. Enumerate the different application of the different types of insulators, with their properties.
7. Calculate the resistance of earth using earth electrodes and Megger.
8. Calculate the dielectric strength of the transformer oil.
9. Enumerate the different applications involved in the power generating station. Write a report on visit of Thermal/Hydro/Nuclear power station.
10. Estimation and Costing of over head lines/distribution lines of specified voltage level and length.
11. Estimation and Costing of service mains for single face, three face domestic/industrial consumers.
12. Estimation and Costing of pole mounted sub-station /indoor outdoor sub-station.
13. To locate fault in a cable by Murray loop test.

SIMULATIONS:

1. MATLAB Simulation of Transmission Line for Short Transmission Line for calculation of various parameters.
2. Explain why the guard ring is required for string insulators. Using MATLAB simulink calculate the potential distribution across different units of string insulator, with and without guard ring and also calculate the string efficiency.
3. MATLAB Simulation of Transmission Line for Medium Transmission Line for calculation of various parameters.
4. MATLAB Simulation of Transmission Line for Long Transmission Line for calculation of various parameters.
5. Study the typical application software for power system (ETAP), which not only handles large power system SLD, also handle fault analysis, load flow analysis, stability analysis etc.
6. Study of single line diagram of typical power system and enumerate the different components involved in the power system viz. Alternator Transformer, Busbar etc. and also write their application.
7. Write a programme in C/C++ to draw a single line diagram of a typical power system, keeping in view the number of generating units, Buses, lines etc with their rating.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENTS LAB

Paper Code: ETEE-258	**L**	**T/P**	**C**
Paper: Electrical and Electronic Measuring Instruments Lab	**0**	**2**	**1**

List of Experiments:

1. Testing of singe phase and three phase electromechanical and electronic energy meters.
2. Measurement of three phase power by two watt meters using instrument transformer.
3. Study and demonstration of Trivector Meter.
4. Calibration of D.C. and A.C. potentiometers.
5. Measurement of low resistance using Kelvin's double bridge.
6. Measurement of inductance using Maxwell's bridge/ Hay's bridge/ Anaderson's bridge/ Owen's bridge.
7. Measurement of capacitance using Desauty Bridge/ Schering Bridge.
8. Study and demonstration of universal / electronic counter and measurement of frequency and time period.
9. Measurement of inductance and capacitance using C.R.O.
10. Measurement of phase and frequency using C.R.O.
11. R.F. Power Measurement.
12. Study and use of different types of Recorders / Printers.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

CONTROL SYSTEMS LAB

	L	T/P	C
Paper Code: ETEE-260			
Paper: Control Systems Lab	**0**	**2**	**1**

List of Experiments:

1. Comparison of open loop & closed loop control in speed control of D.C. motor & to find the transfer function.
2. To study the characteristics of positional error detector by angular displacement of two servo potentiometers
    a. excited with dc
    b. excited with ac
3. To study synchro transmitter in terms of position v/s phase and voltage magnitude with respect to rotor voltage magnitude /phase.
4. To study remote position indicator systems using synchro transmitter/receiver.
5. To plot speed- torque curves for ac servomotor for different voltages.
6. To study ac motor position control system & to plot the dynamic response & calculate peak time, settling time, peak overshoot, damping frequency, steady state error etc.
7. To study the time response of simulated linear systems.
8. To study the performance of PID Controller.
9. Plot impulse response, unit step response, unit ramp response of any 2^{nd} order transfer function on same graph using MATLAB.
10. To draw the magnetization (Volt Amps) characteristics of the saturable core reactor used in the magnetic amplifier circuits.
11. Plot root locus for any 2^{nd} order system (with complex poles). For Mp=30%, find the value of K using MATLAB.
12. To design lead-lag compensator for the given process using Bode plots in MATLAB.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

COMMUNICATION SKILLS FOR PROFESSIONALS

Paper Code: ETHS-301	**L**	**T/P**	**C**
Paper: Communication Skills for Professionals	**2**	**0**	**1**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To develop communication competence in prospective engineers so that they are able to communicate information as well as their thoughts and ideas with clarity and precision. This course will also equip them with the basic skills required for a variety of practical applications of communication such as applying for a job, writing reports and proposals. Further, it will make them aware of the new developments in communication that have become part of business organisations today.

UNIT I

Organizational Communication: Meaning, importance and function of communication, Process of communication, Communication Cycle - message, sender, encoding, channel, receiver, decoding, feedback, Characteristics, Media and Types of communication, Formal and informal channels of communication, 7 C's of communication, Barriers to communication, Ethics of communication (plagiarism, language sensitivity)

Soft Skills: Personality Development, Self Analysis through SWOT, Johari Window, Interpersonal skills -Time management, Team building, Leadership skills. Emotional Intelligence.Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, Career planning, Self esteem.

[T1,T2][No. of Hrs. 08]

UNIT II

Introduction to Phonetics: IPA system (as in Oxford Advanced Learner's Dictionary), Speech Mechanism, The Description of Speech Sounds, Phoneme, Diphthong, Syllable, Stress, Intonation, Prosodic Features; Pronunciation; Phonetic Transcription - Conversion of words to phonetic symbols and from phonetic symbols to words. British & American English (basic difference in vocabulary, spelling, pronunciation, structure)

Non-Verbal Language: Importance, characteristics, types – Paralanguage (voice, tone, volume, speed, pitch, effective pause), Body Language (posture, gesture, eye contact, facial expressions), Proxemics, Chronemics, Appearance, Symbols.

[T1,T2][No. of Hrs. 08]

UNIT III

Letters at the Workplace – letter writing (hard copy and soft copy): request, sales, enquiry, order, complaint.
Job Application -- resume and cover letter

Meeting Documentation-- notice, memo, circular, agenda and minutes of meeting.

Report Writing - Significance, purpose, characteristics, types of reports, planning, organizing and writing a report, structure of formal report. Writing an abstract, summary, Basics of formatting and style sheet (*IEEE Editorial Style Manual)*, development of thesis argument, data collection, inside citations, bibliography; Preparing a written report for presentation and submission. Writing a paper for conference presentation/journal submission.

[T1,T2][No. of Hrs. 08]

UNIT IV

Listening and Speaking Skills: Importance, purpose and types of listening, process of listening, difference between hearing and listening, Barriers to effective listening, Traits of a good listener, Tips for effective listening. Analytical thinking; Speech, Rhetoric, Polemics; Audience analysis. Telephone Skills - making and receiving calls, leaving a message, asking and giving information, etiquettes.

Presentations: Mode, mean and purpose of presentation, organizing the contents, nuances of delivery, voice and body language in effective presentation, time dimension.

Group Discussion: Purpose, types of GDs, strategies for GDs, body language and guidelines for group discussion.

Interview Skills: Purpose, types of interviews, preparing for the interview, attending the interview, interview process, employers expectations, general etiquettes.

[T1,T2][No. of Hrs. 07]

Text Books:

[T1] Anna Dept. Of English. Mindscapes: English for Technologists & Engineers PB. New Delhi: Orient Blackswan.

[T2] Farhathullah, T. M. Communication Skills for Technical Students. Orient Blackswan, 2002.

References Books:

[R1] Masters, Ann and Harold R. Wallace. Personal Development for Life and Work, 10th Edition.Cengage Learning India, 2012.

[R2] Institute of Electrical and Electronics Engineers. IEEE Editorial Style Manual. IEEE, n.d. Web. 9 Sept. 2009.

[R3] Sethi and Dhamija. A Course in Phonetics and Spoken English. PHI Learning, 1999.

[R4] Khera, Shiv. You Can Win. New York: Macmillan, 2003.

POWER ELECTRONICS

Paper Code: ETEE-303	**L**	**T/P**	**C**
Paper: Power Electronics	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the basics of Power Electronics that are required for an engineering student.

UNIT- I

Introduction

Characteristics and switching behaviour of Power Diode, SCR, UJT, TRIAC, DIAC, GTO, MOSFET, IGBT, MCT and power BJT, two-transistor analogy of SCR, firing circuits of SCR and TRIAC, SCR gate characteristics, SCR ratings. Protection of SCR against over current, over voltage, high dV/dt, high dI/dt, thermal protection, Snubber circuits, Methods of commutation, series and parallel operation of SCR, Driver circuits for BJT/MOSFET.

[T1,T2][No. of hrs. 11]

UNIT- II

A.C. to D.C. Converter: Classification of rectifiers, phase controlled rectifiers, fully controlled and half controlled rectifiers and their performance parameters, .three phase half wave, full wave and half controlled rectifiers and their performance parameters, effect of source impedance on the performance of single phase and three phase controlled rectifiers, single-phase and three phase dual converter.

[T1, T2, T3][No. of hrs. 11]

UNIT- III

D.C. to D.C. Converter: Classification of choppers as type A, B, C, D and E, principle of operation, switching mode regulators: Buck, Boost, Buck-Boost, Cuk regulators.

A.C. to A.C. Converter: AC voltage Controllers**,** Cyclo-converters : single phase to single phase, three phase to single phase, three phase to three phase Cyclo-converter circuit and their operation, Matrix converter.

[T1, T2, T3][No. of hrs. 11]

UNIT-IV

D.C. to A.C. Converter: single phase single pulse inverter: Square wave, quasi square. Three phase single pulse inverters (120° and 180° conduction) Modulation Techniques and reduction of harmonics, PWM techniques, SPWM techniques, SVM, Carrier less modulation. , PWM Inverter, Bidirectional PWM converters, voltage source inverters and current source inverter, Multi level Inverter: cascaded and NPC Inverters.

[T1, T2, T3][No. of hrs. 11]

Text Books:

[T1] M.H. Rashid, "Power Electronics: Circuits, Devices and Applications" Pearson Publications.

[T2] Daniel W. Hart, "Power Electronics "Tata McGraw-Hill

[T3] H.C. Rai, "Power Electronics Devices, Circuits, Systems and Application", Galgotia Publications, 3rd Edition

References Books:

[R1] Singh, Kanchandani, "Power Electronics", Tata McGraw-Hill.

[R2] Ned Mohan, Tore M. Undeland and Robbins, "Power Electronics: Converters, Applications and Design" Wiley India Publication

[R3] V R Moorthi, "Power Electronics: Devices, Circuits and Industrial Applications", Oxford Publication.

[R4] Kassakian, Schlecht, Verghese, "Principles of Power Electronics" , Pearson Publications

[R5] M.S. Jamil Asghar, "Power Electronics" PHI Publication

[R6] P. S. Bimbhra "Power Electronics", Khanna Publishing.

SENSORS AND TRANSDUCERS

Paper Code: ETEE-305	**L**	**T/P**	**C**
Paper: Sensors and Transducers	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective:-To provide the basic understanding about operational characteristics and applications of various sensors and transducers.

UNIT I [Introduction to Sensors]

Definition and differences of sensors and transducers, Classification, static and dynamic characteristics, electrical characterization, mechanical and thermal characterization including bath-tub curve.

Different Sensors:

Mechanical & Electromechanical: Potentiometer, Strain gauges, Inductive sensors—Ferromagnetic type, Transformer type, Electromagnetic, Capacitive sensors— parallel plate, variable permittivity, electrostatic, piezoelectric, Introduction to PZT family**.**

[T1][T2][No. of Hrs:11]

UNIT-II

Thermal sensors: Gas thermometric sensors, Dielectric constant, refractive index thermo-sensors, nuclear thermometers, resistance change type thermometric sensors, Thermoemf sensors.

Magnetic sensors: Basic working principles, Magnetostrictive, Hall effect, Eddy current type, SQUID sensors.

Radiation sensors: Photo-detectors, Photo-emissive, photomultiplier, scintillation detectors.

[T1][T2][No. of Hrs:11]

UNIT-III

Electroanalytical sensors: Electrochemical cell, SHE, Polarization, Reference electrode, Metal electrodes, Membrane electrodes, Electroceramics. Advancement in Sensor technology: Introduction to smart sensors, Film sensors, Introduction to semiconductor IC technology and Micro Electro Mechanical System(MEMS), Nano-sensors. Bio-Sensors.

[T1][T2][No. of Hrs:11]

UNIT-IV

Different Transducers: LVDT, RTD, Thermistor, Wire anemometer, piezoresistors, Variable diaphragm capacitance transducers, Angular movement transducers, seismic mass transducer, interferometer transducer.

Feedback transducer system: Inverse transducer, Self-balancing transducer, Servo-operated manometer, Feedback pneumatic load cell, integrating servo.

[T1][T2][No. of Hrs:12]

Text Books:

[T1] D. Patranabis, "Sensors and Transducers", PHI Learning Pvt. Ltd., 2nd edition
[T2] D V S Murty, "Transducers and Instrumentation", PHI Learning Pvt. Ltd.

Reference Book:

[R1] E.O.Doebelin,Dhanesh N Manik, "Measurement Systems",6th Edition,Mcgraw Hill Edu.
[R2] John P. Bentely, "Principles of Measurement System", 4th Edition, Pearson Prentice Hall

SWITCHING THEORY AND LOGIC DESIGN

Paper Code: ETEE-307	**L**	**T/P**	**C**
Paper: Switching Theory and Logic Design	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the knowledge of Logic Systems and Circuits, thereby enabling the student to obtain the platform for studying Digital Systems and Computer Architecture.

UNIT- I

Number Systems and Codes:- Decimal, Binary, Octal and Hexadecimal Number systems, Codes- BCD, Gray Code, Excess-3 Code, ASCII, EBCDIC, Conversion between various Codes.

Switching Theory: - Boolean Algebra- Postulates and Theorems, De' Morgan's Theorem, Switching Functions- Canonical Forms- Simplification of Switching Functions- Karnaugh Map and Quine Mc-Clusky Methods.

Combinational Logic Circuits:- Review of basic gates- Universal gates, Adder, Subtractor ,Serial Adder, Parallel Adder- Carry Propagate Adder, Carry Look-ahead Adder, Carry Save Adder, Comparators, Parity Generators, Decoder and Encoder, Multiplexer and De-multiplexer, ALU, PLA and PAL.

[T2,T3][No. of Hrs. 14]

UNIT- II

Integrated circuits: - TTL and CMOS logic families and their characteristics. Brief introduction to RAM and ROM.

Sequential Logic Circuits: - Latches and Flip Flops- SR, , D, T and MS-JK Flip Flops, Asynchronous Inputs.

Counters and Shift Registers:- Design of Synchronous and Asynchronous Counters:- Binary, BCD, Decade and Up/Down Counters , Shift Registers, Types of Shift Registers, Counters using Shift Registers- Ring Counter and Johnson Counter.

[T2,T3][No. of hrs. 10]

UNIT- III

Synchronous Sequential Circuits:- State Tables State Equations and State Diagrams, State Reduction and State Assignment, Design of Clocked Sequential Circuits using State Equations.

Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and merger chart methods-concept of minimal cover table.

[T1][No. of hrs. 10]

UNIT- IV

Algorithmic State Machine: Representation of sequential circuits using ASM charts synthesis of output and next state functions, Data path control path partition-based design.

Fault Detection and Location: Fault models for combinational and sequential circuits, Fault detection in combinational circuits; Homing experiments, distinguishing experiments, machine identification and fault detection experiments in sequential circuits.

[T1][No. of hrs. 10]

Text Book:

[T1] Zyi Kohavi, "Switching & Finite Automata Theory", TMH, 2nd Edition
[T2] Morris Mano, Digital Logic and Computer Design", Pearson
[T3] R.P. Jain, "Modern Digital Electronics", TMH, 2nd Ed,

Reference Books:

[R1] A Anand Kumar, "Fundamentals of Digital Logic Circuits", PHI
[R2] Taub ,Helbert and Schilling, "Digital Integrated Electronics", TMH

COMMUNICATION SYSTEMS

Paper Code: ETEE-309	**L**	**T/P**	**C**
Paper: Communication Systems	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks

Objective: The objective of the paper is to facilitate the students with the knowledge of electronic communication there by enabling the student to obtain the platform for studying in communication system.

UNIT I

Introduction: Overview of Communication system, Communication channels, Mathematical Models for Communication Channels

Introduction of random Variables: Definition of random variables, PDF, CDF and its properties, joint PDF, CDF, Marginalized PDF, CDF, WSS wide stationery, strict sense stationery, non stationery signals, UDF, GDF, RDF, Binomial distribution, White process, Poisson process, Wiener process.

[T1, T2][No. of Hrs. 11]

UNIT II

Analog Modulation: Modulation- Need for Modulation, Amplitude Modulation theory: DSB-SC, SSB, VSB. Modulators and Demodulators. Angle Modulation, Relation between FM and PM Wave. Generation of FM wave-Direct and Indirect Methods. Bandwidth of FM (NBFM, WBFM)

Pulse Analog Modulation: Sampling-Natural and Flat top. reconstruction, TDM-Pulse Amplitude Modulation (TDM-PAM), Pulse Width Modulation (PWM), Pulse Position Modulation(PPM), Generation and Recovery.

Pulse Digital Modulation: Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM), Delta Modulation (DM), ADPCM.

[T1, T2][No. of Hrs. 11]

UNIT III

Digital Modulation and Transmission: Advantages of digital communication. Modulation schemes: ASK, PSK, FSK. Spectral Analysis. Comparison. Digital Signaling Formats-Line coding.

Information and Coding Theory: Entropy, Information, Channel Capacity. Source Coding Theorem: Shannon Fano Coding, Huffman Coding.

[T1, T2][No. of Hrs. 11]

UNIT IV

Fiber Optical System: Basic Optical Communication System. Optical fibers versus metallic cables, Light propagation through optical fibers. Acceptance angle and acceptance cone, Fiber configurations. Losses in optical fibers. Introduction to Lasers and light detectors. Applications: Military, Civil and Industrial applications.

Advanced Communication Systems: Introduction to cellular radio telephones. Introduction to satellite Communication.

[T1, T2][No. of Hrs. 11]

Text Books:

[T1] George Kennedy, "Electronics Communication System", TMH 1993
[T2] B.P. Lathi, "Analog& Digital Communication", Oxford University Press 1999.

Reference Books:

[R1] Simon Haykin, "Introduction to Analog & Digital Communication", Wiley, 2000
[R2] Tannenbaum, "Computer networks", PHI, 2003
[R3] K. Sam Shanmugam, "Digital & Analog Communication system", John Wiley & Sons 1998.

INDUSTRIAL MANAGEMENT

	L	T/P	C
Paper Code: ETMS-311			
Paper: Industrial Management	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The course provides a broad introduction to some aspects of business management and running of business organization.

UNIT I

Industrial relations- Definition and main aspects. Industrial disputes and strikes. Collective bargaining.
Labour Legislation- Labour management cooperation/worker's participation in management. Factory legislation. International Labour Organization.

[T1,T2][No. of Hrs. 10]

UNIT II

Trade Unionism- Definition, Origin, Objectives of Trade Unions. Methods of Trade unions. Size and finance of Indian Trade unions-size, frequency distribution, factors responsible for the small size. Finance-sources of income, ways of improving finance.

[T1,T2][No. of Hrs. 10]

UNIT III

Work Study-Method study and time study. Foundations of work study. Main components of method study. Time study standards. Involvement of worker's unions. Work Sampling. Application of work study to office work.

[T1,T2][No. of Hrs. 10]

UNIT IV

Quality Management- What is Quality? Control Charts. Quality is everybody's job. Taguchi Philosophy. Service Quality. What is Total Quality Management (TQM)? Roadmap for TQM. Criticism of TQM. Six Sigma.

[T1,T2][No. of Hrs. 10]

Text Books:

[T1] Sinha, P.R.N., Sinha I.B. and Shekhar S.M.(2013), Industrial Relations, Trade Unions and Labour Legislation. Pearson Education
[T2] Chary, S.N. (2012), Production and Operations Management. Tata McGraw Hill Education.

Reference Books:

[R1] Srivastava, S.C. (2012), Industrial Relations and Labour Laws, Vikas Publishing
[R2] Shankar R (2012), Industrial Engineering and Management. Galgotia Publications
[R3] Telsang, M. (2006), Industrial Engineering and Production Management. S.Chand
[R4] Thukaram, Rao (2004), M.E. Industrial Management. Himalaya Publishing House

SENSORS AND TRANSDUCERS LAB

	L	T/P	C
Paper Code: ETEE-351			
Paper: Sensors and Transducers Lab	**0**	**2**	**1**

List of Experiments:

1. Study of various sensors e.g., Thermocouple, RTD, Thermistor, Magnetic Sensorns, Load Cells, Film Sensors.
2. Characteristics of (Resistive and Thermo emf) temperature sensor
3. Measurement of displacement using LVDT
4. Measurement of strain and torque using strain gauges
5. Measurement of speed using photoelectric sensors, tachogenerators and stroboscope.
6. Calibration and measurement of temperature using PRT.
7. Static and Dynamic Characteristics of sensors.
8. Liquid level measurement using capacitive measurement system.
9. Pressure measurement using load cell.
10. Study and operation of Electrochemical Cell.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

POWER ELECTRONICS LAB

	L	T/P	C
Paper Code: ETEE-353			
Paper: Power Electronics Lab	**0**	**2**	**1**

List of Experiments:

1. To study and analyze V-I characteristics of SCR and TRIAC.
2. To study the switching characteristics of MOSFET and IGBT
3. To study R and RC and UJT based firing circuits using SCR.
4. To study single phase Semi-converter and Full converters feeding R and RL load
5. To study A.C phase control using SCR (half and full wave) using DIAC and TRIAC for dimmer application.
6. To study single-phase cyclo- converter feeding R and RL loads.
7. To study the operation and duty cycle control of buck and boost converter feeding R loads.
8. To study the operation and duty cycle control of Type-C chopper.
9. To study the THD in operation of single phase Square wave and Quasi square wave Inverter.
10. To study the operation of SPWM Inverter.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

SWITCHING THEORY AND LOGIC DESIGN LAB

Paper Code: ETEE-355	**L**	**T/P**	**C**
Paper: Switching Theory and Logic Design Lab	**0**	**2**	**1**

List of Experiments:

1. Realize all gates using NAND & NOR gates
2. Realize Half Adder, Full Adder, Half subtracter, Full subtracter
3. Realize a BCD adder
4. Realize a Serial Adder
5. Realize a four bit ALU
6. Realize Master-Save J K Flip-Flop, using NAND/NOR gates
7. Realize Universal Shift Register
8. Realize Self-Starting, Self Correcting Ring Counter
9. Realize Multiplexer and De-Multiplexer
10. Realize Carry Look ahead Adder / Priority Encoder
11. Simulation of PAL and PLA
12. Simulation Mealy and Moore State machines

NOTE: - At least 8 Experiments out of the list must be done in the semester

COMMUNICATION SYSTEMS LAB

Paper Code: ETEE-357	**L**	**T/P**	**C**
Paper: Communication Systems Lab	**0**	**2**	**1**

List of Experiments:

1. Generation of DSB-SC AM signal using balanced modulator.
2. Practical study of amplitude demodulation by linear diode detector
3. Generation of SSB AM signal.
4. Practical study of envelop detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To generate FM signal using voltage controlled oscillator.
6. To generate a FM Signal using Varactor & reactance modulation.
7. Detection of FM Signal using PLL & foster seelay method.
8. Practical study of Super heterodyne AM receiver and measurement of receiver parameters viz.sensitivity, selectivity & fidelity.
9. Practical study of Pre-emphasis and De-emphasis in FM.
10. Generation of Phase modulated and demodulated signal.

Simulations study of some of the above experiments using P-spice or Multisim softwares

NOTE: - At least 8 Experiments out of the list must be done in the semester

ELECTRICAL & ELECTRONIC WORKSHOP

	L	T/P	C
Paper Code: ETEE-359			
Paper: Electrical & Electronic Workshop	**0**	**2**	**1**

IN-HOUSE WORKSHOP FOR EE/EEE

Week – 1 : Identification of hand tools, their specifications and purpose, safety precautions, first aid for electric shock, identification, specification of various types of resistors, capacitors, inductors, diodes, zener diodes, transistors, thyristors, LDR, VDR, UJT. Soldering and desoldering practice on wire and PCB.

Design and fabricate dc power supply using single diode half wave rectifier, two diode full wave rectifier, 4 diode bride rectifier, capacitor filter, without and with regulator.

Week – 2 : Introduction to various electrical components and accessories used in wiring installation for example fuse, MCB, ELCB, switches etc. Introduction of different types of electrical wiring and wiring diagrams, selection (gauges, size etc.) and ratings of wires. Introduction to domestic and industrial wiring installations.

Week – 3 : Fabrication of different types of extension board. Study and wiring of a tube light circuit. Connection of fan with regulator circuit. Demonstration of various types of illumination devices like lamp, tube light, CFL and LED lamps. Trouble shooting of various home appliances.

Week - 4 : Study of various components of a small single phase step down transformer & its fabrication and testing. Safety measures regarding electric fire. Introduction to relays, contactors and starters, their specification and applications. Connecting a 3-phase induction motor through (a) D.O.L. starter (b) Star/delta starter, running & reversing the direction of rotation of motor.

COMMUNICATION SKILLS FOR PROFESSIONALS LAB

Paper Code: ETHS-351	**L**	**T/P**	**C**
Paper: Communication Skills for Professionals Lab	**0**	**2**	**1**

Objective: *To develop communication competence in prospective engineers so that they are able to communicate information as well as their thoughts and ideas with clarity and precision .These activities will enhance students' communication skills with a focus on improving their oral communication both in formal and informal situations. They will develop confidence in facing interviews and participating in group discussions which have become an integral part of placement procedures of most business organisations today.*

Lab Activities to be conducted:

1. **Listening and Comprehension Activities** – Listening to selected lectures, seminars, news (BBC, CNN, etc.). Writing a brief summary or answering questions on the material listened to.
2. **Reading Activities** -- Reading different types of texts for different purposes with focus on the sound structure and intonation patterns of English. Emphasis on correct pronunciation.
3. **Conversation Activities**-- Effective Conversation Skills; Formal/Informal Conversation; Addressing higher officials, colleagues, subordinates, a public gathering; Participating in a video conference.
4. **Making an Oral Presentation**–Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Connecting with the audience during presentation; Projecting a positive image while speaking; Emphasis on effective body language.
5. **Making a Power Point Presentation** -- Structure and format; Covering elements of an effective presentation; Body language dynamics.
6. **Making a Speech** -- Basics of public speaking; Preparing for a speech; Features of a good speech; Speaking with a microphone. Famous speeches may be played as model speeches for learning the art of public speaking. Some suggested speeches: Barack Obama, John F Kennedy, Nelson Mandela, Mahatma Gandhi, Jawahar Lal Nehru, Atal Bihari Vajpayee, Subhash Chandra Bose, Winston Churchill, Martin Luther King Jr.
7. **Participating in a Group Discussion** -- Structure and dynamics of a GD; Techniques of effective participation in group discussion; Preparing for group discussion; Accepting others' views / ideas; Arguing against others' views or ideas, etc.
8. **Participating in Mock Interviews** -- Job Interviews: purpose and process; How to prepare for an interview; Language and style to be used in an interview; Types of interview questions and how to answer them.

Suggested Lab Activities:

1. Interview through telephone/video-conferencing
2. Extempore, Story Telling, Poetry Recitation
3. Mock Situations and Role Play; Enacting a short skit
4. Debate (Developing an Argument), News Reading and Anchoring.

Reference Books:

1. Patnaik, Priyadarshi. *Group Discussion and Interview Skills*: *With VCD*. Cambridge University Press India (Foundation Books), 2012 edition.
2. Kaul,Asha. *Business Communication.* PHI Learning: 2009.
3. Hartman and Lemay. *Presentation Success: A Step-by-Step Approach*. Thomson Learning, 2000.

Note: The Communication Skills Lab should be equipped with computers, microphones, an internet connection, overhead projector, screen, sound system, audio/video recording facilities, and seating arrangement for GDs and mock interviews. The student activities may be recorded and students may replay them to analyse and improve their pronunciation, tone, expressions, body language, etc.

Traditional language lab softwares are not mandatory and may be used by students to practice and enhance their language competence. Such softwares are usually elementary in nature and are mostly based on British/American English (pronunciation, accent and expression). They should preferably be in Indian English.

POWER SYSTEM-II

	L	T/P	C
Paper Code: ETEE-302			
Paper: Power System-II	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to enable the Electrical Engineering students to have knowledge of Power System-II, an important aspect of overall Electricity Supply System.

Unit – I: Protective Relays, CTs and PTs.

Classification of Relays: Electromechanical, static and numerical relays: Construction, operating characteristic and their applications. Constructions and Characteristic of CTs and PTs, capacitance voltage transformer.

[T1,T2][No. of Hrs.: 10]

Unit – II: Protection of Generators and Transformers

Differential Protection, protection of stator windings, rotor earth fault protection, protection against unbalanced loading, loss of excitation and prime mover failure; Protection of motors (induction and synchronous) and bus bars.

[T1,T2][No. of Hrs.: 10]

Unit – III: Protection of Transmission lines

Over current protection, Grading of over current relays, distance protection, types of distance relays and their characteristics, carrier current protection, protection against surges, surge diverters, surge absorbers, use of ground wires on transmission lines, methods of grounding**.**

[T1,T2][No. of Hrs. 12]

Unit – IV: Fuses and Circuit Breakers

Types & Applications of Fuse and MCB, Current interruption theories, types of Circuit Breakers: Air, air-blast, Oil, SF6 and Vacuum circuit breakers-Principle, ratings and applications.

[T1,T2][No. of Hrs.: 10]

Text Books:

[T1] Paithanker, Bhide ,"Fundamentals of Power System Protection " PHI 2014
[T2] Badri Ram"Power System Protection and Switchgear" TMH Publications 2nd Edition

Reference Books:

[R1] J. J. Grainger & W.D. Stevenson, "Power System Analysis" TMH Publication, 2003
[R2] Paul M. Anderson "Power System Protection" IEEE Press.
[R3] C L Wadhva, "Electrical Power System" Wiley Eastern Ltd., 3rd edition 2000
[R4] D.P. Kothari and I.J. Nagrath "Modern Power System Analysis " TMH 4th Edition

UTILIZATION OF ELECTRICAL ENERGY & ELECTRIC TRACTION

Paper Code: ETEE-304	**L**	**T/P**	**C**
Paper: Utilization of Electrical Energy & Electric Traction	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: *To clearly understand the basic concepts related to use of electric energy in various industrial, commercial and residential applications.*

UNIT I

Illumination

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light, discharge lamps, Mercury Vapour and Sodium Vapour lamps- their characteristic and applications. Performance comparison between tungsten filament lamps, fluorescent tubes, CFL and LED Lights. Basic principles of light control, types and design of lighting schemes and flood lighting.

[T1][No. of Hrs. 10]

UNIT II

Electrical Heating : Principle and application of resistance, induction and dielectric heating;,Infrared or radiant heating, High frequency eddy current heating, arc furnaces, induction furnace, electric supply for high frequency heating applications.

Welding: Resistance welding; arc welding, welding generator and welding transformer, properties of arcing electrode, comparison between resistance and arc welding, comparison between A.C. and D.C. welding.

[T2][No. of Hrs. 10]

UNIT III

Electric Traction

Advantages of electric traction, requirements of an ideal traction system, different system of electric traction; comparison between D.C. and A.C. systems of railway electrification; speed – time curves, different types of traction motors and their characteristics; parallel operation of traction motors.

Starting and speed control of 3 phase induction motors, braking, advantages and disadvantages of regenerative braking. Calculation of energy returned during regeneration.

[T1,R1][No. of Hrs. 10]

UNIT IV

Electroplating: Principles and applications of electrolysis. Faraday's law of electrolysis, electroplating; calculation of current required for depositing given amount of metal, current efficiency, voltage-energy efficiency, extraction of metals electro deposition, factors governing deposition process.

Energy Storage Devices: Constructional details, principle of operation of Rechargeable Alkaline, Nickel – Cadmium, Nickel-Metal Hydride, Lithium ion and Lead-acid batteries, their comparison and applications. Charging of batteries and rating. Fuel cell and use of electric double layer capacitor (super capacitor) as battery bank.

[T2,R2][No. of Hrs. 10]

Textbooks:

[T1] Pratab. H. "Art and Science of Utilization of Electrical Energy": Dhanpat Rai & Sons.

[T2] N.V. Suryanarayana , "Utilization of Electrical Power including Electric Drives and Electric Traction", New Age International (P) Limited.

Reference Books:

[R1] C.L. Wadhwa , "Generation, Distribution and Utilization of Electrical Energy", New Age International (P) Limited.

[R2] E. Openshaw Taylor, "Utilization of Electric Energy", Orient Longman, Universities Press

DIGITAL SIGNAL PROCESSING

Paper Code: ETEC-306	**L**	**T/P**	**C**
Paper: Digital Signal Processing	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: *The aim of this course is to provide in depth knowledge of various digital signal processing techniques and design of digital filters, learn the concept of DFT FFT algorithms, and design of digital filters using different approximations, DSP processor and architecture. The prerequisites of this subject are basic knowledge of signal and systems.*

UNIT–I :

Frequency Domain Sampling: The Discrete Fourier Transform, Properties of the DFT, Linear filtering methods based of the DFT.

Efficient computation of the DFT: Principal Of FFT, Fast Fourier Transform Algorithms, Applications of FFT Algorithms, A linear filtering approach to computation of the DFT.

Application of DFT, Design of Notch filter

[T2,T1][No. of Hours: 11]

UNIT–II:

Design & Structure of IIR filters from analog filters: Impulse Invariance; Bilinear transformation and its use in design of Butterworth and Chebyshev IIR Filters; Frequency transformation in Digital Domain, Direct, Cascade, Parallel & transposed structure

Design & structure of FIR filters: Symmetric and anti-symmetric FIR filters; Design of Linear Phase FIR filters using windows, Frequency Sampling Method of FIR design, Direct, Cascade, Frequency Sampling, transposed structure

[T1,T2] [No. of Hours: 11]

UNIT–III:

Implementation of Discrete Time Systems:

Lattice structures, Lattice and Lattice-Ladder Structures, Schur - Cohn stability Test for IIR filters; Discrete Hilbert Transform.

Linear predictive Coding:

Lattice filter design, Levension Darwin Technique, Schur Algorithm

[T1,T2] [No. of Hours: 10]

UNIT–IV:

Quantization Errors in Digital Signal Processing: Representation of numbers, Quantization of filter coefficients, Round-off Effects in digital filters.

Multirate Digital Signal Processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Frequency domain characterization of Interpolator and Decimator; Polyphase decomposition.

[T1, T2][No. of Hours: 10]

Text Books:

[T1] Oppenheim & Schafer, Digital Signal Processing, PHI-latest edition.
[T2] Proakis and Manolakis, Digital Signal Processing, PHI Publication

Reference Books:

[R1] S. K. Mitra, Digital Signal Processing, TMH edition 2006
[R2] Johny. R. Johnson, Introduction to Digital Signal Processing, PHI-latest edition
[R3] R.Babu ,Digital Signal Processing , Scitech Publication.

VLSI DESIGN

Paper Code: ETEC-308	**L**	**T/P**	**C**
Paper: VLSI Design	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The prerequisite are analog devices, STLD, Digital system design and micro-electronics. The students are introducing to MOS technology, design rules and some applications.

UNIT I

Evolution of VLSI, MOS transistor theory, MOS structure, enhancement & depletion transistor, threshold voltage, MOS device design equations, MOSFET scaling and small geometry effects, MOSFET capacitances.
NMOS inverter, CMOS inverter, DC characteristics, static load MOS inverter, pull up/pull down ratio, static & dynamic power dissipation, CMOS & NMOS process technology – explanation of different stages in fabrication, body effect, latch up in CMOS.

[T1,T2][No. of Hours: 11]

UNIT II

Stick diagram and design rules, lambda based design rules, switching characteristics & inter connection effects: rise time, fall time delays, noise margin.
CMOS logic gate design: NAND, NOR, XOR and XNOR gates, Transistor sizing, combinational MOS logic circuits: pass transistor and transmission gate designs, Pseudo NMOS logic.

[T1,T2][No. of Hours: 11]

UNIT III

Sequential MOS logic circuits: SR latch, clocked latch and flip flop circuits, CMOS D latch and edge triggered flip flop, dynamic logic circuits; basic principle, non ideal effects, domino CMOS logic, high performance dynamic CMOS circuits, clocking issues, clock distribution.

[T1,T2][No. of Hours: 11]

UNIT IV

VLSI designing methodology, design flow, design Hierarchy, concept of regularity, modularity & locality, VLSI design style, Design quality, computer aided design technology, adder design and multiplier design examples. Low power design concepts using CMOS Technology.

[T1,T2][No. of Hours: 11]

Text Books:

[T1] Basic VLSI Design - Pucknell Douglas A., Eshraghian Kamran, PHI Learning Pvt Limited, 2013.
[T2] N. Weste and D. Harris, "CMOS VLSI Design: A Circuits and Systems Perspective - 4th Edition", Pearson Education, India.

Reference Book:

[R1] S. M. Kang, Y. Lebiebici, "CMOS digital integrated circuits analysis & design" Tata McGraw Hill, 3rd Edition.
[R2] Digital Integrated Circuit Design- Ken Martin, Oxford University Press
[R3] The MOS Transistor- Yaniiis Tsividis and Colin Mcandrew, Oxford University Press, 2013
[R4] J. M. Rabaey, "Digital Integrated Circuits" PHI Learning Pvt Limited, India
[R5] J. P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley & Sons, Inc., New York, NY
[R6] Neelam Sharma, "Digital Logic Design", Ashirwad Publication 2013-14

MICROPROCESSORS AND MICROCONTROLLERS

Paper Code: ETEE-310	**L**	**T/P**	**C**
Paper: Microprocessors and Microcontrollers	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with the knowledge of microprocessor systems and microcontroller.

UNIT- I

Introduction to Microprocessor Systems: Architecture and PIN diagram of 8085, Timing Diagram, memory organization, Addressing modes, Interrupts. Assembly Language Programming.

[T1][No. of hrs. 10]

UNIT- II

8086 Microprocessor: 8086 Architecture, difference between 8085 and 8086 architecture, generation of physical address, PIN diagram of 8086, Minimum Mode and Maximum mode, Bus cycle, Memory Organization, Memory Interfacing, Addressing Modes, Assembler Directives, Instruction set of 8086, Assembly Language Programming, Hardware and Software Interrupts.

[T2][No. of hrs. :12]

UNIT- III

Interfacing of 8086 with 8255, 8254/ 8253, 8251, 8259: Introduction, Generation of I/O Ports, Programmable Peripheral Interface (PPI)-Intel 8255, Sample-and-Hold Circuit and Multiplexer, Keyboard and Display Interface, Keyboard and Display Controller (8279), Programmable Interval timers (Intel 8253/8254), USART (8251), PIC (8259), DAC, ADC, LCD, Stepper Motor.

[T1][No. of hrs. :12]

UNIT-IV

Overview of Microcontroller 8051: Introduction to 8051 Micro-controller, Architecture, Memory organization, Special function registers, Port Operation, Memory Interfacing, I/O Interfacing, Programming 8051 resources, interrupts, Programmer's model of 8051, Operand types, Operand addressing, Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions, Timer & Counter Programming, Interrupt Programming.

[T3][No. of hrs. 11]

Text Books:

[T1] Muhammad Ali Mazidi, "Microprocessors and Microcontrollers", Pearson, 2006

[T2] Douglas V Hall, "Microprocessors and Interfacing, Programming and Hardware" Tata McGraw Hill, 2006.

[T3] Ramesh Gaonkar, "MicroProcessor Architecture, Programming and Applications with the 8085", PHI

References Books:

[R1] Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. MCKinlay "The 8051 Microcontroller and Embedded Systems",2nd Edition, Pearson Education 2008.

[R2] Kenneth J. Ayala, "The 8086 Microprocessor: Programming & Interfacing The PC", Delmar Publishers, 2007.

[R3] A K Ray, K M Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill, 2007.

[R4] Vaneet Singh, Gurmeet Singh, "Microprocessor and Interfacing", Satya Prakashan, 2007.

POWER STATION PRACTICE

	L	T/P	C
Paper Code: ETEE-312			
Paper: Power Station Practice	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to enable the Electrical Engineering students to have knowledge of Power Stations an important aspect of overall Electricity Supply System.

UNIT I

Different form energy sources: Fossils fuels, Nuclear energy and Hydro power,**-Renewable Energy Sources:** Introduction to Solar energy, geo-thermal energy, tidal energy, wind energy, bio-gas energy and M.H.D. Power generation. **Thermal Power Plant:** Location and Site selection, general layout and working of plant, boilers, economizers, super heaters, draft equipments, fuel and ash handling plants**.**

[T1,T2] [No. of Hrs. 12]

UNIT II

Gas Turbine Power Plant: Lay out, Working and components of gas turbine power plant, combined gas and steam turbine plant.

Hydro Electric Plant: Location and site selection, general layout and operation of plant, Types of Hydro Turbines and their characteristics – Impulse and reaction type (Pelton Wheel, Francis and Kaplan turbines,), speed governing system. **Diesel Power Plant:** Layout and components of plant auxiliary equipments.

[T1,T2][No. of Hrs. 10]

UNIT III

Nuclear Power Plant: Location and site selection, general layout and operation of plant, brief description of reactors, moderators and reflectors.

Economic Operation Of Power System: Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation scheduling Economic Dispatch including transmission losses – approximate penalty factor, iterative technique for solution of economic dispatch with losses; Derivation of transmission loss formula.

[T1,T2][No. of Hrs. 10]

UNIT IV

Substation Layout: Types of substations, typical layout and constructional details of pole mounted, Indoor, Outdoor sub-stations, hybrid gas insulated sub stations, bus bar arrangements, application of substation equipment like transformer , circuit breaker, isolator, metering equipments and protecting equipment , substation grounding.

[T1,T2][No. of Hrs.10]

Text Books:

[T1] M. V. Deshpande, "Elements of Electric Power Station Design", Wheeler Publishing Co.

[T2] B. G. A. Skrotzki & W. A. Vopat, "Power Station Engineering and Economy", Tata McGraw Hill. 5th edition 2013

[T3] Harish. C. Rai, "Power Plant Engineering", I.K. International Publishers.

Reference Books:

[R1] S. L. Uppal, "Electrical Power", Khanna Publishers. 13th edition 2003

[R2] M. L. Soni, P. V. Gupta and U. S. Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, 1st edition 2005

[R3] B. R. Gupta, "Generation of Electrical Energy", Eurasa Publishing House

[R4] C.L. Wadhva, "Generation distribution and utilization Electrical Engg."

POWER SYSTEM-II LAB

	L	T/P	C
Paper Code: ETEE-352			
Paper: Power System-II Lab	**0**	**2**	**1**

List of Experiments:

Exp-1. To study single line to Ground fault as practical application in transmission lines. (Using Experimental setup)

Exp-2. To study three phase fault as practical application in transmission lines. (Using Experimental setup)

Exp-3. To determine the characteristics of the given differential relay and to apply the relay for the protection of a transformer against internal faults. (Using Experimental setup)

Exp-4. To study instantaneous over current relay. (Using Experimental setup)

(1) Study the construction of relay.
(2) Study the operating and deoperating of relay.
(3) Study the current vs. time characteristics.

Exp-5. To study over voltage relay static type and draw its characteristics. (Using Experimental setup)

Exp-6. To study the characteristics of miniature-circuit breaker. (Using Experimental setup)

Exp-7. To study the operating characteristics of HRC fuse. (Using Experimental setup)

Exp-8. To obtain the characteristics of thermal bimetallic relay. (Using Experimental setup)

Exp-9. To study the characteristics of IDMT Earth fault relay. (Using Experimental setup)

LIST OF ADVANCE EXPERIMENTS

Exp-1. Simulation based on Load flow analysis.

Exp-2. Simulation based on Short circuit analysis.

Exp-3. Simulation based on Transient stability study.

Exp-4. Simulation based on Relay co-ordination.

Exp-5. Simulation based on Voltage instability analysis.

Exp-6. Simulation based on Harmonic analysis.

Exp-7. Simulation based on Line and cable parameter.

Exp-8. Simulation based on Long-term load forecast.

Exp-9. Simulation based on Electromagnetic Transient Analysis.

Exp-10. Simulation based on Network Reduction.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

UTILIZATION OF ELECTRICAL ENERGY LAB

	L	T/P	C
Paper Code: ETEE-354			
Paper: Utilization of Electrical Energy Lab	**0**	**2**	**1**

List of Experiments:

1. Demonstration and calculation of current for electro plating process used to different metals.
2. Demonstration of large size cut model of different types of batteries.
3. Study of charging methods of batteries and calculation of their life cycle.
4. Charging and discharging of super capacitors.
5. To plot polar curves for various lamps.
6. Verification of illumination laws.
7. Performance comparison of MV lamps, SV lamps, filament lamps, CFL & LED lights.
8. Design of lighting schemes for house / commercial complex / industry / street light / flood light.
9. Demonstration of resistance / inductance / dielectric heatings.
10. Characteristics of welding transformer.
11. Speed control of various traction motors.
12. Braking schemes for traction motors.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

DIGITAL SIGNAL PROCESSING LAB

Paper Code: ETEC-356	**L**	**T/P**	**C**
Paper: Digital Signal Processing Lab	**0**	**2**	**1**

List of Experiments:

Software Experiments:

1. Generation of basic signals sine, cosine, ramp, step, impulse and exponential in continuous and discrete domains using user defined functions.
2. Write a MATLAB program to find convolution (linear/circular) and correlation of two discrete signals.
3. Perform linear convolution using circular convolution and vice versa.
4. Write a MATLAB program to

a. Find 8 point DFT, its magnitude and phase plot and inverse DFT.
b. Find 16 point DFT, its magnitude and phase plot and inverse DFT.

5. Perform the following properties of DFT-

a. Circular shift of a sequence.
b. Circular fold of a sequence.

6. Write a MATLAB Program to design FIR Low pass filter using

a. Rectangular window
b. Hanning window
c. Hamming window
d. Bartlett window

7. Write a MATLAB program to

a. Implement a Low pass / High pass / Band pass / Band stop IIR Filter using Butterworth Approximation.
b. Implement a Low pass / High pass / Band pass / Band stop IIR Filter using Chebyshev Approximation.

Hardware Experiments using Texas Instruments Kits-DSK 6713:

8. Introduction to Code composer Studio.
9. Write a program to generate a sine wave and see the output on CRO
10. Write a Program to Generate ECHO to give audio file.
11. Write a program to demonstrate Band Stop filter by FIR.

Additional Experiments:

12. Write a program to generate a cos wave and see the output on CRO
13. Write a program to blink the LED
14. Write a program to display a string on LCD.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

MICROPROCESSORS AND MICROCONTROLLERS LAB

	L	T/P	C
Paper Code: ETEE-358			
Paper: Microprocessors and Microcontrollers Lab	**0**	**2**	**1**

List of Experiments:

1. Write a program to add and subtract two 16-bit numbers with/ without carry using 8086.
2. Write a program to multiply two 8 bit numbers by repetitive addition method using 8086.
3. Write a Program to generate Fibonacci series.
4. Write a Program to generate Factorial of a number.
5. Write a Program to read 16 bit Data from a port and display the same in another port.
6. Write a Program to generate a square wave using 8254.
7. Write a Program to generate a square wave of 10 kHz using Timer 1 in mode 1(using 8051).
8. Write a Program to transfer data from external ROM to internal (using 8051).
9. Design a Minor project using 8086 Micro processor (Ex: Traffic light controller/temperature controller etc)
10. Design a Minor project using 8051 Micro controller

NOTE: - At least 8 Experiments out of the list must be done in the semester.

ELECTRICAL DRIVES

Paper Code: ETEE-401	**L**	**T/P**	**C**
Paper: Electrical Drives	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the basics of Electrical Drives that are required for an engineering student.

UNIT- I

Dynamics of Electric Drives: Types of loads, quadrant diagram of speed time characteristics, Basic and modified characteristics of dc and ac motors, equalization of load, steady state stability, calculation of time and energy loss, control of electric drives, modes of operation, speed control and drive classifications, closed loop control of drives, selection of motor power rating, class of duty, thermal considerations.

[T1,T2][No. of hrs. 11]

UNIT- II

DC Motor Drives: DC motor speed control, Methods of armature control, field weakening, semiconductor controlled drives, starting, braking, transient analysis, controlled rectifier fed dc drives, chopper controlled dc drives.

[T1],[T2][No. of hrs. 10]

UNIT- III

Induction Motor Drives: Three phase induction motor starting, braking, transient analysis, speed control from stator and rotor sides, stator voltage control, variable frequency control from voltage sources and current sources, static rotor resistance control, slip power recovery, static Scherbius and static Kramer drive.

[T1], [T2][No. of hrs. 11]

UNIT-IV Drives with Special Machine: Introduction to permanent magnet machines, thermal properties of PM, concept of BLDC motor, 120° and 180° operation, rotor position detection, open loop voltage control, closed loop current control, high speed single pulse operation, permanent magnet synchronous machines, rotor position detection and synchronization, sinusoidal PWM excitation, closed and open loop control, PMSG and its application to wind energy, stepper motor, current and voltage control, drive circuits, SRM drive, modeling and analysis of SRM, different configurations of converters, closed and open loop operation, high speed operation with angle of advance.

[T1],[T2][No. of hrs. 12]

Text Books:

[T1] G K Dubey, "Principle of Electrical Drives", Narosa Publishing House
[T2] Vedam Subrahmanyam, "Electrical Drives", Tata McGraw-Hill

References Books:

[R1] R Krishnan, "Electrical Motor Drives" PHI Publications.
[R2] Ned Mohan, "Electrical Machines And Drives" Wiley India Publication
[R3] Bimal K Bose, "Modern Power Electronics and AC Drives", PHI Publications.
[R4] De, Sen , " Electric Drives" , PHI Publications.
[R5] Bimal K Bose, "Power Electronics and Variable Frequency Drives" Wiley India Publication

ADVANCED CONTROL SYSTEMS

Paper Code: ETEE-403	**L**	**T/P**	**C**
Paper: Advanced Control Systems	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To impart knowledge of state space, discrete systems, non-linear systems and adaptive control.

UNIT – I: State Space Analysis

Introduction, state space representation of continuous LTI systems, transfer function and state variables, transfer matrix, EIGEN values and EIGEN vectors, Solution of State equations, controllability and observability, canonical forms (CCF, OCF, DCF, JCF).

[T1,T2][No. of Hrs.10]

UNIT – II: Discrete System

Introduction to discrete time systems, sampling process, Z-transform and inverse Z-transforms and hold circuits, presentation by difference equation and its solution, pulse transfer function, transient and steady state responses, Dead beat response, steady state error, Representation of discrete systems in state variable form and its solution, stability of digital control system, digital equivalent of conventional controller/compensator.

[T1,T2][No. of Hrs.12]

UNIT – III: Non-Linear System

Introduction, Non-linear system behavior and different types of non-linearities, Describing function analysis, assumptions and definitions, DF of common non-linearities, Phase Plane Analysis, singular points, construction of phase portrait, phase plane analysis of linear/non-linear systems, existence of limit cycles, jump phenomenon, stability analysis:

[T1,T2][No. of Hrs.10]

UNIT – IV: Lyapunov Theory and Adaptive Control

Lyapunov direct method, positive definite functions and Lyapunov functions, existence of Lyapunov functions, Lyapunov analysis of LTI systems, variable gradient method, Krasvoskii method, performance analysis, Popov's stability criteria.

Introduction to basic approaches to adaptive control - Model reference adaptive control systems, self tuning regulators, Applications of adaptive control.

[T1,T2][No. of Hrs.10]

Text Books:

[T1] Dorf-State Space Analysis, Modern Control System, Pearson 4th edition, 2002
[T2] M. Gopal-Digital Control and State Variable Methods, TMH 4th Edition.

Reference Books:

[R1] J. J. Stoline, Nonlinear Control System.
[R2] Brian D.O.Adnerson & John B. Moore, Optimal Control
[R3] R.C. Sukla – Control Stystems, Dhanpat Rai & Co. (P) Ltd.
[R4] Shastri & Badson, Adaptive Control, PHI
[R5] S. Das Gupta, Control System Theory, Khanna Publications.

EHV AC & HVDC TRANSMISSION

Paper Code: ETEE-405	**L**	**T/P**	**C**
Paper: EHV AC & HVDC Transmission	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the basics of EHV AC and HVDC Transmission that are required for an engineering student.

UNIT- I

EHV AC Transmission System: Fundamental design aspects of EHV AC transmission lines and their power carrying capabilities; EHV AC Transmission lines analysis – nominal and equivalent circuits; Problems related with long lines: corona loss, audible noise generation and characteristic corona pulses, RI effect, ferro-resonance, principle of half wave transmission.

[T1,T2][No. of hrs. 11]

UNIT- II

Reactive Power Management in EHV AC System: Reactive power management of power system, reactive power problems associated with EHV AC systems; Reactive power devices – their operation and control, series and shunt compensation of EHV AC system, different equipment and scheme details with analysis, application of FACTS Technology. **Extra High Voltage Testing:** Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.

[T1,T2][No. of hrs. 11]

UNIT- III

HVDC Transmission: Fundamental aspects of HVDC systems and their comparison with EHV AC Systems; Different types of HVDC Schemes with their basic details, HVDC Equipment and their ratings, construction and characteristics; Power Converter circuits associated with HVDC systems, design aspects of 12- pulse converters, simple design problems of HVDC Systems.

[T1,T2][No. of hrs. 10]

UNIT-IV **HVDC**

System Control: Types of DC link, principle of dc link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of dc link, Harmonic Filters – HVDC current and voltage filters, different types of filters, Fundamental aspects of HVDC circuit breaking, MTDC systems: types, control and application.

[T2][No. of hrs. 12]

Text:

[T1] S.Rao, "EHV AC & HVDC Transmission Engineering & Practice", Khanna Publishers.
[T2] Padiyar, K.R, "HVDC power Transmission System", New Age Publication.

References:

[R1] R.D.Begamudre,"Extra high Voltage AC transmission Engineering",Wiley Eastern.
[R2] Naidu, Kamaraju "High Voltage Engineering", ,5 ed., TMH Publishing
[R3] Kamakshaiah, Kamaraju,"HVDC Transmission", McGraw-Hill Publication.
[R4] Nagsarkar, Sukhija, "Power System Analysis" , Oxford Publication

RENEWABLE ENERGY RESOURCES

Paper Code: ETEE-419	**L**	**T/P**	**C**
Paper: Renewable Energy Resources	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to introduce the knowledge of upcoming and future promising area of renewable energy resources to the students, which is developing rapidly.

UNIT- I

Solar Energy: radiation – extra terrestrial, spectral distribution, solar constant, solar radiation on earth, measurements; solar thermal system – solar thermal power and its conversion, solar collectors, flat plate, solar concentrating collectors, - types and applications; photovoltaic (PV) technology - photovoltaic effect, efficiency of solar cells, semi-conductor materials, solar PV system, standards and applications, tracking.

[T1][No. of hrs. 10]

UNIT- II

Wind and Small Hydropower Energy: wind data, properties, speed and power relation, power extracted, wind distribution and speed prediction, wind map of India; wind turbines and electric generators. fundamentals – types of machines and their characteristics, horizontal and vertical wind mills, elementary design principle, wind energy farms, off-shore plants; small, mini and micro hydro power plants and their resource assessment, plant layout with major components shown.

[T2][No. of hrs. 10]

UNIT- III

Other Non-conventional Energy Sources: biomass – photosynthesis and origin of biomass energy, resources, cultivated resources, waste to biomass, terms and definitions – incineration, wood and wood waste, harvesting super tree, energy forest, phyrolysis, thermo-chemical biomass conversion to energy, gasification, anaerobic digester, fermentation, gaseous fuel; geothermal – resources, hot spring, steam system, principle of working, site selection, associated problems in development; ocean and tidal energy – principle of ocean thermal energy conversion, wave energy conversion machines, problems and limitations, fundamentals of tidal power, conversion systems and limitations; hydrogen energy – properties of hydrogen, sources, production and storage, transportation, problems for use as fuel; fuel cells – introduction with types, principle of operation and advantages.

[T1,R2][No. of hrs. 12]

UNIT-IV

Grid Connectivity: wind power interconnection requirement - low-voltage ride through (LVRT), ramp-rate limitations, supply of ancillary services for frequency and voltage control, load following, reserve requirement, impact of connection on stead-state and dynamic performance of power system; interfacing dispersed generation of solar energy with the grid, protective relaying, islanding, voltage flicker and other power quality issues; role of non-conventional energy system in smart grid.

[T2,R3][No. of hrs. 10]

Text Books:

[T1] Tiwari and Ghosal, "Renewable Energy Resources: Basic Principle & Application", Narosa Pub.
[T2] S N Bhadra ,D, Kastha,'Wind Electrical Systems" Oxford Publication 2014

References Books:

[R2] John Twidell, "Renewable Energy Sources", Taylor and Francis
[R3] Godfrey Boyle, "Renewable Energy: Power for a Sustainable Future", Oxford University Press
[R4] Ewald F. Fuchs, "Power Conversion of Renewable Energy Systems", Springer
[R5] B. H. Khan, "Non Conventional Energy", Tata McGraw Hill
[R6] D P kothari ,"Wind energy System and applications" Narosa Pub 2014

POWER DISTRIBUTION SYSTEM

	L	T/P	C
Paper Code: ETEE-409			
Paper: Power Distribution System	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to enable the Electrical Engineering students to have knowledge of Power Distribution System, an important aspect of overall Electricity Supply System.

UNIT- I

Introduction to sub-transmission and distribution system; classification of loads – residential, commercial, agricultural, industrial and their characteristics; distribution system planning – short-term, mid-term, long-term, load modeling and characteristics; definition of demand factor, utilization factor, load factor, plant factor, diversity factor, loss factor; computer applications to distribution system automation; tariff.

[T1,T2][No. of hrs. 10]

UNIT- II

Distribution feeders, transformers and sub-stations; primary feeders – voltage level, radial and loop types, uniformly distributed and non-uniformly distributed load; design considerations for secondary system – voltage level, location of substation, rating, service area with primary feeders, optimal location; existing system improvement.

[T1,T2][No. of hrs. 10]

UNIT- III

System analysis – voltage drop and power loss calculation; methods of solution for radial networks, three-phase balanced primary lines, non-three-phase primary lines; loss reduction, voltage regulation, voltage control and improvement, issues in quality of service – voltage sag, swell and flicker; application of capacitors to distribution system – effect of series and shunt capacitors, power factor correction, economic justification for capacitor with cost-benefit analysis aiming at most economic power factor, optimum location of capacitor.

[T1,T2][No. of hrs. 12]

UNIT-IV

Distribution sub-station bus schemes, description and comparison of switching schemes; types of common faults and procedure for system fault calculation; protection – objectives, over current protection devices – fuses, automatic circuit re-closers, automatic line sectionalizing, coordination of protective devices – fuse to fuse, fuse to circuit breaker, re-closer to circuit breaker.

[T1,T2][No. of hrs. 10]

Text:

[T1] Turan Gonen, "Electric Power Distribution System Engineering", McGraw Hill
[T2] Dale R. Patrick," Electrical Distribution System", 2nd Edition, CRC Press

References:

[R1] James A. Momoh, "Electric Power Distribution Automation, Protection and Control", CRC Press
[R2] A. S. Pabla, "Electric Power Distribution", Tata McGraw Hill

TELEMETRY & DATA ACQUISITION SYSTEM

	L	T/P	C
Paper Code : ETEE-411			
Paper: Telemetry & Data Acquisition System	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: Telemetry is the study of data communication between a numbers of locations. Data Acquisition system deals with acquiring the data from different sources, processing the data so that it can be made compatible to be used with the controlling systems. So, the study of this subject is very useful for the students who are to work in automation industries.

UNIT – I

Telemetry Concepts

Introduction: Methods of data transmission, general telemetry system, types of telemetry systems, voltage, current, position, landline, radio frequency telemetry systems.

Sampling fundamentals: Introduction to sampling theorem and sampling process, convolution, computing minimum sampling rate, Aliasing Errors.

Digital Modulation Techniques: AM, FM, Review of PCM, DPCM, DM code converters, PSK, QPSK, FSK, Probability of error, Phase ambiguity Resolution and differential encoding, Error detection, Error correction, Error correcting codes.

[T1 T2][No. of Hrs. 12]

UNIT – II

Data Communication Systems

Data Transmission system: Methods of binary data transmission, data formats, Block schematic, Sensors, Signal conditioners, Multiplexing – high level and low level, ADC – Range and Resolution, Word Format, Frame format, Frame of Synchronizer codes, RF links, X24, RS422, RS423, RS232C interfaces, Multi terminal configuration, Multiplier & concentrator, Data Modems, Data transmission over telephone lines, power line carrier communication.

Data reception systems: Bit Synchronizers, Frame Synchronizers, Sub frame Synchronizers, PLL, Display System.

[T1 T2][No. of Hrs. 10]

UNIT – III

Remote Control: Communication Based Processing Control Systems, Pipelines, Operational security system components, Pipeline control, Power system control, Programmable controllers for factory automation.

Command: Tone Command system, Tone Digital Command system, ON/OFF command and Data commands.

Aerospace Telemetry: Signal Formation and Conversion, Multiplexing Techniques in Telecontrol installations, Reliability in Telecontrol installations. Optoelectronics/Fiber cable based scheme.

[T1 T2][No. of Hrs. 10]

UNIT – IV

Data Acquisition System (DAS)

Introduction, Analog and digital data acquisition system, Importance of DAS, building blocks of DAS, sample and hold circuits, A/D, D/A, multiplexer . Microprocessor based DAS.

[T1 T2][No. of Hrs. 10]

Text Books:

[T1] Patranabis, "Telemetry Principles", TMH.
[T2] H. Rosemary Taylor, "Data Acquisition for Sensor Systems", Chapman & Hall

Reference Books:

[R1] William Schweber, "Data Communication," TMH Edition-1999
[R2] Frank Cardon, Russell Jedlicka and Robert Henry, "Telemetry Systems Engineering" Artech House, Boston, London

PLC & SCADA SYSTEMS

Paper Code: ETEE-413	**L**	**T/P**	**C**
Paper: PLC & SCADA Systems	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of this paper is to introduce the students about the knowledge of programmable logic controller, principles of PLC and functions and SCADA and its elements and functions.

UNIT-I

Programmable Logic Controller (PLC) Basics: Introduction, Parts of PLC, Principles of operation, PLC size and applications, PLC Advantages and Disadvantages, PLC Manufacturers, PLC hardware components, I/O section, Analog I/O modules, Digital I/O modules, CPU- Processor memory module, Programming devices, Devices which can be connected to I/O modules, Relay, Contactor, SPST, Push Buttons, NO/NC Concept

[T1,T2] [No of Hrs 10]

UNIT-II

Programming of Programmable Logic Controller: General PLC Programming Procedures, Contacts and Coils, Program SCAN, Programming Languages, Ladder Programming, Relay Instructions, Instruction Addressing, Concept of Latching, Branch Instructions, Contact and Coil I/O Programming Examples, Relation of Digital Gate Logic to Contact/Coil Logic.

[T1,T2] [No of Hrs 12]

UNIT-III

Programmable Logic controller Functions: Timer Instructions: ON DELAY Timer and OFF DELAY timer, Counter Instructions: UP/DOWN Counters, Timer and Counter Applications, Program Control Instructions: Master Control Reset, Jump and Subroutine,
Math Instructions- ADD, SUB. Data Handling: Data Move, Data Compare, Data Selection, Electro-pneumatic Sequential Circuits and Applications.

[T1,T2] [No of Hrs 12]

UNIT-IV

SCADA: Definition of SCADA, Applicable Processes, Elements of SCADA System, A Limited Two-Way System. Real Time Systems: Communication Access and Master-Slave determining scan interval. Introduction to Remote Control, Communications-A/D Conversion, Long Distance Communication, Communication System components in brief- Protocol, Modems, Synchronous/Asynchronous telephone cable/radio, Half Duplex, Full Duplex System, Brief introduction to RTU and MTU, Applications-Automatic Control, Advisory Applications.

[R1] [No of Hrs 10]

Text Books:

[T1] Frank D. Petruzella "Programmable Logic Controllers", McGraw-Hill Book Company.
[T2] John w. Webb and Ronald A. Reis, "Programmable Logic Controllers", PHI

Reference Books:

[R1] Stuart A.Boyer "Supervisors Control and Data Acquisition", ISA
[R2] William I. Fletcher "An Engineering Approach to Digital Design", PHI.
[R3] Simpson, Colin "Programmable Logic Controllers", Englewood Cliffs NJ PHI.
[R4] Gray Dunning, "Introduction to Programmable Logic Controllers", Delmar Thompson Learning
[R5] Stenerson, John "Fundamentals Logic Controllers Sensors, & Communications", Englewood Cliffs, NJ, 1993. Prentice Hall.
[R6] Programmable Logic Controllers, W.Bolton, Elsevier

MECHATRONICS

Paper Code: ETAT-403	L	T/P	C
Paper: Mechatronics	3	0	3

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: Mechatronics is the combination of mechanical and electronics automation and computers. Nowadays all the mechanical machines have been made computer controlled. The Subject details the basic hardware and software elements used for proper and successful operation of various equipments. The knowledge of this subject will be helpful to students while working in industries.

UNIT - I

Mechanical Actuating Systems: Types of motion, Degrees of freedom, constraints, Kinematic Chains, Cam, Gear and gear trains, Ratchet and pawl Belt drive, chain drive, Bearing, pre loading.

Hydraulic & Pneumatic Actuation Systems: Fluid power systems, hydraulic systems, Pneumatic systems, system structure and signal flow, hydraulic pumps and Pressure Control Valves and regulation, air compressors and treatment, Cylinders, Direction Control Valves, Process control valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems.

[T1] [T2] [No. of Hrs: 11]

UNIT - II

Electrical Actuation Systems: Switching Devices, Mechanical Switches – SPST, SPDT, DPDT, keypads; Relays, Electronic sensors, Diodes, Thyristors, Transistors, solenoid operating Valve, Solenoid Operated Hydraulic and Pneumatic Valves, Electro-Pneumatic Sequencing Problems. Control of DC Motors, Permanent Magnet DC Motors, Bush less Permanent Magnet DC Motors, AC Motors and speed controls, Stepper Motors and Controls, Servo Motors.

Digital Electronics and systems:

Number Systems, Binary Mathematics, Boolean Algebra, Gates and Integrated Circuits Like 7408, 7402, Karnaugh Maps, Application of Logic Gates as: Parity Generators, Digital Comparators, BCD to Decimal Decoders, Flip Flops and applications, sequential logic, Microprocessor and microcontrollers, programming, instruction set, assembly language, C programming for Intel 8051 / 8082 micro-controller.

[T1] [T2] [No. of Hrs: 11]

UNIT - III

Sensors, transducers and application: Performance Terminology, Static and Dynamic Characteristics, Displacement, Position and Proximity Sensors, Potentiometer Sensors, Strain Gauge Element, LVDT, Optical Encoders, Pneumatic Sensors, Hall Effect Sensors, Tachogenerators, Strain Gauge Load Cell, Thermostats, Photo Darlington. Interfacing Sensors in Mechatronic System.

System Interfacing and data acquisition:

Data acquisition systems, Data loggers, SCADA, Interfacing requirements, Buffers, Darlington Pair, Handshaking, Serial and Parallel Port Interfacing, Peripheral Interface Adapters, Analog to Digital Conversion, Digital To Analog Conversion, Sample and Hold Amplifiers, Multiplexers, Time Division Multiplexing, Digital Signal Processing, Pulse Modulation, Component Interconnection and Impedance Matching, Interfacing Motor drives. Electrical power supply and protection.

Introduction to signal conditioning: Signal Conditioning Processes, Inverting Amplifiers, Non Inverting Amplifiers, Summing, Integrating, Differential, Logarithmic Amplifiers, Comparators, Amplifiers Error, Filtering, wheatstone Bridge, Temperature Compensation, Thermocouple Compensation,

[T1] [T2] [No. of Hrs: 11]

UNIT - IV

Programmable logic controllers:

Programmable logic controllers (PLC) Structure, Input / Output Processing, principles of operation, PLC versus computer, Programming Languages, programming using Ladder Diagrams, Logic Functions, Latching, Sequencing, Timers, Internal Relays And Counters, Shift Registers, Master and Jump Controls, Jumps, Data Movement, Code Conversion, Data handling and manipulation, selecting a PLC.

Case studies: Mechatronic approach to design, Boat Auto pilot, high speed tilting train, automatic car park system, coin counter, engine management system, autonomous mobile system, antilock brake system control, Auto-Focus Camera, Printer, Domestic Washing Machine, Optical Mark Reader, Bar Code Reader and Pick and Place robot Arm, Using PLC for extending and retracting a pneumatic piston and two pneumatic pistons in different combinations, control of vibrating machine, control of process tank, control of conveyor motor, detecting, sorting and packaging unit.

[T1] [T2] [No. of Hrs: 11]

Text Book:

[T1] W. Bolton, "Mechatronics – Electronic control systems in Mechanical & Electrical Engineering", Pearson Education Ltd., 2003.

[T2] K. P. Ramachandran, G.K. Vijayaraghavan, M.S. Balasundaram, Mechatronics - Integrated Mechanical Electronic Systems, Wiley;

Reference Books:

[R1] Joji P, Pneumatic Controls, Wiley.

[R2] Dan Necsulescu, Mechatronics, Pearson

[R3] David g Alciatore, Michael B Histand, "Introduction to Mechatronics and measurement systems", Mc Graw Hill Education.

[R4] A Smaili, F Mrad, "Mechatronics – Integrated Technologies for Intelligent Machines, Oxford Higher Education.

[R5] Nitaigour Premchand Mahalik, "Mechatronics Principles, Concepts & Application", Tata McGraw Hill Publishing Co.Ltd., 2003.

HIGH VOLTAGE ENGINEERING

Paper Code: ETEE-417	**L**	**T/P**	**C**
Paper: High Voltage Engineering	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: To understand the various types of over voltages in power system ,protection methods, measurement of over voltages, nature of Breakdown mechanism in solid, liquid and gaseous dielectrics and Testing of power apparatus and insulation coordination.

UNIT I

High Voltage and Breakdown Phenomenon

Electric field stress due to high voltage, gas ,vacuum, liquid, solids and composites as dielectrics and insulator, estimation and control of electric stress and numerical methods for its computation, surge voltages and their distribution and control, application of insulating materials in transformer, rotating machines, circuit breakers, cable, power capacitors, bushings; breakdown in gaseous and liquid dielectrics, collision process, ionization process, Townsend's Criteria of breakdown in gases, Paschen's law, breakdown in pure and commercial liquids as insulator; intrinsic, electromechanical and thermal breakdown of solid dielectrics, breakdown in composite dielectrics.

[T1][No. of Hrs. 12]

UNIT II

Generation of High Voltages and Currents

Generation of high direct current voltages and high alternating current voltages, generation of impulse voltages and impulse currents, tripping and control of impulse generators.

[T2][No. of Hrs. 10]

UNIT III

Measurement of High Voltages and Currents

Measurements of high voltages - direct, alternating and impulse, measurements of high currents–direct, alternating and impulse, Oscilloscope for impulse voltage and current measurements.

[T1][No. of Hrs. 10]

UNIT IV

Over Voltage, Insulation Coordination and Testing

Causes of over voltage – lightning, switching, faults and other abnormal conditions, principles of insulation coordination in high voltage, extra high voltage and ultra high voltage power systems, measurement of DC resistivity, dielectric constant, loss factor and partial discharge, testing of insulators and bushings, isolators and circuit breakers, cables, transformers, surge arresters, measurement of Radio Interference.

[T1,T2][No. of Hrs. 10]

Text Books:-

[T1] M. S. Naidu & V. Kamaraju , "High Voltage Engineering", Tata McGraw Hill Publications, 3rd Edition.
[T2] E. Kuffel, W.S. Zaengl & J. Kuffel , "High Voltage Engineering – Fundamentals", Elsevier, 2nd Edition.

Reference Books:

[R1] C. L. Wadhwa, "High Voltage Engineering", New Age International (P) Ltd, 1997.
[R2] Ravindra Arora & Wolfgang Mosh, "High Voltage Insulation Engineering", New Age International (P) Ltd, 1995.

SELECTED TOPICS IN EEE

Paper Code: ETEE-421	**L**	**T/P**	**C**
Paper: Selected Topics in EEE	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of this paper is to introduce the student about induction Generator, Harmonics in Electrical Machine, Solar photovoltaic system and other related functions

UNIT I

Induction Generator: Torque-speed characteristics of an induction machine under generation mode, Line/grid Connected Induction Generator : Operation and limitations, Self Excited Induction Generator (SEIG) : Process of self excitation, conditions of self excitation, critical capacitance curve, no load characteristics (terminal capacitance vs induced voltage at constant speed), load characteristics (terminal voltage vs load current at fixed terminal capacitance & constant speed), frequency characteristics (frequency of generated voltage vs resistive load current) and voltage characteristic improvement using additional capacitor (capacitance vs resistive load current keeping terminal voltage and speed constant).

[T1,R3] [No. of Hrs. : 10]

UNIT II

Harmonics in Electrical Machines: Harmonics in 3-phase transformers, Space distribution of magnetic field produced by direct current in stator field coils of a D.C. machine, Space distribution of magnetic field produced by current in armature windings of a D.C. machine, Effect of armature MMF on main field of a D.C. machine, Space distribution of magnetic field produced by 3-phase distributed stator winding of a 3-phase induction machine, Space harmonics and their effects in a 3-phase induction machine, Operation of 3-phase induction motor on unbalanced supply.

[T1,R4] [No. of Hrs. : 10]

UNIT III

Solar Photovoltaic System: Introduction, Standards, SPV Water Pumping System, SPV Cell for Communication Equipment and other application of SPV, PV Hybrid System, Grid Interactive Solar PV System, Solar Photovoltaic in India, Roof top Solar Plant, Introduction of JNNSM, Possibilities and Limitations of Solar Energy in India.

[T2,R1,R2] [No. of Hrs. : 10]

UNIT IV

Electrical Energy Conservation: Modern compact fluorescent lamps, energy audit methods of saving electricity in drives, lighting, air conditioning, pumps and distributions systems metering, KW, KWh and KVAR meters,
Standby power generation: DG sets, UPS, online Inverters and their maintenance.

[T2,R5,R6] [No. of Hrs. : 10]

Text Books:

[T1] Chapman – "Electrical Machine Fundamentals", McGraw Hill.
[T2] D.P. Kothari – "Renewable Energy Sources and Emerging Technologies", PHI, Second Edition.

References:

[R1] Tiwari and Ghosal, "Renewable Energy Resources: Basic Principle & Application", Narosa Publication
[R2] John Twidell, "Renewable Energy Sources", Taylor and Francis
[R3] A Fitzgerald, Charles Kingsley, Stephen Umans, Electric Machinery, Tata McGraw Hill Education, 6th Edition, 2002
[R4] K. Venkataratnam, "Special Electrical Machines", Oxford University Press, Hydearbad, 2008
[R5] W.C. Turner, Energy Management Handbook, 2e, Fairmont press, 1993.
[R6] UNESCAP – Guide Book on Promotion of Sustainable Energy Consumption.

OPTOELECTRONICS AND OPTICAL COMMUNICATIONS

Paper Code: ETEC-403	**L**	**T/P**	**C**
Paper: Optoelectronics and Optical Communications	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks

Objective: The objective of this paper is to introduce the student about Optical Fiber, Wave propagation, Detectors and its structures and functions.

UNIT I

Introduction: Optical Fiber :-Structures, Wave guiding and Fabrication – Nature of light, Basic optical laws and Definition, Optical fiber modes and Configuration, Mode theory for circular waveguides, Single mode fibers, Graded index fiber, Fiber materials, Fabrication and mechanical properties, Fiber optic cables, Basic Optical Communication System, Advantage of Optical Communication System .

[T1, T2][No. of Hrs.10]

UNIT – II

Attenuation in Optical Fibers: Introduction, Absorption, Scattering, Very Low Loss Materials, All Plastic & Polymer-Clad-Silica Fibers.

Wave Propagation: Wave propagation in Step-Index & Graded Index Fiber, Overall Fiber Dispersion-Single Mode Fibers, Multimode Fibers, Dispersion-Shifted Fiber, Dispersion, Flattened Fiber, Polarization.

[T1, T2][No. of Hrs.11]

UNIT – III

Source & Detectors: Design & LED's for Optical Communication, Semiconductor Lasers for Optical Fiber Communication System and their types, Semiconductor Photodiode Detectors, Avalanche Photodiode Detector & Photo multiplier Tubes. Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling. Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors. Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers .

[T1, T2][No. of Hrs.11]

UNIT – III

Optical Fiber Communication Systems: Data Communication Networks – Network Topologies, Mac Protocols, Analog System. Advanced Multiplexing Strategies – Optical TDM, Sub carrier Multiplexing, WDM Network. Architectures: SONET/SDH. Optical Transport Network, Optical Access Network, Optical Premise Network. **Applications**-Military Applications, Civil, Consumer & Industrial Applications.

[T1, T2][No. of Hrs.12]

Text Books:

[T1] J. Gowar, "Optical Communication System", IEEE Press – 2nd Edition.
[T2] R.P.Khare "Fiber Optics and Opto Electronics" Oxford Publication

Reference Books:

[R1] Optical Information Processing – F. T. S. Yu – Wiley, Newyork, 1983
[R2] G. P. Agrawal, Fiber optic Communication Systems, John Wiley & sons, New York, 1992
[R3] A. Ghatak, K. Thyagarajan, "An Introduction to Fiber Optics", Cambridge University Press
[R4] J. H. Franz & V. K. Jain, "Optical Communication Components & Systems", Narosa Publish, 2013
[R5] John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.

DATABASE MANAGEMENT SYSTEMS

	L	T/P	C
Paper Code: ETCS-425			
Paper: Database Management Systems	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective: The concepts related to database, database techniques, SQL and database operations are introduced in this subject. This creates strong foundation for application data design.

UNIT-I : Introductory Concepts of DBMS: Introduction and application of DBMS, Data Independence, Database System Architecture – levels, Mapping, Database users and DBA, Entity – Relationship model, constraints, keys, Design issues, E-R Diagram, Extended E-R features- Generalization, Specialization, Aggregation, Translating E-R model into Relational model.

[T1, T2][No. of Hrs. 10]

UNIT-II : Relational Model: The relational Model, The catalog, Types, Keys, Relational Algebra, Fundamental operations, Additional Operations-, SQL fundamentals, DDL,DML,DCL PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Integrity – Triggers.

[T2, R3][No. of Hrs. 10]

UNIT-III: Functional Dependencies, Non-loss Decomposition, First, Second, Third Normal Forms, Dependency Preservation, Boyce/Codd Normal Form, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

[T2, R1][No. of Hrs. 10]

UNIT-IV: Transaction Management: ACID properties, serializability of Transaction, Testing for Serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, Database recovery management.

Implementation Techniques: Overview of Physical Storage Media, File Organization, Indexing and Hashing, B+ tree Index Files, Query Processing Overview, Catalog Information for Cost Estimation, Selection Operation, Sorting, Join Operation, Materialized views, Database Tuning.

[T1, T2, R2][No. of Hrs. 12]

Text Books:

[T1] Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 5th Edition, Tata McGraw Hill, 2006

[T2] Elmsari and Navathe, "Fundamentals of Database Systems", 4th Ed., A. Wesley, 2004

References Books:

[R1] C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.

[R2] J. D. Ullman, "Principles of Database Systems", 2nd Ed., Galgotia Publications, 1999.

BIOMEDICAL INSTRUMENTATION

Paper Code: ETIC-403	**L**	**T/P**	**C**
Paper: Biomedical Instrumentation	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1.. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Q. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective:-The objective of teaching this subject is to make students understand the applications of electronics in diagnostic and therapeutic area. Further the methods of recording various bio potentials; measurement of biochemical and physiological information are explained. The topics such as Patient Monitoring systems, Audiometers, imaging systems, Patients safety are also included. The emerging Computer Applications in Biomedical field are also dealt with.

UNIT I

Biomedical signals & Physiological transducers: Source of biomedical signal, Origin of bioelectric signals, recording electrodes, Electrodes for ECG, EMG & EEG .Physiological transducers: Pressure, Temperature, photoelectric & ultrasound Transducers. Measurement in Respiratory system**:** Physiology of respiratory system, Measurement of breathing mechanics Spiro meter, Respiratory therapy equipments Inhalators ventilators & Respirators , Humidifiers , Nebulizers Aspirators, Biomedical recorders: ECG, EEG & EMG.

[T1, T2][No of Hours:-11]

UNIT II

Patient Monitoring systems & Audiometers: Cardiac monitor, Bedside patient monitor, measurement of heart rate, blood pressure, temperature, respiration rate, Arrhythmia monitor, Methods of monitoring fatal heart rate, Monitoring labor activity . Audiometers: Audiometers, Blood cell counters, Oximeter, Blood flow meter, cardiac output measurement, Blood gas analyzers.

[T1, T2][No of Hours:-11]

UNIT III

Modern Imaging systems: Introduction, Basic principle & Block diagram of x-ray machine, x- ray Computed Tomography (CT), Magnetic resonance imaging system (NMR), ultrasonic imaging system. Eco-Cardiograph, Eco Encephalography, Ophthalmic scans, MRI. Therapeutic Equipments: Cardiac pacemakers, cardiac defibrillators, Hemodialysis machine, Surgical diathermy machine.

[T1, T2][No of Hours:-11]

UNIT III

Patients safety & Computer Applications in Biomedical field: Precaution, safety codes for electro medical equipment, Electric safety analyzer, Testing of biomedical equipment, Use of microprocessors in medical instruments, Microcontrollers, PC based medical instruments, Computerized Critical care units, Planning & designing a computerized critical care unit. Physiotherapy: Software Diathermy, microwave diathermy, Ultrasound therapy unit. Electrotherapy Equipments, Ventilators.

[T1, T2][No of Hours:-11]

Text Books:

[T1] Joseph J. Carr & John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson.
[T2] Shakti Chatterjee, "Textbook of Biomedical Instrumentation System", Cengage Learning

Reference Books:

[R1] R.S.Khandpur, "Hand book of Biomedical Instrumentation", TMH
[R2] Walter Welko- Witiz and Sid Doutsch, "Biomedical Instruments: Theory and Design" Wiley
[R3] Lesile Cromwell, Fred J. Weibell & Erich A. Pfeiffer, "Biomedical Instrumentation & Measurements", PHI

DIGITAL SYSTEM DESIGN

Paper Code: ETEC-427	**L**	**T/P**	**C**
Paper: Digital System Design	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: To enhance the knowledge and skill of the students in digital system design with emphasis on Hardware Description Language (VHDL HDL)

UNIT I

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements. Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration**.**

[T1][No. of Hrs.: 12]

UNIT II

Combinational logic circuit design and VHDL implementation of following circuits –first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

[T1][No. of Hrs.: 10]

UNIT III

Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC).

[T2][No. of Hrs.: 10]

UNIT IV

Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, clock skew and timing considerations

Introduction to place & route process, Introduction to ROM, PLA, PAL, Architecture of CPLD (Xilinx/Altera).

[T2][No. of Hrs.: 12]

Text Books:

[T1] Douglas Perry ,"VHDL" 4th Edition, TMH
[T2] Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL design", TMH.

Reference Books:

[R1] Charles. H.Roth ,"Digital System Design using VHDL", PWS (1998)
[R2] John F. Wakerley ,"Digital Design Principles And Practices" ,Pearson Education
[R3] Navabi Z , "VHDL-Analysis & Modelling of Digital Systems",McGraw Hill.
[R4] William I. Fletcher, "An Engineering Approach To Digital Design", Prentice Hall
[R5] Bhasker, "A VHDL Primmer", Prentice Hall 1995.

POWER LINE CARRIER COMMUNICATION

	L	T/P	C
Paper Code: ETEE-431			
Paper: Power Line Carrier Communication	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with the knowledge of communication through power lines.

UNIT- I

Channel Characterization: Introduction, channel modelling fundamentals, model for outdoor channel, models for indoor channels, noise and disturbances ,measuring techniques, PLC channel emulation tools. Coupling: Introduction, filtering basics, transformer and capacitor coupler design, impedance adaptation concepts.

[T1,T2] [No. of hrs. 11]

UNIT- II

Digital Transmission Techniques: Introduction, Architecture of PLC system, Narrowband and broadband PLC systems, Modulation and coding for narrow band and broad band PLC systems, Error Handling.

[T1,T2] [No. of hrs. 11]

UNIT- III

PLC Networks : Introduction, Organisation and structure of PLC networks, Media Access Control layer, Multiple Access Schemes, Protocols for PLC, Traffic control, Supporting Energy Management Systems, Quality of service(QOS), International standards on PLC networking Technology .

[T1,T2][No. of hrs. 11]

UNIT-IV

Systems and Implementations: PLC smart grid systems, PLC broadband Access systems, Multimedia PLC systems, DC-PLC systems, PLC in emerging countries

[T1,T2] [No. of hrs. 11]

Text:

[T1] Hendrik C. Ferreira,Lutz Lampe John Newbury,Theo G.Swart,"PLC: theory and Applications for narrow band and broad band communication over power lines".Wiley and Sons.

[T2] Halid Hrasnica, Abdelfatteh Haidine, Ralf Lehnert" Broad Band Power line Communications: Network Design" Wiley and sons.

References:

[R1] Gilbert Held,"Understanding Broadband over Power line",Auerbach Publications.

ELECTRICAL MACHINES DESIGN

Paper Code: ETEL-405	**L**	**T/P**	**C**
Paper: Electrical Machines Design	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: *Providing sound knowledge about the principles of operation of various electrical machines, their constructional features, and their behavior and Design concepts of various components of each electrical machine so that machines after manufacturing operate at optimum efficiency and economy under various condition of operation.*

UNIT I

General Concepts: Major considerations in Design of Electrical Machines Electrical Engineering Materials, Space factor, Choice of Specific Electrical and Magnetic loadings, Thermal considerations, Heat flow, Temperature rise, Rating of machines, Standard specifications.

DC Machines : Output Equations, Main Dimensions, Magnetic circuit calculations, Carter's Coefficient, Net length of Iron, Real & Apparent flux densities, Selection of number of poles, Design of Armature, Design of commutated and brushes, performance prediction using design values.

[T1, T2][No. of Hrs. 10]

UNIT II

Transformers: Output Equations, Main Dimensions, KVA output for single and three phase transformers, Window space factor, Overall dimensions, Operating characteristics, Regulation, No load current, Temperature rise in Transformers, Design of Tank, Methods of cooling of Transformers.

[T1, T2][No. of Hrs. 10]

UNIT III

Induction Motors: Output equation of Induction motor, Main dimensions, Length of air gap, Rules for selecting rotor slots of squirrel cage machines, Design of rotor bars & slots, Design of end rings, Design of wound rotor, Magnetic leakage calculations, leakage reactance of poly phase machines, Magnetizing current, Short circuit current, Circle diagram, Operating characteristics.

[T1, T2][No. of Hrs. 10]

UNIT IV

Synchronous Machines: Output equations, choice of loadings, Design of salient pole machines, Short circuit ratio, shape of pole face, Armature design, Armature parameters, Estimation of air gap length, Design of rotor, Design of damper winding, Determination of full load field mmf, Design of field winding, Design of turbo alternators, Rotor design.

[T1, T2][No. of Hrs. 10]

Text Books:

[T1] Electrical Machine Design the Design and Specification of Direct and Alternating Current Machinery, Alexander Gray, Nabu Press, First reprint edition, 2014

[T2] Electric Machines Steady State, Transients, and Design with MATLAB, IonBoldea, Lucian Tutelea, CRC Press, Taylor & Francis, First edition, 2010.

Reference

[R1] Principles of Electrical Machine Designs with Computer Programmes, Sen, S.K., Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, 1987.

[R2] Electrical Machine Design Data Book, A. Shanmugasundaram, G. Gangadharan, R. Palani, New Age International Pvt. Ltd., Reprint 2007.

[R3] Design and Testing of Electrical Machines, M.V. Deshpande, PHI, 2013.

[R4] Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Co., New Delhi, 6th Edition, 2013.

SOCIOLOGY AND ELEMENTS OF INDIAN HISTORY FOR ENGINEERS

	L	T/P	C
Paper Code: ETHS-419			
Paper: Sociology and Elements of Indian History for Engineers	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of this course is to familiarize the prospective engineers with elements of Indian history and sociological concepts and theories by which they could understand contemporary issues and problems in Indian society. The course would enable them to analyze critically the social processes of globalization, modernization and social change. All of this is a part of the quest to help the students imbibe such skills that will enhance them to be better citizens and human beings at their work place or in the family or in other social institutions.

UNIT I

Module 1A: Introduction to Elements of Indian History: What is History? History Sources-Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography.

[*3 Lectures*]

Module 1B: Introduction to sociological concepts-structure, system, organization, social institution, Culture social stratification (caste, class, gender, power). State & civil society.

[*7 Lectures*]

[T1][No. of Hrs. 10]

UNIT II

Module 2A: Indian history & periodization; evolution of urbanization process: first, second & third phase of urbanization; Evolution of polity; early states of empires; Understanding social structures-feudalism debate.

[*3 Lectures]*

Module 2B: Understanding social structure and social processes: Perspectives of Marx, Weber & Durkheim.

[*7 Lectures*]

[T1][No. of Hrs. 10]

UNIT III

Module 3A: From Feudalism to colonialism-the coming of British; Modernity & struggle for independence.

[3 Lectures]

Module 3B: Understanding social structure and social processes: Perspectives of Marx, Weber & Durkheim.

[9 *Lectures*]

[T1][No. of Hrs. 12]

UNIT IV

Module 4A: Issues & concerns in post-colonial India (upto 1991); Issues & concerns in post-colonial India 2nd phase (LPG decade post 1991).

[*3 Lectures*]

Module 4B: Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing nature of work and organization.

[*10 Lectures*]

[T1][No. of Hrs. 13]

Text Books:

[T1] Desai, A.R. (2005), Social Background of Indian Nationalism, Popular Prakashan.
[T2] Giddens, A (2009), Sociology, Polity, 6th Edition

Reference Books:

[R1] Guha, Ramachandra (2007), India After Gandhi, Pan Macmillan
[R2] Haralambos M, RM Heald, M Holborn, (2000), Sociology, Collins

ELECTRICAL DRIVES LAB

Paper Code: ETEE-451	**L**	**T/P**	**C**
Paper: Electrical Drives Lab	**0**	**2**	**1**

List of Experiments:

1. Load equalization by flywheel for intermittent duty loads.
2. Comparison of various braking methods and their range of braking for induction motor.
3. Open loop AC voltage Control of single phase capacitor run induction motor.
4. Verification of linear relationship between duty cycle vs speed in open loop step down chopper controlled DC motor drive.
5. Single phase thyristorised full converter fed closed loop speed control of DC motor drive.
6. Closed loop speed control of 4 quadrant DC motor drive.
7. Closed Loop constant v/f speed control of Induction motor drive.
8. Closed Loop speed control through static rotor resistance controlled slip ring Induction motor.
9. Closed loop speed control of BLDC motor drive.
10. Closed Loop speed control of SRM drive.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

ADVANCED CONTROL SYSTEMS LAB

Paper Code: ETEE-453	**L**	**T/P**	**C**
Paper: Advanced Control Systems Lab	**0**	**2**	**1**

List of Experiments:

1. Study of open loop and closed loop time/ frequency responses of first/second order LTI system
2. Conversion of transfer functions to state model of LTI system and vice versa
3. Determine State Space Model of a given system and determine its controllability and observability.
4. Analysis of Zero order hold and first order hold circuits.
5. Conversion of transfer functions to state model of discrete time system.
6. To determine state transition matrix of a given system.
7. Study of saturation and dead zone non-linearity using describing function technique of a relay control system.
8. To draw phase trajectory of a given non-linear system.
9. Experiments based on PLC applications e.g. Lift control models, pick and place module etc.
10. Study of operation of a stepper motor interface with microprocessor.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

ELECTRICAL MACHINES DESIGN LAB

Paper Code: ETEE-455(ELECTIVE)	**L**	**T**	**C**
Paper: Electrical Machines Design Lab	**3**	**0**	**3**

List of Experiments:

To design the following parts of the electrical machines by using C++/MATLAB or any other related software.

1. Design of Armature
2. Design of Commutator
3. Design of Armature winding
4. Design of Magnetic Core of Transformer
5. Design of rotor bars and slots of squirrel cage induction motor
6. Design of rotor core of slip ring induction motor
7. Design of salient pole rotor of synchronous machine
8. Design of stator core and winding for synchronous machine
9. Design of rotor for turbo alternators
10. Design of damper winding

Reference:

[R1] Computer aided design of electrical machines by K.M. Vishnu Murthy, BS publications, Hyderabad, 2008.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

DIGITAL SYSTEM DESIGN LAB

Paper Code: ETEE-455(ELECTIVE)	**L**	**T/P**	**C**
Paper: Digital System Design Lab	**0**	**2**	**1**

List of Experiments:

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
    a. half adder
    b. full adder
3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
    c. multiplexer
    d. demultiplexer
4. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
    a. decoder
    b. encoder
5. Write a VHDL program for a comparator and check the wave forms and the hardware generated
6. Write a VHDL program for a code converter and check the wave forms and the hardware generated
7. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated
8. Write a VHDL program for a counter and check the wave forms and the hardware generated
9. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
    a. register
    b. shift register

NOTE:- At least 8 Experiments out of the list must be done in the semester.

DATABASE MANAGEMENT SYSTEMS LAB

Paper Code: ETEE-455(ELECTIVE)	**L**	**T/P**	**C**
Paper: Database Management Systems Lab	**0**	**2**	**1**

LAB BASED ON DBMS

Lab includes implementation of DDL, DCL, DML i.e SQL in Oracle.

List of Experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER, UPDATE and DELETE
4. Write the queries to implement the joins
5. Write the queries for implementing the following functions: MAX (), MIN (),AVG (),COUNT ()
6. Write the queries to implement the concept of Integrity constrains
7. Write the queries to create the views
8. Perform the queries for triggers
9. Perform the following operation for demonstrating the insertion, updation and deletion using the referential integrity constraints

TEXT BOOK:

[T1] SQL/ PL/SQL, The programming language of Oracle, Ivan Bayross, 4th Edition BPB Publications

NOTE:- At least 8 Experiments out of the list must be done in the semester.

HUMAN VALUES & PROFESSIONAL ETHICS – II

Paper Code: ETHS-402	**L**	**T**	**C**
Paper : Human Values & Professional Ethics-II	**1**	**0**	**1**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.
3. Two internal sessional test of 10 marks each and one project report* carrying 5 marks.

Objectives:

1. *The main object of this paper is to inculcate the skills of ethical decision making and then to apply these skills to the real and current challenges of the engineering profession.*
2. *To enable student to understand the need and importance of value-education and education for Human Rights.*
3. *To acquaint students to the National and International values for Global development*

UNIT I - Appraisal of Human Values and Professional Ethics:

Review of Universal Human Values: Truth, Love, Peace, Right conduct, Non violence, Justice and Responsibility. Living in harmony with 'SELF', Family, Society and Nature. Indian pluralism - the way of life of Islam, Buddhism, Christianity, Jainism, Sikhism and Hinduism, Greek - Roman and Chinese cultural values.

Sensitization of Impact of Modern Education and Media on Values:

a) Impact of Science and Technology
b) Effects of Printed Media and Television on Values
c) Effects of computer aided media on Values (Internet, e-mail, Chat etc.)
d) Role of teacher in the preservation of tradition and culture.
e) Role of family, tradition & community prayers in value development.

Review of Professional Ethics: Accountability, Collegiality, Royalty, Responsibility and Ethics Living. Engineer as a role model for civil society, Living in harmony with 'NATURE', Four orders of living, their inter-correctness, Holistic technology (eco-friendly and sustainable technology).

[T1] [T2] [R1] [R5] [R4][No. of Hrs. 03]

UNIT II – Engineers responsibility for safety:

Safety and Risks, Risk and Cost, Risk benefit analysis, testing methods for safety. Engineer's Responsibility for Safety Social and Value dimensions of Technology - Technology Pessimism – The Perils of Technological Optimism – The
Promise of Technology – Computer Technology Privacy

Some Case Studies: Case Studies, BHOPAL Gas Tragedy, Nuclear Power Plant Disasters, Space Shuttle Challenger , Three Mile Island Accident, etc.

[T1] [T2] [R4] [R2][No. of Hrs. 03]

UNIT III – Global Issues:

Globalization and MNCs: International Trade, Issues,
Case Studies: Kelleg's, Satyam, Infosys Foundation, TATA Group of Companies
Business Ethics: Corporate Governance, Finance and Accounting, IPR.
Corporate Social Responsibility (CSR): Definition, Concept, ISO, CSR.
Environmental Ethics: Sustainable Development, Eco-System, Ozone depletion, Pollution.
Computer Ethics: Cyber Crimes, Data Stealing, Hacking, Embezzlement.

[T1] [T2] [R4][No. of Hrs. 05]

UNIT IV - Engineers Responsibilities and Rights and Ethical Codes:

Collegiality and loyalty, Conflict of interests, confidentiality, occupational crimes, professional rights, responsibilities. To boost industrial production with excellent quality and efficiency, To enhance national economy, To boost team spirit, Work Culture and feeling of job satisfaction, National integration, Examples of some illustrious professionals.

Need for Ethical Codes, Study of some sample codes such as institution of Electrical and Electronics Engineers, Computer Society of India etc., Ethical Audit.

Development and implementation of Codes: Oath to be taken by Engineering graduates and its importance**,

[T1] [T2] [R4][R2][No. of Hrs. 05]

Text Books:

[T1] Professional Ethics, R. Subramanian, Oxford University Press.
[T2] Professional Ethics & Human Values: Prof. D.R. Kiran, TATA Mc Graw Hill Education.

References Books:

[R1] Human Values and Professional Ethics: R. R. Gaur, R. Sangal and G. P. Bagaria, Eecel Books (2010, New Delhi). Also, the Teachers‟ Manual by the same author
[R2] Fundamentals of Ethics, Edmond G. Seebauer & Robert L. Barry, Oxford University Press
[R3] Values Education: The paradigm shift, by Sri Satya Sai International Center for Human Values, New Delhi.
[R4] Professional Ethics and Human Values – M.Govindrajan, S.Natarajan and V.S. Senthil Kumar, PHI Learning Pvt. Ltd. Delhi
[R5] A Textbook on Professional Ethics and Human Values – R.S. Naagarazan – New Age International (P) Limited, Publishers New Delhi.
[R6] Human Values & Professional Ethics- S B Gogate- Vikas publishing house PVT LTD New Delhi.
[R7] Mike Martin and Roland Schinzinger, “Ethics in Engineering” McGraw Hill
[R8] Charles E Harris, Micheal J Rabins, “Engineering Ethics, Cengage Learning
[R9] PSR Murthy, “Indian Culture Values and Professional Ethics”, BS Publications
[R10] Caroline Whitback< Ethics in Engineering Practice and Research, Cambridgs University Press
[R11] Charles D Fleddermann, “Engineering Ethics”, Prentice Hall.
[R12] George Reynolds, “Ethics in Information Technology”, Cengage Learning
[R13] C, Sheshadri; The Source book of Value Education, NCERT
[R14] M. Shery; Bhartiya Sanskriti, Agra (Dayalbagh)

*Any topic related to the experience of the B.Tech student in the assimilation and implementation of human values and professional ethics during the past three years of his/her studies in the institute OR A rigorous ethical analysis of a recent case of violation of professional ethics particularly related to engineering profession.

**All students are required to take OATH in writing prior to submission of major project and the record of the same is to be maintained at the college level and/or, this oath may be administered by the head of the institutions during the graduation ceremonies. The draft for the same is available alongwith the scheme and syllabus.

OATH TO BE TAKEN BY ENGINEERING GRADUATES

In a manner similar to the Hippocratic Oath taken by the medical graduates, Oath to be taken by the engineering graduates is as given below.

1. I solemnly pledge myself to consecrate my life to the service of humanity.
2. I will give my teacher the respect and gratitude, which is their due.
3. I will be loyal to the profession of engineering and be just and generous to its members.
4. Whatever project I undertake, it will be for the good of mankind.
5. I will exercise my profession solely for the benefit of humanity and perform no act for criminal purpose and not contrary to the laws of humanity.
6. I will keep away from wrong, corruption and avoid tempting others to vicious practices.
7. I will endeavor to avoid waste and consumption of non-renewable resources.
8. I will speak out against evil and unjust practices whenever and wherever I encounter them.
9. I will not permit considerations of religion, nationality, race, party politics or social standing to intervene between my duty and my work, even under threat.
10. I will practice my profession with conscience, dignity and uprightness.
11. I will respect the secrets, which are confided to me.

I make these promises solemnly, freely and upon my honor.

(Name of the Student)

Correspondence Address: _____

_____

_____

Email: _____

NEURO & FUZZY SYSTEMS

Paper Code: ETEE-404	**L**	**T/P**	**C**
Paper: Neuro & Fuzzy Systems	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To impart knowledge of soft computing techniques and applications in engineering systems.

UNIT -I

Neural Networks: Fundamental of neural network, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning Methods, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perception Model, Radial Basis functions, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

[T1, T2][No. of Hrs. 11]

UNIT-II

Fuzzy sets: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Extension principle and fuzzy relationsFuzzy Logic: Fuzzification and defuzzification, Membership Function, Linguistic Variables, Linguistic hedges, Fuzzy rules and reasoning, lamda cut-sets. Arithmetic operations on Fuzzy numbers.

[T1, T2][No. of Hrs. 10]

UNIT-III

Fuzzy Inference System: Fuzzy Modeling, Mamdani Fuzzy model, TSK Fuzzy model, Fuzzy Controller, Industrial Applications.

Introduction of Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks, Hybrid learning algorithms, Neuro-fuzzy Control.

[T1, T2][No. of Hrs. 11]

UNIT-IV

Introduction to Evolutionary Techniques: Genetic Algorithm, Basic Concepts, Flow Chart of GA, Genetic representations (Encoding), Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Convergence of GA and Applications.

[T1, T2][No. of Hrs. 10]

Text Books:

[T1] Neural Network,Fuzzy Logic and Genetic Algorithms by S.Rajasekaran PHI Learning India 2011
[T2] Principles of Soft Computing by S. N. Sivanandam , S.N. Deepa, Wiley India.

References Books:

[R1] Artificial Intelligence, Patricks Henry,Winston,Pearson Education,2001
[R2] Artificial Intelligence, Nilsson, Morgon, Kufmann 1998.
[R3] Neuro-Fuzzy and Soft Computing by J.-S.R.Jung, c.T.Sun PHI Learning India 2011
[R4] Hagan Demuth, Beale" Neural Network Design " Cengage Learning 2013
[R5] S N Sivanandam, "Neural Network using Matlab" TMH 2013

POWER SYSTEM OPERATION & CONTROL

	L	T/P	C
Paper Code: ETEE-406			
Paper: Power System Operation & Control	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the importance of Optimal Control and Stability Concerns in Power Systems.

UNIT- I

AUTOMATIC GENERATION CONTROL:

Introduction: Load frequency control (single area case), load frequency (Two Area Case) control, load frequency control with GRC, Speed Governor Dead Band and its effects.

[T1], [T2][No. of Hrs. 10]

UNIT- II

ECONOMIC LOAD DESPATCH:

Introduction, System constraint, Economic Dispatch Neglecting losses, Optimum load dispatch including transmission losses, Exact Transmission loss formula, Automatic load dispatching.

[T1], [T2][No. of Hrs. 10]

UNIT- III

RESTRUCTURING OF POWER SYSTEM:

Introduction: Reason for restructuring or deregulation of power industry, Understanding the restructuring process, introduction to issues involved in deregulation, reasons and objectives of deregulation of various power system across the world, Transmission Congestion management.

[T3][No. of hrs. 10]

UNIT-IV

REACTIVE POWER AND VOLTAGE CONTROL:

Bases of reactive power control, Excitation System, Modeling. Generation and Absorption of Reactive Power, Relation between voltage, power and reactive power at node, methods of voltage control.

[T1][T2][T4][No. of hrs. 10]

Text Books:

[T1] I.J. Nagrath & D.P. Kothari, Power System Engineering, Mc Graw Hill, 2007.

[T2] S. Sivanagaraju, Power System Operation and Control, Pearson Education India, 2009.

[T3] Loi Lei Lai "Power System Restructuring and deregulation: Trading Performance & Information Technology, John Wiley & Sons.

[T4] Chakravarti & Halder, Power System Analysis: Operation & control Prentice Hall of India.

Reference Books:

[R1] P.Kundur, Power System Control and Stability, Mc Graw Hill.

[R2] Power System Stability Volume-I: E.W. Kimbark, John Wiley & Sons.

[R3] Dr. K. Uma Rao, Power System: Operation and Control, Wiley-India.

APPLICATION OF POWER ELECTRONICS TO POWER SYSTEMS

Paper Code: ETEE-408	**L**	**T/P**	**C**
Paper: Application of Power Electronics to Power Systems	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with the basics of Application of Power Electronic to Power Systems that are required for an engineering student.

UNIT- I

Overview of Power Quality : Classification of power quality issues, characterization of electric power quality, power acceptability curves, power quality problems, poor load power factor, nonlinear and unbalanced loads, transients, voltage sags and swells, over voltages and under voltages, outage, harmonic distortion, voltage notching, flicker, electrical noise, power quality indices, distortion index, IEEE guidelines and recommendations, harmonics creating loads, characterization of nonlinear loads, modelling of nonlinear loads, harmonic prorogation series and parallel resonances, harmonic power flow.

[T2][No. of hrs. 11]

UNIT- II

Compensation of Power Quality Problems: Passive Filters, various types, analysis and design, basics of P-Q theory, Clarke's and Park transformations (abc-dq)**,** Synchronous Reference Frame theory (SRF), comparison between SRF and pq theory, application to 3 ph- 3 wire and 3ph-4wire system, harmonic, reactive power and current unbalance compensation by DSTATCOM, voltage regulation, distortion and voltage unbalance compensation by DVR, Hybrid power filters and Unified Power Quality Conditioner.

[T2][No. of hrs. 12]

UNIT-III

Compensation with FACTS Controllers: Reactive power control in power systems, static series and shunt compensators, objectives of shunt and series compensation, methods of controllable VAR generation, Voltage sourced converters and current source converters, SVC and STATCOM for transmission lines, comparison between SVC and STATCOM, principles of TCSC and SSSC, basic operating principles of UPFC, applications for power flow control.

[T3][No. of hrs. 11]

UNIT- IV

DC Power Transmission and System Control: Introduction, comparison of AC and DC transmission, application of DC transmission. General principles of DC link control, converter control characteristics, combined rectifier and inverter characteristics, alternative inverter control modes, mode stabilization, system control hierarchy, harmonics and filters.

[T1][No. of hrs. 10]

Text:

[T1] Padiyar, K.R, "HVDC power Transmission System", New Age Publication.
[T2] Arindam Ghosh, Gerard Ledwich, "Power Quality Enhancement using custom Power Devices" Penguin Books Limited
[T3] Mathur, Verma, "Thyristor-Based FACTS Controllers For Electrical Transmission System", Wiley India Publication

References:

[R1] E. Acha, "Power Electronic control in Electrical Power System", Penguin Books Limited
[R2] P. Kundur, "Power System Stability and Control " TMH Publication
[R3] Lecture Series on Power Quality- NPTEL

DIGITAL IMAGE PROCESSING

Paper Code: ETIT-418	**L**	**T/P**	**C**
Paper: Digital Image Processing	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: The aim of this course is to provide digital image processing fundamentals, hardware and software, digitization, encoding, segmentation, feature extraction etc. It will enhance the ability of students to apply tools in image restoration, enhancement and compression and to apply the techniques in both the spatial and frequency domains. It will enhance the ability of students to identify the quality characteristics of medical images, differences between computer vision and image processing and help in studying the remote sensing images of the environmental studies.

UNIT- I:

Introduction and Digital Image Fundamentals: The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.

Image Enhancement in the Spatial Domain: Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods**.**

[T1, T2][No. of Hrs: 10]

UNIT- II:

Filtering in the Frequency Domain: Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters.

Image Restoration: A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.

[T1, T2][No. of Hrs. 12]

UNIT- III:

Image Compression: fundamentals of compression, coding redundancy, Lossy and lossless compression, Spatial and temporal redundancy, Image compression models. Some basic compression methods

Image Segmentation: Detection of Discontinuities, Edge linking and boundary detection, Region Oriented Segmentation, Motion based segmentation.

[T1, T2][No. of Hrs. 12]

UNIT- IV:

Representation and Description: Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms.

Object Recognition: Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.

[T1, T2][No. of Hrs: 10]

Text Books:

[T1] Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 3Rd edition, Pearson Education, 2002.

[T2] A.K. Jain, "Fundamental of Digital Image Processing", PHI, 1989.

Reference Books:

[R1] Bernd Jahne, "Digital Image Processing", 5th Ed., Springer, 2002.

[R2] William K Pratt, "Digital Image Processing: Piks Inside", John Wiley & Sons, 2001.

RELIABILITY ENGINEERING & APPLICATION TO POWER SYSTEMS

Paper Code: ETEE-412	**L**	**T/P**	**C**
Paper: Reliability Engineering & Application to Power Systems	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the concept of probability theory and Reliability modelling of a generation system.

UNIT- I

Basics of Probability theory & Distribution:

Basic probability theory – rules for combining probabilities of events – Bernoulli's trials – probabilities density and distribution functions – binomial distribution – expected value and standard deviation of binomial distribution.

[T1], [T2][No. of hrs. 10]

UNIT- II

Network Modelling and Reliability Analysis:

Analysis of Series, Parallel, Series-Parallel networks – complex networks – decomposition method. Reliability functions f(t), F(t), R(t), h(t) and their relationships – exponential distribution – Expected value and standard deviation of exponential distribution – Bath tub curve – reliability analysis of series parallel networks using exponential distribution – reliability measures MTTF, MTTR, MTBF.

[T1],[T2][No. of hrs. 10]

UNIT- III

Markov Modelling:

Markov chains – concept of stochastic transitional probability Matrix, Evaluation of limiting state Probabilities. – Markov processes one component repairable system – time dependent probability evaluation using Laplace transform approach – evaluation of limiting state probabilities using STPM – two component repairable models.

[T1][No. of hrs. 10]

UNIT-IV

Generation System Reliability Analysis:

Reliability model of a generation system– recursive relation for unit addition and removal – load modeling - Merging of generation load model – evaluation of transition rates for merged state model – cumulativeProbability, cumulative frequency of failure evaluation – LOLP, LOLE

[T1],[T2][No. of hrs. 10]

Text Books:

[T1] Reliability Evaluation of Engg. System – R. Billinton, R.N.Allan, Plenum Press, New York, reprinted in India by B.S.Publications, 2007.

[T2] Reliability Evaluation of Power systems – R. Billinton, R.N.Allan, Pitman Advance Publishing Program, New York, reprinted in India by B.S.Publications, 2007

Reference Books:

[R1] Sharles E. Ebeling An Introduction to Reliability and Maintainability Engineering, McGraw Hill,2006

[R2] E. Balagurusamy, "Reliability Engineering", Tata McGraw Hill PC, 2002.

ELECTRICAL MACHINES–III

Paper Code: ETEE-414	L	T/P	C
Paper: Electrical Machines–III	3	0	3

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: Providing sound knowledge about the principles of operation of various electrical machines, their constructional features, and their behavior and characteristics under various conditions of operation.

UNIT I:

Induction Generator: Torque-speed characteristics of an Induction machine under generation mode, Line/grid Connected Induction Generator: Operation and Limitations, Self-Excited Induction Generator: Process of self-excitation, conditions of self-excitation, critical capacitance curve, No load characteristics, load characteristics, frequency characteristics, Voltage characteristics improvement using additional terminal capacitors. Doubly fed Induction generator, Induction voltage regulator.

[T1, T2] [No. of Hrs. 10]

UNIT II:

Stepper Motors: Principle of operation, characteristics and analysis of variable reluctance, permanent magnet and hybrid stepper motors, torque equation, drive circuits and switching diagrams, Open-Loop Control of Stepper Motor, Microprocessor-Based Control of Stepper Motor.

Switched Reluctance Motors: Construction, principle of operation, torque production, modes of operation, drive circuits, microprocessor based control of SRM and sensor less control.

[T1, T2] [No. of Hrs. 10]

UNIT III:

Permanent Magnet Machines: Construction, working principle, torque equation, equivalent circuit, performance characteristics and applications of permanent magnet brushed DC motors (PMBDC), PMBLDC Motors, permanent magnet synchronous motors, reluctance motors, synchronous reluctance motors. DC and AC tacho generators.

[T1, T2][No. of Hrs. 10]

UNIT IV:

Special Electrical Machines: Construction, principle of operation, characteristics and analysis of fractional horse power universal motor, hysteresis motor. Construction, principle of operation of Linear Induction Motors and applications,

[T1, T2][No. of Hrs. 10]

Text Books:

[T1] Electric Machinery, A Fitzgerald, Charles Kingsley, Stephen Umans, Tata McGraw Hill Education, 6th edition, 2002

[T2] Special Electrical Machines by K Venkatratnam, Universities Press 2014

Reference Books:

[R1] Electric Machines Steady State, Transients, and Design with MATLAB, IonBoldea, Lucian Tutelea, CRC Press, Taylor & Francis, First edition, 2010.

[R2] Dynamic Simulations of Electric Machinery: Using MATLAB/SIMULINK, Chee-Mun Ong, Prentice Hall, 1st edition, 1997

[R3] Principles of Electrical Machines and Power Electronics, P.C. Sen, John Wiley, 2002.

[R4] Special Electrical Machines, E.G. Janardanan, PHI, 2014.

[R5] Generalized Theory of Electrical Machines, P.S. Bimbhra, Khanna Publishers.

[R6] Special Electrical Machines by K Venkatratnam, Universities Press 2014

ELECTRICAL ENERGY CONSERVATION

	L	T/P	C
Paper Code: ETEE-416			
Paper: Electrical Energy Conservation	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS : **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objectives: To impart knowledge on Electrical energy conservation, energy auditing and power quality, Principle and design of illumination systems and methods of heating and their performance.

UNIT I

Energy Conservation and Energy Policies

Energy policies of India and their development, Central and estate Policies on the consumption and wastage of energy, need of renewable energy in India, Energy efficiency, Energy accounting, monitoring and control, Electricity audit and related instruments, Energy consumption models, Specific Energy Consumption, ECO assessment and Evaluation methods Energy conservation schemes, Investment in energy saving equipments, subsidies and tax rebates, Development of Energy Management System.

[T1,R1][No. of Hrs. 10]

UNIT II

Energy Conservation in Electrical Installations

Electric loads of air conditioning and refrigeration, Energy conservation, Power consumption in compressors, Energy conservation measures, Electrolytic process, Electric heating, Furnace operation and scheduling, Transformer loading ,efficiency analysis, Feeder loss evaluation, Reactive Power, Power factor and its improvement, Capacitor sizing, Capacitor losses, location, placement and maintenance, Case studies.

[T1,R1][No. of Hrs. 10]

UNIT III

Energy Efficient Motors

Types and operating characteristics of electric motors, Energy efficient control and starting – Load matching, Selection of motors, Efficiency and load analysis, Energy efficiency, High efficiency motors, Industrial drives, Control schemes, Variable speed drives and Energy conservation schemes, Pumps and fans, Efficient control strategies, Over-sizing Case studies.

[T1,R1][No. of Hrs. 10]

UNIT IV

Energy Efficient Building / Green Building

Energy Conservation in Buildings Air conditioning, monitoring and control systems of energy efficient buildings. Principle of Energy efficient building design water heading system, photovoltaic systems and Energy conservation in lighting schemes, Energy efficient light sources, Domestic, commercial and industrial lighting, Lighting controls, Luminaries.

[T2,R5][No. of Hrs. 10]

Text Books:-

[T1] H. Partab, "Art and Science of Utilisation of Electrical Energy", Pritam.
[T2] S.C. Tripathy, " Electric Energy Utilization and Conservation", Tata McGraw Hill

Reference Books:

[R1] Bureau of Energy efficiency of India.
[R2] IEEE Bronze Book: IEEE Standard 739-1984 – Recommended Practice for Energy Conservation and Cost Effective Planning in Industrial Facilities, IEEE Publications, 1996.
[R3] A.P.W. Thumann: Plant Engineers and Managers Guide to Energy conservation, 7e, UNR, 1977.
[R4] W.C. Turner, Energy Management Handbook, 2e, Fairmont press, 1993.
[R5] UNESCAP – Guide Book on Promotion of Sustainable Energy Consumption.

POWER SYSTEM ANALYSIS & STABILITY

Paper Code: ETEL-402	**L**	**T/P**	**C**
Paper: Power System Analysis & Stability	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with detailed study of flow of power in the network, subsequent faults and the stability limits in the system.

UNIT- I
LOAD FLOW STUDIES
Type of buses , bus admittance method , load flow equation , GS method , NR method , Fast decoupled load flow.
[T1], [T2],[T3][No. of hrs. 10]

UNIT- II
FAULT CALCULATIONS
Symmetrical Components, symmetrical faults, unsymmetrical faults, Sequence networks for synchronous Machines, Transformers and Transmission Line, Sequence impedance.
[T1], [T2], [T3][No. of hrs. 10]

UNIT- III
POWER SYSTEM STABILITY
Introduction, swing equation, steady state stability, equal area criteria, critical clearing angle, point by point method, factors affecting Steady State and Transient Stability and Methods of Improvements.
[T1], [T2], [T3][No. of hrs. 10]

UNIT-IV
OPTIMAL POWER FLOW
Problem statement, solution of optimal power flow , gradient method , Newton method , Linear sensitivity analysis, LP methods- with real power variables only, LP method with ac power flow variable and detailed cost functions, security constraint optimal power flow
[T1], [T2], [T3][No. of hrs. 10]

Text Books:
[T1] J. J. Grainger & W.D. Stevenson ,Power System Analysis, TMH Publication,2006.
[T2] D.P. Kothari& I.J. Nagrath, Power System Engineering, TMH Publication, 2007.
[T3] P.Kundur, Power system stability and control, TMH Publication.

Reference Books:
[R1] Computer- Aided Power System Analysis, George L. Kusic, PHI Publication.
[R2] Hadi Saadat,Power System Analysis , PSA Publishing, 2010.
[R3] D.P. Kothari, I Nagrath, Modern Power System Analysis, TMH Publication.
[R4] L.P Singh, Advanced power system analysis and dynamics, New age International Ltd.
[R5] C. L. Wadhwa, Electrical Power Systems, New age International Ltd.

ELECTRICAL SYSTEM DESIGN

Paper Code: ETEE-418	**L**	**T/P**	**C**
Paper: Electrical System Design	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marls

Objective: The objective of the paper is to facilitate the student with detailed Design aspects of Electrical Systems.

UNIT-I

Design of D.C Machines: Design specifications – output equation – output coefficient – specific loadings – choice of speed and number of poles – calculation of D and L – Armature design – choice of type of winding – number of sots – number of conductors per slot – current density – cross sectional area – slot insulation – length of air gap – field winding design – field ampere turns – excitation voltage per coil – conductor cross section – height of pole – design of ventilating ducts – design of commutator and brushes – Carter's coefficient – real and apparent flux density.

[T1],[T2][No. of hrs. 10]

UNIT- II

Transformers: Design – single phase and three phase – output equation – specific magnetic loading – core design – single, stepped core – windings – number of turns – current density – area of cross section of conductors – types of coils – insulation – window area – window space factor – overall dimensions – cooling – design of cooling tank with tubes – design of distribution and power transformers – design of small transformers like 230V/6-0-6V. Heating, cooling and temperature rise calculation – Continuous, short time and intermittent rating.

[T1][T2][No. of hrs. 10]

UNIT-III

Design of Synchronous Machines: Specific loading – output equation – output coefficient – main dimensions – types of winding – design of field system – turbo alternator – main dimensions – stator design – rotor design – damper winding design – comparison of water wheel and turbo alternators, cooling of turbo alternator.

Design of three phase Induction motors: output equation – output coefficient – main dimensions – rotor bar currents.

[T1],[T2][No. of hrs. 10]

UNIT-IV

Estimate the quantity of materials required and draw the electrical wiring layout of (a) residential building (b) Multi-storied building using rising mains (c) factory with one number of small and high rating motor at LT ot HT supply and many number of connected loads with suitable starters/switches and control panels (d) Cinema hall design, layout and estimation of power supply arrangement for (1). A bulk Industrial consumer (2) An underground power supply (3) An Over head line to a rural consumer. Estimate and draw the layout of (1) indoor (2) outdoor 11KV transformer station with all accessories – single line diagram and physical layout Design and draw the typical earthing installation like (1) pipe earthing (2) Plate earthing (3) earth mat/grid.

[T1],[T2][No. of hrs. 10]

Text Books:

[T1] A.K Sawhney, "Electrical Machine Design", 4th Edition, Dhanpat Rai & Sons.
[T2] M.G Say, "Performance and Design of A.C Machines", CBS Publisher.

Reference Books:

[R1] Performance and Design of D.C Machine: Clayton
[R2] Design of Electrical Machines: V. N Mittal

EMBEDDED SYSTEMS

	L	T/P	C
Paper Code: ETIC-410			
Paper: Embedded Systems	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to enable a student to design an embedded system for specific tasks..

UNIT- I

Overview of Embedded Systems: Characteristics of Embedded Systems. Comparison of Embedded Systems with general purpose processors. General architecture and functioning of micro controllers. 8051 micro controllers.

PIC Microcontrollers: Architecture, Registers, memory interfacing, interrupts, instructions, programming and peripherals.

[T1][No. of hrs. 12]

UNIT- II

ARM Processors: Comparison of ARM architecture with PIC micro controller, ARM 7 Data Path, Registers, Memory Organization, Instruction set, Programming, Exception programming, Interrupt Handling, Thumb mode Architecture.

Bus structure: Time multiplexing, serial, parallel communication bus structure. Bus arbitration, DMA, PCI, AMBA, I2C and SPI Buses.

[T2][No. of hrs. 12]

UNIT- III

Embedded Software, Concept of Real Time Systems, Software Quality Measurement, Compilers for Embedded System

[T3][No. of hrs. 10]

UNIT-IV

RTOS: Embedded Operating Systems, Multi Tasking, Multi Threading, Real-time Operating Systems, RT-Linux introduction, RTOS kernel, Real-Time Scheduling.

[T3][No. of hrs. 10]

Text book:

[T1] Design with PIC Microcontrollers, John B. Peatman, Pearson Education Asia, 2002

[T2] ARM System Developer's Guide: Designing and Optimizing System Software, Andrew N. Sloss, Dominic Symes, Chris Wright, , Morgan Kaufman Publication, 2004.

[T3] Computers as components: Principles of Embedded Computing System Design, Wayne Wolf, Morgan Kaufman Publication, 2000

References Books:

[R1] The Design of Small-Scale embedded systems, Tim Wilmshurst, Palgrave2003

[R2] Embedded System Design, Marwedel ,Peter , Kluwer Publishers , 2004.

DATA COMMUNICATION & NETWORKS

	L	T/P	C
Paper Code: ETEC-420			
Paper: Data Communication & Networks	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives: The objective of the paper is to provide an introduction to the fundamental concepts on data communication and the design, deployment, and management of computer networks.

UNIT- I

Data Communications : Components, protocols and standards, Network and Protocol Architecture, Reference Model ISO-OSI, TCP/IP-Overview ,topology, transmission mode, digital signals, digital to digital encoding, digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission media-guided and unguided, transmission impairment, Performance, wavelength and Shannon capacity. Review of Error Detection and Correction codes.

Switching: Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and Datagram approach), message switching.

[T1, T2, R1, R4] [No. of Hours: 11]

UNIT- II

Data Link Layer: Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ. Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to –Point Access: PPP Point – to- Point Protocol, PPP Stack,

Medium Access Sub layer: Channel allocation problem, Controlled Access, Channelization, multiple access protocols, IEEE standard 802.3 & 802.11 for LANS and WLAN, high-speed LANs, Token ring, Token Bus, FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

[T1, T2,R1][No. of Hours: 11]

UNIT- III

Network Layer: Design issues, Routing algorithms, Congestion control algorithms,

Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full & Classless), Subnet, Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6.

[T1, T2,R1][No. of Hours: 11]

UNIT- IV

Transport Layer: Process to Process Delivery: UDP; TCP, congestion control and Quality of service.

Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP), file transfer (FTP), HTTP and WWW.

[T2, T1, R1, R4][No. of Hours: 11]

Text Books:

[T1] A. S. Tannenbum, D. Wetherall, "Computer Networks", Prentice Hall, Pearson, 5th Ed

[T2] Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw-Hill, 4th Ed

Reference Books:

[R1] Fred Halsall, "Computer Networks", Addison – Wesley Pub. Co. 1996.

[R2] Larry L, Peterson and Bruce S. Davie, "Computer Networks: A system Approach", Elsevier, 4th Ed

[R3] Tomasi, "Introduction To Data Communications & Networking", Pearson 7th impression 2011

[R4] William Stallings, "Data and Computer Communications", Prentice Hall, Imprint of Pearson, 9th Ed.

[R5] Zheng , "Network for Computer Scientists & Engineers", Oxford University Press

[R6] Data Communications and Networking: White, Cengage Learning

OBJECT ORIENTED PROGRAMMING USING C++

	L	T/P	C
Paper Code: ETCS-430			
Paper: Object Oriented Programming Using C++	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with the basics of Object Oriented Programming that are required for an engineering student.

UNIT- I

Object oriented programming concepts , Benefits of OOP, Applications of OOP , Introduction to C++, History of C++, Structure of C++, Difference between C and C++ , Basic data types, Derived data types, Symbolic constants., Dynamic initialization, Type modifiers, Type Casting, Operator and control statements, Input and Output statements in C++.Classes and objects, class specification, member function specification, scope resolution operator, Access qualifiers, Instance creation, Member functions. Function prototyping, Function components, Passing parameters, call by reference, Return by reference, Inline functions, Default arguments, Overloaded function.

[T1], [T2][No. of hrs. 12]

UNIT- II

Array of objects, pointers to objects, this pointer, Dynamic allocation operators, Dynamic objects.,Constructors, default constructor , Parameterized constructors , Constructor with dynamic allocation ,copy constructor , destructors, operator overloading, friend functions, overloading through friend functions , overloading the assignment operator, static members Objects , pointers and objects ,constant objects ,nested classes , local classes

[T1],[T2][No. of hrs. 11]

UNIT- III

Inheritance, Defining derived classes, Single inheritance, protected data with private inheritance, multiple inheritance, multi level inheritance, hierarchical inheritance, hybrid inheritance, multipath inheritance, Constructors in derived and base class, Abstract classes, virtual function and dynamic polymorphism, pure virtual functions, virtual destructor, Exception Handling, principle of Exception handling, Exception handling mechanism, multiple catch, Nested try, Rethrowing the exception.

[T1], [T2][No. of hrs. 12]

UNIT-IV

Streams in C++, Stream classes, Formatted and Unformatted data, manipulators, User defined manipulators, file streams, file pointer manipulation, file open and close, Templates, Template functions and Template classes.

[T1],[T2] [No. of hrs. 10]

Text Books:

[T1] S. B. Lippman & J. Lajoie, " C ++ Primer" 3rd Edition, Addison Wesley, 2000.
[T2] A.R.Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH.
[T2]. R. Lafore, "Object Oriented Programming using C++", BPB Publications.

References:

[R1] A.K. Sharma," Object Oriented Programming," Pearson Publication, 2014
[R2] Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
[R3] D . Parasons, "Object Oriented Programming with C++", BPB Publication.
[R4] Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication.
[R5[Yashwant Kanethkar, "Object Oriented Programming using C++", BPB Publications.
[R6[B. Stroustrup, "The C++ Programming language", Third edition, Pearson Education.

POWER PLANT INSTRUMENTATION

Paper Code: ETEE-426	**L**	**T/P**	**C**
Paper: Power Plant Instrumentation	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with detailed survey of methods of power generation, monitoring and control.

UNIT I

Power plant: Unit, overview, Types of boiler, Exhaust Gas Boilers and Incinerators, turbine generators, condensers, material handling systems. Comparison of thermal power plant, hydroelectric power plant, Nuclear power plant, solar power plant, Wind power plant.

[T1],[T2][No. of hrs. 10]

UNIT II

Boiler Instrumentation: Control and optimization, Combustion control, air to fuel ratio control, 3-element drum level control, steam temperature and pressure control, oxygen/CO2 in flue gases, furnace draft, boiler interlocks, sequence event recorder, supervisor control, data acquisition controls, burner management systems and controllers. Start-up and shut-down procedures, Boiler safety standard, Boiler inspection procedures. Boiler load calculation, boiler efficiency calculation.

[T1], [T2][No. of hrs. 10]

UNIT IIII

Turbine instrumentation and control, start-up and shut-down, thermal stress control, condition monitoring & power distribution instrumentation. Synchronous, Induction generators.

[T1], [T2][No. of hrs. 10]

UNIT IV

Hydroelectric power generation, regulation & monitoring of voltage & frequency of output power. Pollution & effluent monitoring & control. Energy Management, electrical sub-station controls

Power Generation using non-conventional energy sources viz. Wind Power, solar Power, Tidal Power, Plant safety & redundancies. Nuclear Power Generation & control Station. Diesel Generator Controls.

[T1], [T2][No. of hrs. 10]

Text Books:

[T1] E. L. Wakil, M. M. Power Plant Technology, McGraw Hill
[T2] Krishnaswamy/Ponni Bala, Power Plant Instrumentation, PHI Learning

Reference Books:

[R1] An Introduction to Reliability and Maintainability Engineering. Sharles E. Ebeling, McGraw Hill
[R2] E. Balagurusamy, "Reliability Engineering", Tata McGraw Hill PC, 1984.

INTELLIGENT AND SMART INSTRUMENTATION

Paper Code ETEE-428	**L**	**T/P**	**C**
Paper: Intelligent and Smart Instrumentation	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective:- To introduce modern devices and techniques used in instrumentations, especially in automation and critical applications.

UNIT-I

Recent Trends in Sensor Technologies: Introduction**;** Film sensors (Thick film sensors, Thin film sensors)**;** Semiconductor IC technology – standard methods; Microelectro-mechanical systems (Micro-machining, some application examples)**;** Nano-sensors**.** Bulk Micromachining. Micromachining Surface Micromachining. Other Micromachining Techniques. (LIGA Process) Micromilling. Micromachined Materials, Digital transducers.

[T1][T2][No. of Hrs. 12]

UNIT-II

Sensors:- Primary sensors**;** Excitation**;** Amplification; Filters**;** Converters; Compensation (Nonlinearty**:** look up table method**,** polygon interpolation, polynomial interpolation**,** cubic spline interpolation, Approximation & regression; Noise & interference**;** Response time**;** Drift; Cross-sensitivity)**;** Information Coding/ Processing**;** Data Communication**;** Standards for smart sensor interface.

[T1][T2][No. of Hrs. 11]

UNIT-III

VI and Data Acquisition: Introduction to virtual Instrumentation, VI programming using LabVIEW, Signal Conditioning, DAQ Hardware Configuration, DAQ Hardware, DAQ Software Architecture, DAQ Assistant, Channel and Task configuration, Selecting and Configuring a DAQ device, Serial interfacing - RS 232C, RS 422, RS 423, RS 485.

[T2][No. of Hrs. 12]

UNIT IV

Instrumentation Systems:- Types of Instrumentation systems, Intelligent Instrumentation, Component of Intelligent Instrumentation System, Concept of real time system and its industrial application, realization of real time system using microcontroller and typical applications.

[T2][No. of Hrs. 10]

Text Books:

[T1] Mathivanan, "PC Based Instrumentation",1st Ed., PHI
[T2] D.Patranabis, "sensors and Transducers" 2nd Edition, PHI

Reference Books:-

[R1] J.Jerome, "Virtual Instrumentation using LabVIEW", PHI
[R2] P.Rai Choudhury, MEMS and MOEMS Technology and Application,PHI
[R3] Barney, " Intelligent Instrumentation, Microprocessor Applications in measurement and Control", PHI
[R4] M.Bhuyan, "Intelligent Instrumentation: Principles and Applications", CRC Press

DIGITAL COMMUNICATION

Paper Code: ETEC-430	**L**	**T/P**	**C**
Paper: Digital Communication	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To enable the students

1. *To distinguish between analog and digital communication.*
2. *To understand the concept of digital communication system.*
3. *To understand the concept of random variables and random process.*
4. *To learn the digital modulation techniques.*

UNIT- I

Introduction to Digital Communication:

Line coding: NRZ, RZ, Manchester encoding, differential Manchester encoding, AMI coding, high density bipolar code, binary with n-zero substitution codes,

Review of sampling theorem, uniform and non- uniform quantization, companding, μ Law and A- law compressors, Concept and Analysis of PCM, DPCM, DM and ADM modulators and demodulators, M-ary waveforms, S/N ratio for all modulation, probability of error for PCM in AWGN Channel and other modulation techniques, Duo Binary pulse.

[T1, R2][No. of Hours: 11]

UNIT- II

Random Signal Theory:

Probability, Concept of Random variable (Stationary, Non stationary, WSS, SSS), Random process, CDF, PDF, Joint CDF, Joint PDF, marginal PDF, Mean, Moments, Central Moment Auto-correlation & Cross-correlation, covariance functions, ergodicity, power spectral density, Gaussian distribution, Uniform distribution, Rayleigh distribution, Binomial distribution, Poisson's distribution, Weiner distribution, Wiener-khinchin theorem, Central limit Theorem.

[T1, T2, R2][No. of Hours: 11]

UNIT- III

Designing of Receiver:

Analysis of digital receiver, Prediction Filter, Design and Property of Matched filter, Correlator Receiver, Orthogonal Signal, Gram-Schmidt Orthogonalization Procedure, Maximum likelihood receiver, Coherent receiver design, Inter Symbol Interference, Eye Pattern.

[T1, T2, R1, R2][No. of Hours: 11]

UNIT- IV

Digital modulation schemes:

Coherent Binary Schemes: ASK, FSK, PSK, QPSK, MSK, G-MSK. Coherent M-ary Schemes, Incoherent Schemes (DPSK and DEPSK), Calculation of average probability of error for different modulation schemes, Power spectra of digitally modulated signals, Performance comparison of different digital modulation schemes.

Review of 2 Latest Research Paper.

[T1, T2, R2][No. of Hours: 11]

Text Books:

[T1] Simon Haykin, "Communication Systems" John Wiley & Sons, Inc, 4th Edition.

[T2] Taub Schilling, "Principles of Communication Systems" TMH, 2nd Edition

Reference Books:

[R1] George Kennedy, "Communication System" TMH – 4th Edition

[R2] B. P. Lathi, "Modern Digital and Analog Communication System" Oxford University Press – 3rd Edition.

[R3] Digital Communications by John G.Proakis; McGraw Hill.

ELECTRICAL POWER QUALITY

Paper Code: ETEE-432	**L**	**T/P**	**C**
Paper: Electrical Power Quality	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with the importance of Power Quality and methods to improve it that are required in the power industry.

UNIT I

Introduction: Power Quality (PQ), PQ problems , Sags, Swells, Transients, Harmonics, Interruptions, Flicker, Voltage fluctuations, Notch. PQ Issues, Assessing PQ: Remedies -Customer side of meter, Utility side of the meter. Power quality monitoring – Monitoring considerations, Historical Perspective of PQ Measuring Instruments, PQ measurement equipment, Assessment of PQ measurement data, Application of intelligent systems, PQ monitoring standards.

[T1],[T2],[T3][No. of hrs. 10]

UNIT II

Voltage Sag Analysis: Voltage sag characteristics - Methodology for computation of voltage sag magnitude and occurrence — Accuracy of sag analysis — Duration & frequency of sags — Faults behind transformers — Effect of pre-fault voltage — Simple examples — Voltage dip problems, fast assessment methods for voltage sags in distribution systems.

[T1],[T2],[T3][No. of hrs. 10]

UNIT III

PQ Consideration in Industrial Power Systems: Adjustable speed drive (ASD) systems and applications — Sources of power system harmonics — Mitigation of harmonics — Characterization of voltage sags experienced by three-phase ASD systems — Types of sags and phase angle jumps — Effects of momentary voltage dips on the operation of induction and synchronous motors.

[T1],[T2],[T3][No. of hrs. 10]

UNIT IV

Harmonics: Harmonic distortion, Voltage versus current distortion, Harmonics versus Transients, Harmonic Indices, Harmonic sources from commercial loads, Harmonic sources from industrial loads, Locating Harmonic sources, System response characteristics, Effects of Harmonic distortion, Inter harmonics, Devices for controlling harmonic distortion.

[T1],[T2],[T3][No. of hrs. 10]

Text Books:

[T1] Math H.J. Bollen, Understanding Power Quality Problems, IEEE Press, 1999.
[T2] Roger C.Dugan, Mark F.McGranaghan, Surya Santoso, H.Wayne Beaty, Electrical Power Systems Quality, Second Edition, Tata McGraw-Hill Edition.
[T3] C.Sankaran, Power Quality, CRC Press, 2002.

References Books:

[R1] N. G. Hingonani, Gyugi, Understanding FACTS concepts, Technology of flexible AC Transmission systems, IEEE Press, 1999
[R2] T.J.E Milles – Reactive Power Control in electric systems, John Wiley & Sons 1982
[R3] J. Arrillaga, D.A Bradely and P.S. Bodger, Power System Harmonics. New York: Wiley,1985

NEURO & FUZZY SYSTEMS LAB

Paper Code: ETEE-452	**L**	**T/P**	**C**
Paper: Neuro & Fuzzy System Lab	**0**	**2**	**1**

List of Experiments:

1. Design a neural network using neural network toolbox, which identify the given data set.
   P= [0 1 2 3 4 5 6 7 8 9 10]; (Given input data)
   T= [0 1 2 3 4 3 2 1 2 3 4]; (Given output data)
2. Write a program to implement AND function using perception networks with bipolar inputs and outputs.
3. Write a program to implement AND function using ADALINE with bipolar inputs and outputs.
4. Implement a Back Propagation network for a given input pattern by a suitable MATLAB program. Perform 3 epochs of operation.
5. Write a program to construct and test auto-associative network for input vector using HEBB/Outer Product Rule.
6. Write a program to construct and test hetero associative network for binary inputs and targets using HEBB/Outer Product Rule
7. Consider the following fuzzy sets

$$A=\left\{\frac{1}{2}+\frac{0.4}{3}+\frac{0.6}{4}+\frac{0.3}{5}\right\}$$

$$B=\left\{\frac{0.3}{2}+\frac{0.2}{3}+\frac{0.6}{4}+\frac{0.5}{5}\right\}$$

   Calculate $A\cup B, A\cap B, \bar{A}, \bar{B}$, by using a MATLAB program.
8. Find the fuzzy relation using fuzzy max-min method for the following
   Using MATLAB program

$$\begin{bmatrix}0.2 & 0.3 & 0.4\\ 0.3 & 0.5 & 0.7\\ 1 & 0.8 & 0.6\end{bmatrix} \qquad S=\begin{bmatrix}0.1 & 1\\ 0.4 & 0.2\\ 0.3 & 0.7\end{bmatrix}$$

9. Using MATLAB programming to draw triangular and Gaussian membership function. Given x=0 to 10 with increment of 0.1. Triangular membership function is defined between [5 6 7] and Gaussian membership is defined between 2 and 4.
10. Using MATLAB program find the crisp lambda cut set relation for lambda=0.6.
    The fuzzy matrix is given by:

$$R=\begin{bmatrix}0.1 & 0.6 & 0.8 & 1\\ 1 & 0.7 & 0.4 & 0.2\\ 0 & 0.6 & 1 & 0.5\\ 0.1 & 0.5 & 1 & 0.9\end{bmatrix}$$

11. Write a Matlab program/GATOOL for maximizing/minimizing a function.
12. Design a Controller using Fuzzy /Neural Network/ANFIS Editor

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NOTE:- At least 8 Experiments out of the list must be done in the semester.

ELECTRICAL ENERGY CONSERVATION LAB

Paper Code: ETEE-454 (ELECTIVE)	**L**	**T/P**	**C**
Paper: Electrical Energy Conservation	**0**	**2**	**1**

List of Experiments:

1. Experimental study of solar PV pumping system.
2. Experimental study of solar lighting systems.
3. Efficiency evaluation of pumps/fans/compressors.
4. Power quality measurements of electrical appliances.
5. Design of measurement and control systems using virtual instrumentation software for motors, PV and lighting systems.
6. Life Cycle Analysis (LCA) using software.
7. Building energy analysis using software.

NOTE:- At least 8 Experiments from the syllabus must be done in the semester.

ELECTRICAL MACHINES-III LAB

Paper Code: ETEE-454 (ELECTIVE)	**L**	**T/P**	**C**
Paper: Electrical Machines–III Lab	**0**	**2**	**1**

List of Experiments:

EXP. 1 To plot following characteristics of self-excited Induction generator.

a) No load characteristics (terminal capacitance vs. induced voltage at no load and constant speed)
b) Load characteristics (terminal voltage vs. load current at fixed terminal capacitance & constant speed).
c) Frequency characteristics (frequency of generated voltage vs. resistive load current at constant speed)

EXP. 2 To plot load-voltage characteristics of doubly fed Induction generator.
EXP. 3 To Study Induction voltage regulator.
EXP. 4 To draw torque speed characteristic of variable reluctance motor.
EXP. 5 To control the Speed of stepper motor.
EXP. 6 To draw the torque speed characteristic of hysteresis motor.
EXP. 7 To draw the torque speed characteristic of universal motor.
EXP. 8 To draw the torque speed characteristic of repulsion motor.
EXP. 9 To draw the torque speed characteristic of linear induction motor.
EXP. 10 To draw the Torque speed characteristic of doubly fed induction motor.

Reference Books:

R1. Laboratory Operations for Rotating Electric Machinery and Transformer Technology ,Donald V. Richardson, Prentice Hall, 1980
R2. Electric Machinery Experiments: Laboratory Practices and Simulation Studies, Sailendra Nath Bhadra, Alpha Science International Ltd, 2013

NOTE:- At least 8 Experiments out of the list must be done in the semester.

EMBEDDED SYSTEMS LAB

Paper Code: ETEE-454 (ELECTIVE)	**L**	**T/P**	**C**
Paper: Embedded Systems Lab	**0**	**2**	**1**

List of Experiments:

1. Introduction to microcontroller and interfacing modules.
2. To interface the seven segment display with microcontroller 8051
3. To create a series of moving lights using PIC on LEDs.
4. To interface the stepper motor with microcontroller.
5. To display character 'A' on 8*8 LED Matrix.
6. Write an ALP to add 16 bits using ARM 7 Processor
7. Write an ALP for multiplying two 32 bit numbers using ARM Processor
8. Write an ALP to multiply two matrices using ARM processor

NOTE:- At least 8 Experiments out of the list must be done in the semester.