SCHEME OF EXAMINATION

and

SYLLABI

for

### Bachelor of Technology
Instrumentation and Control 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
THEORY PAPERS						
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

#NUES (Non University Examination System)

#NCC/NSS can be completed in any 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.

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

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

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
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

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#NCC/NSS can be completed in any 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.

BACHELOR OF TECHNOLOGY
(INSTRUMENTATION AND CONTROL ENGINEERING)
THIRD SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
ETMA 201		Applied Mathematics – III	3	1	4	
ETIC 203		Sensors and Transducers	3	1	4	M
ETEC 205		Switching Theory and Logic Design	3	1	4	M
ETEE 207		Circuits and Systems	3	1	4	
ETCS 209		Data Structures	3	1	4	
ETIC 211		Basics of Measurements	3	1	4	M
PRACTICAL/VIVA VOCE						
ETIC 251		Sensors and Transducers Lab	0	2	1	M
ETEC 253		Switching Theory and Logic Design Lab	0	2	1	M
ETCS 255		Data Structures Lab.	0	2	1	
ETEE 257		Circuit and Systems Lab*	0	2	1	
		NCC/NSS**#	-	-	-	
TOTAL			18	14	28	

M: Mandatory for award of degree

#NUES (Non University Examination System)

NCC/NSS can be completed in any 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/ETAP/Scilab/LabVIEW

BACHELOR OF TECHNOLOGY
(INSTRUMENTATION AND CONTROL ENGINEERING)
FOURTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
ETIC-204		Measurements and Instrumentation	3	0	3	M
ETEE-212		Control Systems	3	1	4	M
ETIC-206		Power Electronics	3	1	4	
ETIC-208		Theory and Applications of Integrated Circuits	3	1	4	M
ETIC-210		Electrical Machines	3	1	4	
ETIC-212		Communication Systems	3	1	4	
PRACTICAL/VIVA VOCE						
ETIC-252		Measurements and Instrumentation Lab	0	2	1	M
ETEE-260		Control Systems Lab	0	2	1	M
ETIC-256		Power Electronics Lab	0	2	1	
ETIC-258		Theory and Applications of Integrated Circuits Lab	0	2	1	M
ETIC-254		Electrical Machines Lab	0	2	1	
ETSS-250		NSS/NCC*	-	-	1	
TOTAL			**18**	**15**	**29**	

M: Mandatory for award of degree

NCC/NSS can be completed in any 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 Instrumentation Workshop (Lab needs to be developed) will be held after fourth semester. However, Viva-Voce will be conducted in the fifth semester (ETIC 359).

BACHELOR OF TECHNOLOGY
(INSTRUMENTATION AND CONTROL 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	
ETIC 303		Industrial Instrumentation	3	1	4	M
ETEC 305		Microprocessors and Microcontrollers	3	1	4	M
ETEC 309		Digital System Design	3	1	4	
ETIC 309		Object Oriented Programming using JAVA	3	0	3	
ETMS 311		Industrial Management	3	0	3	
PRACTICAL/VIVA VOCE						
ETHS-351		Communication Skills for Professionals Lab	0	2	1	
ETIC-353		Industrial Instrumentation Lab	0	2	1	M
ETEC-355		Microprocessors and Microcontrollers Lab	0	2	1	
ETEC-351		Digital System Design Lab	0	2	1	
ETIC-357		Object Oriented Programming using JAVA Lab	0	2	1	
ETIC-359		Industrial training / In-house Instrumentation Workshop#*	0	0	1	
TOTAL			**17**	**13**	**25**	

NUES

M: Mandatory for the award of degree.

*Viva-Voce for evaluation of Industrial Training / In-house Workshop will be conducted in this semester.

BACHELOR OF TECHNOLOGY
(INSTRUMENTATION AND CONTROL ENGINEERING)
SIXTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
ETIC-302		Pneumatic and Hydraulic Instrumentation	3	1	4	M
ETIC-304		Process Control	3	1	4	M
ETEC-306		Digital Signal Processing	3	1	4	
ETIC-308		Analytical Instrumentation	3	1	4	
ETIC-310		Modern Control Systems	3	1	4	M
ETEC-310		Data Communication and Networks	3	1	4	
PRACTICAL/VIVA VOCE						
ETIC-352		Pneumatic and Hydraulic Instrumentation Lab	0	2	1	M
ETIC-354		Process Control Lab	0	2	1	M
ETEC-356		*Digital Signal Processing Lab.	0	2	1	
ETIC-358		Modern Control Systems Lab	0	2	1	M
ETEC-358		Data Communication and Networks Lab	0	2	1	
TOTAL			18	16	29	

M: Mandatory for award of degree

#NUES (Non University Examination System)

Note: Minimum of 4-6 weeks of industrial training related to ICE will be held after 6th semester; however, viva-voce will be conducted in 7th Semester (ETIC 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/MATLAB/ETAP/Scilab/LabVIEW

BACHELOR OF TECHNOLOGY
(INSTRUMENTATION AND CONTROL ENGINEERING)
SEVENTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETIC-401		Digital Control Systems	3	1	4
ETIC-403		Biomedical Instrumentation	3	0	3
ETIC-405		Artificial Neural Networks	3	1	4
ELECTIVE (SELECT ANY TWO, ONE FROM EACH GROUP)					
#GROUP-A					
ETIC-407		Industrial Automation and Control	3	0	3
ETAT-403		Mechatronics	3	0	3
ETEE-401		Electrical Drives	3	0	3
ETIC-413		Instrumentation Diagnostics	3	0	3
ETMT-415		Process Modeling and Optimization Techniques	3	0	3
ETCS-425		Database Management Systems	3	0	3
ETEE-419		Renewable Energy Resources	3	0	3
ETIC-417		Selected Topics in ICE**	3	0	3
#GROUP-B					
ETIC-419		Engineering Materials	3	0	3
ETIC 421		Computer Architecture	3	0	3
ETIC 423		Software Engineering	3	0	3
ETIC 427		Operating Systems	3	0	3
ETHS 419		Sociology and Elements of Indian History for Engineers	3	0	3
PRACTICAL/VIVA VOCE					
ETIC 451		Digital Control Systems Lab	0	2	1
ETIC 453		Biomedical Instrumentation Lab	0	2	1
ETIC 455		Seminar (topic should be linked to industrial training/ Soft skills learnt)#	0	2	1
ETIC 461		Lab based on Electives Group A or B	0	2	1
ETIC 457		Minor Project+	0	6	3
ETIC 459		Industrial Training@	0	0	1
TOTAL			**15**	**16**	**25**

#NUES

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

**Syllabus may be revised after 2 years.

Imp:- Elective Paper will be floated if one-third of the total students opt for the same. It is advised that the decision about the elective subject for 8th Semester is done before 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.

+ 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.

BACHELOR OF TECHNOLOGY
(INSTRUMENTATION AND CONTROL ENGINEERING)
EIGHTH SEMESTER EXAMINATION

Code No.	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETHS-402		Human Values and Professional Ethics-II	1	0	1
ETIC-404		Intelligent Systems and Control	3	1	4
ETIC-406		Virtual Instrumentation	3	0	3
ELECTIVE (SELECT ANY TWO , ONE FROM EACH GROUP)					
GROUP-A					
ETIC-408		System Modelling and Simulation	3	0	3
ETIC-410		Embedded Systems	3	0	3
ETIT-418		Digital Image Processing	3	0	3
ETIC-414		VLSI Design	3	0	3
ETEC-408		Consumer Electronics	3	0	3
ETIC-418		Mobile Communication	3	0	3
GROUP-B					
ETMT-402		Robotics	3	0	3
ETEC-406		Ad hoc and Sensor Networks	3	0	3
ETCS-412		Object Oriented Software Engineering	3	0	3
ETIC-428		Computer Graphics and Multimedia	3	0	3
ETIC-430		Electromagnetic Field Theory	3	0	3
ETEC-404		Satellite Communication	3	0	3
PRACTICAL/VIVA VOCE					
ETIC-452		Intelligent Systems and Control Lab	0	2	1
ETIC-454		Virtual Instrumentation Lab	0	2	1
ETIC-458		Lab based on Elective Group A or B	0	2	1
ETIC-456		*Major Project	0	12	8
TOTAL			**13**	**19**	**25**

*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. The progress will be monitored through seminars and progress reports.
**Syllabus may be revised after 2 years.
NOTE:
1. The total number of the credits of the B.Tech. (ICE) Programme = 215.
2. Student shall be required to appear in examinations of all courses. However, to award the degree a student shall be required to earn the minimum of 200 credits including Mandatory papers (M).

FOR LATERAL ENTRY STUDENTS:
1. The total number of the credits of the B.Tech. (ICE) Programme = 161.
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 the minimum of 150 credits, including mandatory papers (M).

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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-I

Paper Code : ETMA-101   **L**   **T**   **C**
Paper : Applied Mathematics-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 facilitate the student with the basics of Applied Mathematics that are required for an engineering student.

UNIT- I

Successive differentiation: Leibnitz theorem for n^{th} derivative (without proof). Infinite series: Convergence and divergence of infinite series, positive terms infinite series, necessary condition, comparison test (Limit test), D'Alembert ratio test, Integral Test, Cauchy's root test, Raabe's test and Logarithmic test(without proof). Alternating series, Leibnitz test, conditional and absolutely convergence. Taylor's and Maclaurin's expansion(without proof) of function (e^x, log(1+x), cos x , sin x) with remainder terms ,Taylor's and Maclaurin's series, Error and approximation.

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

UNIT- II

Asymptotes to Cartesian curves. Radius of curvature and curve tracing for Cartesian, parametric and polar curves. Integration: integration using reduction formula for $\int_0^{\frac{\pi}{2}} sin^n\theta \, d\theta$, $\int_0^{\frac{\pi}{2}} cos^n\theta d\theta$, $\int_0^{\frac{\pi}{2}} sin^n\theta cos^m\theta d\theta$. Application of integration : Area under the curve, length of the curve, volumes and surface area of solids of revolution about axis only .Gamma and Beta functions.

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

UNIT- III

Matrices: Orthogonal matrix, Hermitian matrix, Skew-Hermitian matrix and Unitary matrix. Inverse of matrix by Gauss-Jordan Method (without proof). Rank of matrix by echelon and Normal (canonical) form. Linear dependence and linear independence of vectors. Consistency and inconsistency of linear system of homogeneous and non homogeneous equations . Eigen values and Eigen vectors. Properties of Eigen values (without proof). Cayley-Hamilton theorem (without proof). Diagonlization of matrix. Quadratic form, reduction of quadratic form to canonical form.

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

UNIT-IV

Ordinary differential equations: First order linear differential equations, Leibnitz and Bernaulli's equation. Exact differential equations , Equations reducible to exact differential equations. Linear differential equation of higher order with constant coefficients, Homogeneous and non homogeneous differential equations reducible to linear differential equations with constant coefficients. Method of variation of parameters. Bessel's and Legendre's equations (without series solutions), Bessel's and Legendre's functions and their properties.

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

Text:
[T1]   B. S. Grewal,"Higher Engineering Mathematics" Khanna Publications.
[T2].   R. K. Jain and S.R.K. Iyengar,"Advanced Engineering Mathematics "Narosa Publications.

References:
[R1]   E. kresyzig," Advance Engineering Mathematics", Wiley publications
[R2]   G.Hadley, " Linear Algebra" Narosa Publication
[R3]   N.M. Kapoor, " A Text Book of Differential Equations", Pitambar publication.
[R4]   Wylie R, " Advance Engineering mathematics" , McGraw-Hill
[R5]   Schaum's Outline on Linear Algebra, Tata McGraw-Hill
[R6]   Polking and Arnold, " Ordinary Differential Equation using MatLab" Pearson.

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<u>**APPLIED PHYSICS – I**</u>

		L	T	C
Paper Code: ETPH – 103		2	1	3
Paper: Applied Physics – I				

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 Applied Physics aspects that are required for his understanding of basic physics.

UNIT I
Interference: Introduction, Interference due to division of wave front: Fresnel's Biprism, Interference due to division of amplitude: wedge shaped film, Newton's rings.

Diffraction: Introduction, Difference between Fresnel and Fraunhofer diffraction, Single slit diffraction, Transmission diffraction grating, Absent spectra.

[T1], [T2](No. of Hrs. 8)

UNIT II
Polarization: Introduction, Uniaxial crystals, Double refraction, Nicol prism, Quarter and half wave plates, Theory of production of plane, circularly and elliptically polarized lights, Specific rotation, Laurents half shade polarimeter.

Laser: Spontaneous and stimulated emissions, Einstein's coefficients, Laser and its principle, He-Ne laser.

Fibre optics: Introduction,   Single mode fibre, Step index and graded index multimode fibres, Acceptance angle and numerical aperture.

[T1], [T2](No. of Hrs. 8)

UNIT III
Theory of Relativity: Introduction, Frame of reference, Galilean transformation, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Mass energy relation

Ultrasonics: Introduction, Production of ultrasonics by magnetostriction and Piezoelectric methods, Applications.

[T1], [T2](No. of Hrs. 8)

UNIT IV
Nuclear Physics: Introduction, Radioactivity, Alpha decay, Beta decay, Gamma decay, Q value, Threshold energy, Nuclear reactions, Nuclear fission: Liquid drop model, Nuclear fusion, Particle accelerators: Linear accelerator, Cyclotron, Radiation detectors: Ionization chamber, Geiger Mueller Counter.

[T1](No. of Hrs. 8)

Text Books:
[T1].   Arthur Beiser, 'Concepts of Modern Physics', [McGraw-Hill], 6th Edition 2009
[T2].   A. S.Vasudeva, 'Modern Engineering Physics', S. Chand, 6th Edition, 2013.

Reference Books
[R1].   A. Ghatak 'Optics' , TMH, 5th Edition, 2013
[R2].   G. Aruldhas 'Engineering Physics' PHI 1st Edition, 2010.
[R3].   Fundamentals of Optics : Jenkins and White , Latest Edition
[R4].   C. Kittle, "Mechanics", Berkeley Physics Course, Vol.- I.
[R5].   Feynman " The Feynman lectures on Physics Pearson Volume 3 Millennium Edition, 2013
[R6].   Uma Mukhrji 'Engineering Physics' Narosa, 3rd Edition, 2010.
[R7].   H.K. Malik & A. K. Singh 'Engineering Physics' [McGraw-Hill], 1st Edition, 2009.

MANUFACTURING PROCESSES

		L	T	C
Paper Code: ETME-105				
Paper: Manufacturing Processes		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 basic Manufacturing processes.

Unit-I

Introduction: Introduction of Manufacturing processes and their classification, Basic Metals & Alloys : Properties and Applications. Properties of Materials: Strength, elasticity, stiffness, malleability, ductility, brittleness, toughness and hardness. Ferrous Materials: Carbon steels, its classification based on % carbon as low, mild, medium & high carbon steel, its properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching & tempering and case- hardening.

Non-Ferrous metals & alloys: Properties and uses of various non-ferrous metals & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin.

Casting Processes:

Principles of metal casting, Pattern materials, types and allowance, composition and properties of moulding sand, foundry tools, concept of cores and core print, elements of gating system, description and operation of cupola, special casting processes e.g. die-casting; permanent mould casting; centrifugal casting; investment casting; casting defects.

$(T_1, T_2, R_1, R_2, R_3, R_4, R_5)$ **[No. of Hrs.12]**

UNIT-II

Smithy and Forging:

Hot working and cold working, Forging tools and equipments, Forging operations, Forging types: Smith forging, Drop forging, Press forging, Machine forging; Forging defects; Extrusion, wire drawing, swaging.

BENCH WORK AND FITTING:

Fitting shop tools, operation: Fitting; sawing; chipping; thread cutting (with taps and dies);
Marking and marking tools.

$(T_1, T_2, R_1, R_2, R_3, R_4, R_5)$ **[No. of Hrs. 12]**

Unit-III

Metal joining: Welding principles, classification of welding techniques, Oxyacetylene Gas welding, equipment and field of application, Arc-welding, metal arc, Carbon arc welding, submerged arc welding and atomic hydrogen welding, TIG and MIG welding, Electric resistance welding: spot; seam; flash; butt and percussion welding, Flux: composition; properties and function, Electrodes, Types of joints and edge preparation, Brazing and soldering, welding defects.

$(T_1, T_2, R_1, R_2, R_3, R_4, R_5)$**[No. of Hrs. 12]**

Unit-IV

Sheet Metal Work:

Tools and equipments used in sheet metal work, metals used for sheets, standard specification for sheets, Types of sheet metal operations: shearing, drawing, bending. Other operations like spinning, stretch forming, embossing and coining.

Powder Metallurgy: Introduction of powder metallurgy process: powder production, blending, compaction, sintering.

$(T_1, T_2, R_1, R_2, R_3, R_4, R_5)$**[No. of Hrs. 12]**

Text Books:
[T1]. Manufacturing Process by Raghuvanshi.(Dhanpat Rai and Co.)
[T2]. Manufacturing Technology by P.N.Rao (TMH publications)

Reference Books:
[R1]. Workshop Technology by Hazra-Chowdhary (Media Promoters and Publishers Pvt. Ltd.)
[R2]. Production Engineering by R.K.Jain (Khanna Publishers)
[R3]. Workshop Technology by Chapman (Elsevier Butterworth-Heinemann)
[R4]. Fundamentals of Modern Manufacturing by Mikell P. Groover (Wiley India Edition)
[R5]. Manufacturing Processes for Engineering Materials by Kalpakjian and Schmid (Pearson)

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ELECTRICAL TECHNOLOGY

		L	**T**	**C**
Paper Code: ETEE-107				
Paper : Electrical Technology		3	0	3

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

1. This is first introductory course in electrical technology to the students of all the branches of engineering in first year.
2. 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.
3. 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 exposure to the students in respects of the basics of different aspects of electrical engineering with emphasis on constructional, measurement and applications of various types of instruments and equipments.

UNIT – I: DC Circuits
Introduction of Circuit parameters and energy sources (Dependent and Independent), Mesh and Nodal Analysis, Superposition, Thevenin's, Norton's, Reciprocity, Maximum Power Transfer and Millman's Theorems, Star-Delta Transformation and their Applications to the Analysis of DC circuits.

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

UNIT – II: A.C.Circuits
A.C. Fundamentals, Phasor representation, Steady State Response of Series and Parallel R-L, R-C and R-L-C circuits using j-notation, Series and Parallel resonance of RLC Circuits, Quality factor, Bandwidth, Complex Power, Introduction to balanced 3-phase circuits with Star- Delta Connections.

[T1],[T2][No. of Hrs. 14]

UNIT – III: Measuring Instruments
Basics of measuring instruments and their types ,Working principles and applications of moving coil, moving iron (ammeter & voltmeter) and Extension of their ranges, dynamometer- type Wattmeter , induction-type Energy Meter , Two-wattmeter method for the measurement of power in three phase circuits, Introduction to digital voltmeter, digital Multimeter and Electronic Energy Meter.

[T1],[T2],[R2][No. of Hrs. 11]

UNIT – IV: Transformer and Rotating Machines
Fundamentals of Magnetic Circuits, Hysteresis and Eddy current losses, working principle, equivalent circuit, efficiency and voltage regulation of single phase transformer and its applications. Introduction to DC and Induction motors (both three phase and single phase), Stepper Motor and Permanent Magnet Brushless DC Motor.

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

Text Books:
[T1]   S.N Singh, "Basic Electrical Engineering" PHI India Ed 2012
[T2]   Chakrabarti, Chanda,Nath "Basic Electrical Engineering" TMH India", Ed 2012.
Reference Books:
[R1]   William Hayt "Engineering Circuit Analysis" TMH India Ed 2012
[R2]   Giorgio Rizzoni "Principles and Application of Electrical Engineering" Fifth Edition TMH India.

HUMAN VALUES & PROFESSIONAL ETHICS

Paper Code: ETHS-109   **L**   **T**   **C**
Paper : Human Values & Professional Ethics   **1**   **1**   **1**

Non-University Examination Scheme (NUES)
Note: There will be no End-Term External University Examination. Marks are to be given on the basis of two internal sessional test of 30 marks each and one final Viva-voce project report Examination of 40 marks.

Objectives:
This introductory course input is intended
  a. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
  b. To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on the correct understanding of the Human reality and the rest of the Existence. Such a Holistic perspective forms the basis of value-based living in a natural way.
  c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

UNIT-1: Introduction to Value Education   **No. of lectures: 03+1**
1. Understanding the need, basic guidelines, content and process for value education.
2. Basic Human Aspirations: Prosperity and happiness
3. Methods to fulfil the human aspirations – understanding and living in harmony at various levels.
4. Practice Session – 1.   **[T1], [R1], [R4]**

UNIT-2: Harmony in the Human Being   **No. of lectures: 05+1**
1. Co-existence of the sentient "I" and the material body – understanding their needs – Happiness & Conveniences.
2. Understanding the Harmony of "I" with the body – Correct appraisal of physical needs and the meaning of prosperity.
3. Programme to ensure harmony of "I" and Body-Mental and Physical health and happiness.
4. Harmony in family and society: Understanding Human-human relationship in terms of mutual trust and respect.
5. Understanding society and nation as extensions of family and society respectively.
6. Practice Session – 02   **[T2], [R1], [R2]**

UNIT-3: Basics of Professional Ethics   **No. of lectures: 04+1**
1. **Ethical Human Conduct** – based on acceptance of basic human values.
2. **Humanistic Constitution and universal human order** – skills, sincerity and fidelity.
3. **To identify the scope and characteristics of people** – friendly and eco-friendly production system, Technologies and management systems.
4. Practice Session – 03.

         [T1],[R4]

UNIT-4: Professional Ethics in practice   **No. of lectures: 04+1**
 1. **Profession and Professionalism** – Professional Accountability, Roles of a professional, Ethics and image of profession.
 2. **Engineering Profession and Ethics -** Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world.
 3. **Professional Responsibilities –** Collegiality, Loyalty, Confidentiality, Conflict of Interest, Whistle Blowing
 4. Practice Session – 04

         [T1], [T2], [T3], [R3]

Text Books:
[T1]   Professional Ethics, R. Subramanian, Oxford University Press.
[T2]   Professional Ethics & Human Values: S.B. Srivasthva, SciTech Publications (India) Pvt. Ltd. New Delhi.
[T3]   Professional Ethics & Human Values: Prof. D.R. Kiran, TATA Mc Graw Hill Education.

References:

[R1]   Success Secrets for Engineering Students: Prof. K.V. SubbaRaju, Ph.D., Published by SMARTstudent.
[R2]   Ethics in Engineering Mike W. Martin, Department of Philosophy, Chapman University and Roland Schinzinger, School of Engineering, University of California, Irvine.
[R3]   Human Values: A. N. Tripathy (2003, New Age International Publishers)
[R4]   Value Education website, http.//www.universalhumanvalues.info[16]
[R5]   Fundamentals of Ethics, Edmond G. Seebauer & Robert L. Barry, Oxford University Press.
[R6]   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.

*PRACTICAL SESSIONS OF 14 HOME ASSIGNMENTS will be followed by the students pursuing this paper. (Ref: Professional Ethics & Human Values: S.B. Srivastava, SciTech Publications (India) Pvt. Ltd. New Delhi.)

CONTENT OF PRACTICE SESSION

Module 1: Course Introduction – Needs, Basic Guidelines, Content and Process of Value Education

PS-1: Imagine yourself in detail. What are the goals of your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcoming in your life? Observe and analyze them.

Expected Outcome:
The students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

PS-2: Now a days there is lot of voice about techno-genie maladies such as energy and natural resource depletion, environmental Pollution, Global Warming, Ozone depletion, Deforestation, etc. – all these scenes are man-made problems threatening the survival of life on the earth – what is root cause of these maladies and what is the way out in your opinion?
On the other hand there is rapidly growing danger because of nuclear proliferation, arm race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression and suicidal attempts, etc - what do you think the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

Expected Outcome:
The students start finding out that technical education with study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all the problems and the sustained solution could emerge only through understanding of human values and value based living. Any solutions brought out through fear, temptation or dogma will not be sustainable.

PS-3: 1.Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of following:
a)What is naturally acceptable to you in relationship – feeling of respect or disrespect?
b)What is naturally acceptable to you - to nurture or to exploit others? Is your living the same as your natural acceptance or different?
2.Out of three basic requirements for fulfillment of your aspirations, right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time and efforts you devote for each in your daily routine.

Expected Outcome:
1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify the right or wrong, and referring to any external source life text or instrument or any other person cannot enable them to verify with authenticity, it will only develop assumptions.
2. The students are able to see that their practice in living is not in harmony with their natural acceptance at most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.

3. The students are able to see that lack of right understanding leading to lack of relationship is the

major cause of the problems in their family and the lack of physical facilities in most of the cases; while they have given higher priority to earning of physical facilities in their life ignoring relationship and not being aware that right understanding is the most important requirement for any human being.

Module 2: Understanding harmony in human being – Harmony in myself!

PS-4: Prepare the list of your desires. Observe whether the desires. Observe whether the desires are related with self "I" or body. If it appears to be related with the both, see which part of it is related to self "I" and which part is related to body.

Expected Outcome:
The students are able to see that they can enlist their desires and the desires are not vague, also they are able to relate their desires to "I" and "body" distinctly. If, any desire appears to be related with both, they are able to see that feeling is related to "I" while the physical facility is related to the body. They are also able to see that "I" and "body" are two realities, and most of their desires are related to "I" and not with the "Body"; while their efforts are mostly connected on the fulfillment of the need of the body assuming that it will meet the needs of "I" too.

PS-5:
1. {A}.   Observe that any physical facilities you use, follows the given sequence with time; Necessary and tasteful – unnecessary & tasteful – unnecessary & tasteless.
    {B}.   In contrast, observe that any feelings in you are either naturally acceptable or not acceptable at all. If, naturally acceptable, you want it continuously and if not acceptable, you do not want it at any moment.
2.   List Down all your activities. Observe whether the activity is of "I" or of "body" or with the participation both "I" and "body".
3.   Observe the activities with "I". Identify the object of your attention for different moments (over a period say 5 to 10 minute) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

Expected Outcome:
1.   The students are able to see that all physical facilities they use are required for limited time in a limited quantity. Also they are able to see that cause of feeling, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable eve for a single moment.
2.   The students are able to see that activities like understanding, desires, thoughts and selection are the activities of "I" only; the activities like breathing, palpitation of different parts of the body are fully the activities of the body. With the acceptance of "I", while activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs, etc. are such activities that require the participation of both "I" and "body"
3.   The students become aware of their activities of "I" and start finding their focus of attention at different moments. Also they are able see that most of their desires are coming from outsides (through preconditioning or sensation) and are not based on their natural acceptance.

PS-6:   1.Chalk out the program to ensure that you are responsible to your body – for the nurturing, protection and right utilization of the body.
2.Find out the plants and shrubs growing in and your campus. Find out their use for curing different diseases.

Expected Outcome:
The students are able to list down activities related to a proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing the different diseases.

Module 3: Understanding harmony in the family and society - Harmony in Human – Human relationship

PS-7: Form small groups in the class and in that group initiate the dialogue and ask the eight questions related to trust. The eight questions are-

S.No.	Intention (Natural Acceptance)	S.No.	Competence
1.a.	Do I want to make myself happy?	**1.b.**	Am I liable to make myself always Happy?
2.a.	Do I want to make the other happy?	**2.b.**	Am I liable to make the other always happy?
3.a.	Does the other want to make him happy?	**3.b.**	Is the other able to make him always happy?
4.a.	Does the other want to make me happy? What is answer?	**4.b.**	Is the other able to make me always happy? What is answer?

Let each student answer the question for himself and everyone else. Discuss the difference between intention and competence.

Expected Outcome:
The students are able to see that the first four questions are related to our natural acceptance i.e. intention and the next four to our competence. They are able to note that the intention is always correct, only competence is lacking. We generally evaluate ourselves on the basis of our intention and other on the basis of their competence. We seldom look at our competence and other's intention as a result we conclude that I am a good person and other is a bad person.

PS-8:
1. Observe that on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasion you are disrespecting by way of under evaluation, over evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

Expected Outcome:
The students are able to see that respect is right evaluation and only right evaluation leads to fulfilment of relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect) like gender biasness, generation gap, caste conflicts, class struggle, and domination through poor play, communal violence, and clash of isms and so on so forth.
All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

PS-9:
1. Write a note in the form of a story, poem, skit, essay, narration, dialogue, to educate a child.
   Evaluate it in a group.
2. Develop three chapters to introduce "social science", its needs, scope and content in the primary education of children.

Expected Outcome:
The students are able to use their creativity for educating children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

Module 4: Understanding harmony in the nature and existence – Whole existence as Co – existence -

PS-10: Prepare the list of units (things) around you. Classify them into four orders. Observe and explain the mutual fulfilment of each unit with other orders.

Expected Outcome:
The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them. They are also able to see that human beings are not fulfilling to their orders today

and need to take appropriate steps to ensure right participation (in term of nurturing, protection and right utilization) in the nature.

PS-11:
1. Make a chart for the whole existence. List down different courses of studies and relate them to different or levels in the existence.
2. Choose any one subject being taught today. Evaluate and suggest suitable modifications to make it appropriate and holistic.

Expected Outcome:
The students are confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are liable to make out how these courses can be made appropriate and holistic.

Module 5: Implication of the above Holistic Understanding of Harmony at all Levels of Existence.

PS-12: Choose any two current problem of different kind in the society and suggest how they can be solved on the basis of the natural acceptance of human values. Suggest the steps you will take in present conditions.

Expected Outcome:
The students are liable to present sustainable solutions to the problem in society and nature. They are also able to see that these solutions are practicable and draw road maps to achieve them.

PS-13:
1. Suggest ways in which you can use your knowledge of engineering / technology / management for universal human order from your family to world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

Expected Outcome:
The students are able to grasp the right utilization of their knowledge in their streams of technology / engineering / management to ensure mutually enriching and recyclable production systems.

PS-14: The course is going to be over now. Evaluate your state before and after the course in terms of-
- Thoughts
- Behavior
- Work and
- Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

Expected Outcome:
The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for happy and prosperous society.

FUNDAMENTALS OF COMPUTING

		L	**T**	**C**
Paper Code: ETCS-111				
Paper: Fundamentals of Computing		**2**	**0**	**2**

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 10 marks

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Objective: The objective of the paper is to facilitate the student with applied working knowledge of computers. This is the first course of computing and does not assume any pre-requisite.

UNIT-I
Five Component Model of a Computer, System and Application software (introduction) storage devices , primary (RAM, ROM, PROM, EPROM, cache) Memory and secondary (magnetic tape, hard disk, Compact disks) memory , peripheral devices , printers.

[T1], [T2][8 Hours]

UNIT-II
Operating Systems: DOS Internal, External commands, Windows (2000 and NT) , Overview of architecture of Windows, tools and system utilities including registry , partitioning of hard disk , Overview of Linux architecture , File system , file and permissions , concept of user and group , installation of rpm and deb based packages.

[T1], [T2][8 Hours]

UNIT-III
Basics of programming through flow chart , Networking Basics - Uses of a network and Common types of networks , Network topologies and protocols , Network media and hardware , Overview of Database Management System.

[T1],[T2],[R1][8 Hours]

UNIT-IV
Libre / Open Office Writer : Editing and Reviewing, Drawing, Tables, Graphs, Templates
Libre / Open Office Calc : Worksheet Management , Formulas, Functions, Charts
Libre / Open Office Impress: designing powerful power-point presentation

[R2][R3] [8 Hours]

Text:
[T1]   Peter Norton, Introduction to computers, Sixth Edition Tata McGraw Hill (2007).
[T2]   Andrews Jean, A+Guide to Managing & Maintaining Your PC, Cengage Publication 6/e
References:
[R1]   Anita Goel, Computer Fundamentals, Pearson Education.
[R2]   Joiner Associates Staff, Flowcharts: Plain & Simple: Learning & Application Guide , Oriel Inc
[R3]   http://www.openoffice.org/why/
[R4]   http://www.libreoffice.org/get-help/documentation/

APPLIED CHEMISTRY

Paper Code: ETCH – 113   **L**   **T**   **C**
Paper : Applied Chemistry   **2**   **1**   **3**

INSTRUCTIONS TO PAPER SETTER: **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. Each 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 Applied Chemistry aspects that are required for his understanding of basic chemistry

UNIT I: FUELS

Definition, Classification & Calorific value of fuels (gross and net), Dulong's formula **(Numericals)**, Determination of calorific value of fuels using bomb's calorimeter **(Numericals)**, Determination of calorific value of fuels using Boy's Gas Calorimeter **(Numericals),** Cracking – Thermal & catalytic cracking, Octane & Cetane numbers with their significance. High & Low temperature carbonization, Manufacture of coke (Otto – Hoffmann oven) Proximate and ultimate analysis of Coal **(Numericals)** Combustion of fuels **(Numericals)**.

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

UNIT II: THE PHASE RULE & CATALYSIS

Definition of various terms, Gibb's Phase rule & its derivation, Application of phase rule to One component system- The water system, Application of phase rule to Two component system- The Lead-Silver system (Pattinson's process).

Catalyst and its characteristics, Types of catalysts, Concept of promoters, inhibitors and poisons. Theories of catalysis: Intermediate compound formation theory, adsorption or contact theory. Application of catalysts for industrially important processes Enzyme catalysis: Characteristics, Kinetics & Mechanism of enzyme catalysed reaction (Michaelis-Menten equation), Acid-Base catalysis: Types, Kinetics & Mechanism, Catalysis by metals salts (Wilkinson's Catalyst), Auto-catalysis, Heterogeneous catalysis (Langmuir-Hinshelwood mechanism.

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

UNIT III: WATER

Introduction and specifications of water , Hardness and its determination by EDTA method **(Numericals)**, Alkalinity and its determination **(Numericals)**, Reverse Osmosis, Electrodialysis, Disinfection by break-point chlorination. Boiler feed water, boiler problems– scale, sludge, priming & foaming: causes & prevention, Boiler problems– caustic embrittlement & corrosion: causes & prevention, Water Softening by Internal Treatment: carbonate & phosphate conditioning, colloidal conditioning & calgon treatment Water Softening by External Treatment: Lime-Soda Process **(Numericals)** Zeolite & Ion-Exchange Process.

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

UNIT IV: CORROSION & ITS CONTROL

Causes, effects & consequences; Chemical or Dry corrosion & its mechanism (Pilling-Bedworth Rule) Electrochemial or Wet Corrosion & Its mechanism, Rusting of Iron Passivity, Galvanic series, Galvanic Corrosion, Soil Corrosion Pitting Corrosion, Concentration Cell or Differential Aeration Corrosion, Stress Corrosion. Factors Influencing Corrosion: Nature of metal and nature of corroding environment; Protective measures: Galvanization, Tinning Cathodic Protection, Sacrificial Anodic protection, Electroplating, Electroless plating, Prevention of Corrosion by Material selection & Design.

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

 Text Books:
[T1]   P. C. Jain & Monika Jain, *Engineering Chemistry*, Latest edition, Dhanpat Rai Publishing Co., 2002.
[T2]   P. Mathew, *Advance Chemistry*, 1 & 2 Combined Editions, Cambridge University Press, 2003.

Reference Books:
[R1]   P. W. Atkins and J. De Paula, *Atkins' Physical Chemistry*, Oxford, 2010.
[R2]   T. Engel and P. Reid, *Physical Chemistry*, Pearson Education, 2013.
[R3]   K. Qanungo, *Engineering Chemistry*, PHI Learning Private Limited, New Delhi, 2009.
[R4]   O. G. Palanna, *Engineering Chemistry*, Tata McGraw Hill Education Private Limited, 2012.
[R5]   D. A. Jones, *Principles and Prevention of Corrosion*, Prentice Hall, 2nd Edition, 1996.
[R6]   H. K. Chopra and A. Parmar, *Engineering Chemistry- A Text Book*, Narosa Publishing House, 2012.
[R7]   S. Chawla, *Engineering Chemistry*-All India Edition, Dhanpat Rai & Co., 2003.
[R8]   R. Gadi, S. Rattan and S. Mohapatra, *Environmental Studies*, S.K. Kataria & Sons, 2nd Edition 2009.

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

APPLIED PHYSICS LAB – I

Paper Code: ETPH-151   **P**   **C**
Paper : Applied Physics Lab – I   **2**   **1**

LIST OF EXPERIMENTS
1. To determine the wavelength of sodium light by Newton's Rings.
2. To determine the wavelength of sodium light by Fresnel's biprism.
3. To determine the wavelength of sodium light using diffraction grating.
4. To determine the refractive index of a prism using spectrometer.
5. To determine the dispersive power of prism using spectrometer and mercury source.
6. To determine the specific rotation of cane sugar solution with the help of half shade polarimeter.
7. To find the wavelength of He-Ne laser using transmission diffraction grating.
8. To determine the numeral aperture (NA) of an optical fibre.
9. To plot a graph between the distance of the knife-edge from the center of the gravity and the time period of bar pendulum. From the graph, find
   (a) The acceleration due to gravity
   (b) The radius of gyration and the moment of inertia of the bar about an axis.
10. To determine the velocity of ultrasound waves using an ultrasonic spectrometer in a given liquid (Kerosene Oil).
11. To verify inverse square law.
12. To determine Planck's constant.

Text Books:
[T1] C. L. Arora 'B. Sc. Practical Physics' S. Chand

Note: Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.

ELECTRICAL TECHNOLOGY LAB

Paper Code: ETEE 153   **L**   **P**   **C**
Paper: Electrical Technology Lab   **0**   **2**   **1**

LIST OF EXPERIMENTS

1. To Design the circuit for a given load and selection of its various Components and instruments from the safety point of view
2. Study and applications of CRO for measurement of voltage, frequency and phase of signals.
3. Connection of lamp by
   (1)Single Switch Method.(2) Two-way Switch Method.
   OR
   Performance comparison of of fluorescent Tube & CFL Lamp.
4. To Verify Thevenin's & Norton's Theorem
   OR
   To Verify Superposition &Reciprocity Theorem.
   OR
   To Verify Maximum Power Transfer Theorem.
5. To Measure Power & Power Factor in a Single-Phase A.C Circuit using Three Ammeters or three Voltmeters.
6. To Measure Power & Power Factor in a Balanced Three Phase Circuit using Two Single Phase Wattcmeters.
7. To study of Resonance in a series R-L-C or Parallel R-L-C Circuits.
8. To perform open circuit and short circuit test on 1-phase transformer.
9. Starting, Reversing and speed control of DC shunt Motor
10. Starting, Reversing and speed control of 3-phase Induction Motor
11. To Study different types of Storage Batteries & its charging system.
12. .To Study different types of earthing methods including earth leakage circuit breaker (GFCI)

Note:- Any 8-10 Experiments out of the list may be chosen.

WORKSHOP PRACTICE

			L	P	C
Paper Code: ETME-155   **L P C**

Paper Code: ETME-155   L P C
Paper: Workshop Practice   0 3 2

LIST OF EXPERIMENTS

Sheet Metal Shop

1. To study the tools and machineries used in sheet metal shop.
2. To make a tray using sheet metal tools.
3. To make a Funnel using sheet metal tools.
4. To make a cylindrical mug in sheet metal shop.

Foundry Shop

5. To make a mould in Foundry Shop.

Carpentry Shop

6. To make a half lap T-joint in Carpentry Shop.
7. To make a half cross lap joint in Carpentry Shop.
8. To make a pattern using Carpentry Tools.

Welding Shop

9. To study arc and gas welding equipments and tools.
10. To make Lap Joint, T-Joint and Butt Joint in Welding shop.

Fitting Shop

11. To make V-Section and T-Slot in fitting shop.

Machine Shop

12. To study basic operations on lathe, shaper, milling, drilling and grinding machines..
13. To perform step turning, knurling and threading operations on lathe.
14. To prepare a simple job on shaper.

Note:- Any 8-10 Experiments out of the list may be chosen.

ENGINEERING GRAPHICS

Paper Code: ETME-157   **L**   **P**   **C**
Paper: Engineering Graphics Lab   **0**   **3**   **2**

LIST OF EXPERIMENTS

UNIT - I

General: Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications,

Projections of Point and Lines: Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

$(T_1, T_2, R_1, R_2, R_3)$

Unit - II

Planes other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

Projections of Plane Figures: Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

$(T_1, T_2, R_1, R_2, R_3)$

Unit - III

Projection of Solids: Simple cases when solid are placed in different positions, Axis faces and lines lying in the faces of the solid making given angles. $(T_1, T_2, R_1, R_2, R_3)$

Unit-IV

Isometric Projection of plain surface and bodies. $(T_1, T_2, R_1, R_2, R_3)$

Text Books:

[T1]   Engineering drawing by N.D.Bhatt (Charotar Publications).

[T2]   Engineering Drawing by S.C.Sharma & Navin Kumar (Galgotia Publications)

Reference Books:

[R1]   Engineering Drawing by Venugopalan, (New Age International).

[R2]   **Engineering Drawing by P.S.Gill (S.K. Kataria & Sons)**

[R3]   Engineering Graphics by K.C.John (PHI)

Note:- Any 8-10 Experiments out of the list may be chosen.

FUNDAMENTAL OF COMPUTING LAB

	L	**P**	**C**
Paper Code: ETCS 157			
Paper: Fundamental of Computing Lab	**0**	**2**	**1**

LIST OF EXPERIMENTS

For program development an IDE e.g. CodeBlock[a], Eclipse CDT [b], Netbeans[c] is recommended

1. Dismantling a PC Part -1
2. Dismantling a PC Part -2
3. Internal and External commands of DOS
4. System utilities of windows including regedit
5. Installation of any rpm or debianlinux distribution with emphasis on drive partitioning
6. Installation of rpm and deb based packages
7. Understanding of File system of Linux
8. Creating user and group (through CLI)
9. Understanding and working knowledge of .Libre / Open Office Writer
   : Editing and Reviewing, Drawing, Tables, Graphs, Templates
10. Understanding and working knowledge of Libre / Open Office Calc
11. Understanding and working knowledge Libre / Open Office Impress
12. Understanding of flow chart development through Dia *
13. Two Mini Projects based on the skills learned in experiments 1-12
    * [Dia] http://projects.gnome.org/dia/

Note:- Any 8-10 Experiments out of the list may be chosen.

APPLIED CHEMISTRY LAB

Paper Code –ETCH-161 **P** **C**
Paper : Applied Chemistry Lab **2** **1**

LIST OF EXPERIMENTS

1. Determination of alkalinity of water sample.
2. Determination of hardness of water sample by EDTA method.
3. Determine the percentage composition of sodium hydroxide in the given mixture of sodium hydroxide and sodium chloride.
4. Determine the amount of oxalic acid and Sulphuric acid in one litre of solution, given standard sodium hydroxide and Potassium Permanganate.
5. Determine the amount of copper in the copper ore solution, provided hypo-solution (Iodometric Titration).
6. Determine the amount of chloride ions present in water using silver nitrate (Mohr's Precipitation Method).
7. Determine the strength of $MgSO_4$ solution by Complexometric titration.
8. Determine the surface tension of a liquid using drop number method.
9. Determine the viscosity of a given liquid (density to be determined).
10. Determine the cell constant of conductivity cell and titration of strong acid/strong base conductometrically.
11. To determine (a) λ max of the solution of $KMnO_4$. (b) Verify Beer's law and find out the concentration of unknown solution by spectrophotometer.
12. Determination of the concentration of iron in water sample by using spectrophotometer.
13. Determination of the concentration of Iron (III) by complexometric titration.
14. Proximate analysis of coal.
15. Determination of eutectic point and congruent melting point for a two component system by method of cooling curve.

    (At least 8 to 10 experiments are to be performed)

Suggested Books:

1. A. I. Vogel, G. H. Jeffery, *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5th Edition, 1989.
2. S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3rd Edition, 2008.
3. S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2nd Edition, 2003.
4. O. P. Pandey, D. N. Bajpai and S. Giri, *Practical Chemistry*, Published by S. Chand, 2005.
5. M. S. Kaurav, *Engineering Chemistry with Laboratory Experiments*, Published by PHI Learning Private Limited, 2011.
6. S. K. Bhasin and Sudha Rani, *Laboratory Manual on Engineering Chemistry*, Published by Dhanpat Rai Publishing Company, 2006.
   Note:- Any 8-10 Experiments out of the list may be chosen.

APPLIED MATHEMATICS-II

Paper Code : ETMA-102		**L**	**T**	**C**
Paper: APPLIED MATHEMATICS-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 the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student.

Unit –I
Partial differentiation and its Applications: Partial derivatives of first and second order. Euler's theorem for homogeneous functions (without proof). Derivatives of Implicit Functions, total   derivatives. Change of variables. Jacobian. Taylor's theorem for function of two variables(without proof). Error and approximation. Extreme values of function of several variables(maxima ,minima, saddle points). Lagrange method of undetermined multipliers. Partial differential equations: Formulation, solution of first order equations, Lagranges equations, Charpit's method.

[T2][No. of 12hrs.]

Unit-II
Laplace Transformation: Definition, Laplace transformation of basic functions , existence condition for Laplace transformation, Properties of Laplace transformation(Linearity, scaling and shifting). Unit step function, Impulse Function, Periodic Functions. Laplace transformation of derivatives, Laplace transformation of integrals, differentiation of transforms, Integration of transforms, Convolution theorem ,inverse Laplace transformation. Solution of ordinary Differential equations.

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

Unit-III
Complex Function: Definition, Derivatives, Analytic function, Cauchy's Riemann equation (without proof). Conformal and bilinear mappings, Complex Integration: Complex Line integration, Cauchy's integral theorem and integral formula(without proof). Zeros and Singularities, Taylor's and Laurent's series (without proof). Residues, Residue theorem (without proof). Evaluation of real definite integrals: Integration around the unit circle, Integration around a small semi circle and integration around rectangular contours.

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

Unit-IV
Multiple integrals: Double integrals, Change of order of integration, Triple integrals. Vector Calculus: Scalar and vector functions, Gradient, Divergence and curl. Directional derivatives, Line Integrals. Surface integrals, volume integrals. Green's theorem, Stoke's theorem and Gauss divergence theorem (without proof).

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

Text:
[T1].   E. kresyzig," Advance Engineering Mathematics", Wiley publications
[T2]   Michael Greenberg, "Advance Engineering mathematics", Pearson.

References:
[R1]   R.K. Jain and S.R.K. Iyengar,"Advanced Engineering Mathematics "Narosa Publications
[R2]   B. S. Grewal,"Higher Engineering Mathematics" Khanna Publications.
[R3]   S. Ponnusamy, "Foundation of Complex Analysis" Narosa Publication
[R4]   G.B. Thomas and R. N. Finny " Calculus and Analytic Geometry" Addison Wesley/ Narosa
[R5]   Wylie R, " Advance Engineering mathematics" , McGraw-Hill
[R6]   M. Spiegel, "Schaum's Outline on Laplace Transform, Tata McGraw-Hill

APPLIED PHYSICS – II

Paper Code: ETPH-104

| | **L** | **T** | **C** |

Paper : APPLIED PHYSICS – II   **2   1   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 Applied Physics aspects that are required for his understanding of basic physics.

UNIT I
Electromagnetic Theory : Gradient, Divergence, Curl, Gauss' law, Ampere's Law, Continuity equation, Maxwell's equations (differential and integral forms), Significance of Maxwell's equations, Poynting Theorem, Electromagnetic wave propagation in dielectrics and conductors.

[T1], [T2][No. of Hrs. 8]

UNIT II
Statistical Physics: Black body radiation, Planck's radiation formula, Wien's and Rayleigh-Jeans Laws, Distribution laws: Qualitative features of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics & their comparison (without derivation).

Quantum Mechanics: Postulates of Quantum mechanics, de-Broglie hypothesis, Davisson Germer experiment, Wave function and its physical significance, Wave Packet, Phase and group velocities, Uncertainty principle, Schrodinger equation for free particle, Time dependent Schrodinger equation, Particle in a box (1-D).

[T1][T2][No. of Hrs. 8]

UNIT III
Crystal Structure: Types of solids, Unit cell, Types of crystals, Translation vectors, Lattice planes, Miller indices, Simple crystal structures, Interplaner spacing, Crystal structure analysis: Bragg's law, Laue method, Point defects: Schottcky and Frankel defects.

[T1], [T2][No. of Hrs. 8]

UNIT IV
Band Theory of Solids: Introduction, Kronig-Penney model: E-k diagram, Effective mass of an electron, Intrinsic semiconductors: Electron concentration in conduction band, Hole concentration in valence band, Extrinsic semiconductor: p-type and n-type semiconductors, Fermi level, Hall Effect: Hall voltage and Hall coefficient.

[T1][T2][No. of Hrs. 8]

Text Books:
[T1].   Arthur Beiser 'Concepts of Modern Physics', [McGraw-Hill], 6th Edition 2009.
[T2].   A. S.Vasudeva, 'Modern Engineering Physics', S. Chand, 6th Edition, 2013.

Reference Books
[R1].   Richard Wolfson 'Essential University Physics' Pearson, Ist edition, 2009.
[R2].   H.K. Malik & A. K. Singh 'Engineering Physics' [McGraw-Hill], Ist Edition, 2009.
[R3].   C. Kittle, 'Mechanics', Berkeley Physics Course, Vol.- I. Latest Edition.
[R4].   Irving Kaplan 'Nuclear Physics' Latest Edition.
[R5].   John R. Taylor, Chris D. Zafirator and Michael A. Dubson, 'Modern Physics For Scientists and Engineers', PHI, 2nd Edition.
[R6].   D.J. Griffith, 'Introduction to Electrodynamics', Prentice Hall, Latest Edition.

ELECTRONIC DEVICES

		L	T	C
Paper Code: ETEC-106		**3**	**0**	**3**
Paper : Electronic Devices				

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

1. This is the first introductory course in Electronics Engineering to the students of all the branches of engineering during the first year.
2. Question No.1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions from each unit. It should be of 25 marks.
3. 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: Objective of the paper is to facilitate the student with the basics of electronic aspects that are required for his understanding and applications in their respective field of study. The pre-requisites are, to have a basic understanding of Applied Physics and Mathematics.

Unit-I

Evaluation Of Electronics: Introduction & Application Of Electronics, Energy Band Theory Of Crystals, Energy Band Structures In Metals, Semiconductors And Insulators, Theory Of Semiconductors: Classification Of Semiconductors, Conductivity Of Semiconductors, Carrier Concentration In Intrinsic & Extrinsic Semiconductors, Properties Of Intrinsic And Extrinsic Semiconductors, Variation In Semiconductors Parameters With Temperature, Fermi-Dirac Function, Fermi Level In A Semiconductor Having Impurities, Band Structure Of Open-Circuited P-N Junction, Drift And Diffusion Currents, Carrier Life Time, Continuity Equation (Elementary Treatment Only)

[T1][T2][T3][No. Of Hours: 12]

Unit – II

Theory of p-n junction Diode: Diode Current Equation, Diode Resistance, Transition Capacitance, Diffusion Capacitance, (Elementary treatment only), Effect of Temperature on p-n Junction Diode, Switching Characteristics, Piecewise Linear Model, **Special Diodes:** Zener Diode, Varactor Diode, Tunnel Diode, Photodiode, Light Emitting Diodes, Schottky Barrier Diode, **Applications of Diodes:** Half-Wave Diode Rectifier, Full-Wave Rectifier, Clippers and Clampers (Elementary treatment only).

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

Unit – III

Bipolar junction transistor: Introduction of transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations, Eber-moll's model.

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

Unit – IV

Application of BJT: CB, CE, CC configurations, hybrid model for transistor at low frequencies, Introduction to FETs and MOSFETs.

Fundamentals of digital electronics: Digital and analog signals, number systems, Boolean algebra, logic gates with simple applications, logic gates, karnaugh maps.

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

Text Books

[T1]　S. Salivahanan, N. Suresh Kr. & A. Vallavaraj, "Electronic Devices & Circuit", Tata McGraw Hill, 2008
[T2]　Millman, Halkias and Jit, "Electronic devices and circuits" McGraw Hill
[T3]　Boylestad & Nashelsky, "Electronic Devices & Circuits", Pearson Education, 10TH Edition.

Reference Books

[R1]　Sedra & Smith, "Micro Electronic Circuits" Oxford University Press, VI Edition
[R2]　Robert T. Paynter, "Introducing Electronic Devices & Circuits", Pearson Education, VII Edition, 2006

INTRODUCTION TO PROGRAMMING

		L	**T**	**C**
Paper Code: ETCS-108		3	0	3
Paper: Introduction to Programming				

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 basics of programming aspects, using C as the primary language. This course focuses on the programming constructs which are used in other languages as well. This is the first course on programming and does not assume any prerequisite.

UNIT I
Concept of algorithms, Flow Charts, Overview of the compiler (preferably GCC) , Assembler, linker and loader , Structure of a simple Hello World Program in C ,Overview of compilation and execution process in an IDE (preferably Code Block)

[T1],[T2], [R4][R5][No. of hrs 8]

UNIT II
Programming using C: Preprocessor Directive, C primitive input output using get char and put char , simple I/O Function calls from library , data type in C including enumeration , arithmetic, relational and logical operations, conditional executing using if, else, switch and break .Concept of loops , for, while and do-while , Storage Classes: Auto, Register, Static and Extern

[T1], [T2], [R7][No. of hrs 8]

UNIT III
Arrays (one and two dimensional), 2-d arrays used in matrix computation. Concept of Sub-programming, functions. Parameter transmission schemes i.e. call by value and call by reference, Pointers, relationship between array and pointer, Argument passing using pointers, Array of pointer, passing arrays as arguments

[T2], [R1], [R7][No. of hrs 8]

UNIT IV
Structure and unions , Strings and C string library, File Handling in C Using File Pointers,fopen( ), fclose( ),Input and Output using file pointers, Character Input and Output with Files , String Input / Output Functions , Formatted Input / Output Functions,Block Input / Output Functions, Sequential Vs Random Access Files , Positioning the File Pointer

[T1], [T2],[R2][R7][No. of hrs 8]

Text Books:
[T1]   Herbert Schildt, "C: The Complete Reference", OsbourneMcgraw Hill, 4th Edition, 2002.
[T2]   Forouzan Behrouz A. "Computer Science: A Structured Programming Approach Using C, Cengage Learning 2/e

Reference Books:
[R1]   Kernighan & Ritchie, "C Programming Language", The (Ansi C version), PHI, 2/e
[R2]   K.R Venugopal, "Mastering C ", TMH
[R3]   R.S. Salaria "Application Programming in C " Khanna Publishers4/e
[R4]   Yashwant Kanetkar " Test your C Skills " , BPB Publications
[R5]   http://www.codeblocks.org/
[R6]   http://gcc.gnu.org/
[R7]   Programming in ANSI C, E. Balagurusamy; Mc Graw Hill, 6th Edition.

ENGINEERING MECHANICS

	L	**T**	**C**
Paper Code: ETME 110			
Paper: Engineering Mechanics	2	1	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 GIVE THE BASIC PRINCIPLES OF MECHANIC APPLIED IN DIFFERENT DISCIPLINES OF ENGINEERING.

UNIT- I

Force system: Free body diagram, Parallel force system, concurrent force system, Equilibrium equations and applications in different force systems.

Friction: Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, Belt drive- derivation of equation $T_1/T_2 = e^{\mu\theta}$ and its application, M.A, V.R and Efficiency of Screw Jack, Application of friction in pivot and collar bearing..

                                                         [T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

UNIT- II

Structure: Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section, graphical method.

Distributed Force: Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, Pappus theorems, polar moment of inertia.

                                                         [T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

Unit-III

Kinematics of Particles: Rectilinear motion, plane curvilinear motion-rectangular coordinates, normal and tangential component.

Kinetics of Particles: Equation of motion, rectilinear motion and curvilinear motion, work energy equation, conservation of energy, impulse and momentum, conservation of momentum, impact of bodies, co-efficient of restitution, loss of energy during impact.

                                                         [T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

Unit-IV

Kinematics of Rigid Bodies: Concept of rigid body, type of rigid body motion, absolute motion, introduction to relative velocity, instantaneous center of velocity, Velocity polygons for four bar mechanism and single slider mechanism.

Kinetics of Rigid Bodies: Equation of motion, translatory motion and fixed axis rotation, application of work energy principles to rigid bodies conservation of energy.

Shear force and bending Moment Diagram.   **[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]**

Text Books:
[T1]   Engg Mechanics by A.K.Tayal (Umesh Publications).
[T2]   Engg Mechanics by Basudeb Bhattacharya (Oxford university Press)

Reference Books:
[R1]   Engg Mechanics by Irving H. Shames (Pearson publications).
[R2]   Engg Mechanics by U.C.Jindal (Galgotia Publications).
[R3]   Engg Mechanics by Beer & Johnston(TMH).
[R4]   Engg Mechanics by K.L.Kumar (TMH).
[R5]   Engg Mechanics by Sadhu Singh (Khanna Publishers).

COMMUNICATION SKILLS

	L	**T**	**C**
Paper Code: ETHS – 112			
Paper: Communication Skills	**2**	**1**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXMIUM 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 language and communication competence of professional students with emphasis on English for Specific Purposes (ESP) through communication skills related activities.

UNIT-I

I. **Basic Remedial Grammar** (Errors in Parts of Speech, Tenses, Verbs and Modal; Reported Speech; Active and Passive Voice; Conditional clauses; Question Tags and Short Responses)

[T1],[R2],[R3]**[No. of hrs 06]**

UNIT-II

II. **Vocabulary and usage** (Synonyms and Antonyms; Suffixes and Prefixes; Homophones and Homonyms; One-word substitution; Prepositions; Phrasal verbs and Idioms, Indianism)

[T1],[R2],[R3]**[No. of hrs 06]**

UNIT-III

(A)
  I.   Types of writing (Expository, Descriptive, Narrative, Analytical and Argumentative)
  II.   Definition, description and explanation of scientific objects, instruments and processes etc.
  III. Interpretation and use of charts, graphs and tables in technical writing.[T1],[R1]

(B)
  I.   Paragraph writing
  II.   Precis writing
  III. Comprehension   [T1],[R2],[R3]

[No. of hrs 10]

UNIT-IV
  I.   Reading different types of texts (speed and purpose)[T1]
  II.   Reading five essays [T2]
  III. E.M. FORSTER, *What I Believe*   (Pg-123)
  IV.   JAMES BRYCE, *Some Hints on Public Speaking*   (Pg-135)
  V.   L.A. HILL, *Principles of Good Writing*   (Pg-150)
  VI.   A.P.J. ABDUL KALAM, *Work Brings Solace*   (Pg-207)
  VII. SALIM ALI, *Man and Nature in India: The Ecological Balance*   (Pg-213)

[No. of hrs 10]

TEXT BOOKS
[T1]   Technical Communication: Principles and practice (OUP), (Meenakshi Raman and Sangeeta Sharma) OXFORD UNIVERSITY PRESS
[T2]   Communication Skills for Engineers, Murli Krishna, Pearson.
[T3]   Wren and Martin: High School English Grammar and Composition; S. Chand
[T4]   Exploration of Ideas; An Anthology of Prose: Orient Blackswan.

REFERENCE BOOKS:
[R1]   Professional Communication: Aruna Koneru, MCGRAW HILLS EDUCATION PVT. LTD
[R2]   Wren and Martin: High School English Grammar and Composition; S. Chand
[R3]   Advanced English Grammar and Composition: Gurudas Mukherjee & Inidbar Mukherjee; (ANE BOOKS PVT. LTD.)

ENVIRONMENTAL STUDIES

Paper Code: ETEN-114	L	T	C
Paper : Environmental Studies	2	1	3

INSTRUCTIONS TO PAPER SETTER:	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. Each 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 make students environment conscious. They will be exposed through the fundamental concepts of environment and ecosystem so that they can appreciate the importance of individual and collective efforts to preserve and protect our environment. This course must raise various questions in student's mind that how our environment is inter dependent on various factors and how human being must care for their natural surroundings.

UNIT I: Environmental Studies: Ecosystems, Bio-diversity and its Conservation

(i) The Multidisciplinary Nature of Environmental Studies-
Definition, scope and importance of Environmental Studies. Biotic and a biotic component of environment, need for environmental awareness.

(ii) Ecosystems

Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structures and function of the following ecosystem:
(a) Forest ecosystem
(b) Grassland ecosystem
(c) Desert ecosystem
(d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

(iii) Bio-diversity and its Conservation

Introduction to biodiversity —definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, national and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity : Habitat loss, Poaching of wildlife, man-wildlife conflicts, rare endangered and threatened species(RET) endemic species of India, method of biodiversity conservation: *In-situ* and *ex-situ* conservation.

[T1], [R3][No. of hrs. 08]

UNITII: Natural Resources: problems and prospects

   (i)   Renewable and Non-renewable Natural Resources
   Concept and definition of Natural Resources and need for their management

- *Forest resources:* Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.
- *Water resources:* Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems, Water conservation, rain water harvesting, watershed management.
- *Mineral resources:* Uses are exploitation, environmental effects of extracting and using mineral resources, case studies.
- *Food resources:* World food problems, changes causes by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- *Energy resources:* Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Urban problems related to energy, case studies.
- *Land resources:* Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

[T1], [R3][No. of hrs. 08]

UNIT III: Environmental Chemistry and Pollution Control
(i) *Chemistry of Environment*
    (a) Green Technology

Principles of Green technology, Zero Waste Technology, Green Chemistry & Its basic principles, Atom Economy, Green Methodologies. clean development mechanisms (CDM), concept of environmental impact assessment,

    (b) Eco-Friendly polymers

Environmental degradation of polymers, Biodegradable, Photo-biodegradable polymers, Hydrolysis & Hydrobiodegradable, Biopolymers & Bioplastics: polylactic acid, polyhydroxybutyrate, polycaprolactone,. Concept of bioremediation.

(ii)*Environmental Pollution*

Definition, types, causes, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards. Pollution case studies. Solid waste and its management: causes, effects and control measures of urban and industrial waste.

Chemical toxicology-Terms related to toxicity, impact of chemicals (Hg, As, Cd, Cr, Pb) on environment.

[T1], [R3][No. of hrs. 08]

UNIT IV: Disaster Management, Social Issues, Human Population and the Environment
    (i)   Disaster Management

Disaster management: floods, earthquake, cyclone and land-slides, nuclear accidents and holocaust, *case studies*.

  (ii) Social Issues, Human Population and the Environment

Sustainable development, Climate change, global warming, acid rain, ozone layer depletion, Environmental ethics: Issues and possible solutions, Consumerism and waste products, , Wasteland reclamation. Population growth, problems of urbanisation.

Environment Protection Act, 1986; Air (Prevention and Control of Pollution) Act, 1981; Water (Prevention and Control of Pollution) Act, 1974; Wildlife Protection Act, 1972; Forest Conservation Act, 1980; Environmental management system standards-ISO 14000 series.

[T1][No. of hrs. 08]

Text Books:
[T1]   E. Barucha, *Textbook of Environmental Studies for Undergraduate Courses*,
          Universities Press (India) Pvt. Ltd., 2005.
[T2]   S. Chawla, *A Textbook of Environmental Studies,* McGraw Hill Education Private Limited, 2012

References Books:
[R1]   G. T. Miller, *Environmental Science*, Thomas Learning, 2012
[R2]   W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
[R3]   R. Rajagopalan, *Environmental Studies*: From Crisis to Cure, 2nd Edition, Oxford University Press, 2011.
[R4]   A.K. De, *Environmental Chemistry*, New Age Int. Publ. 2012,,
[R5] A. Kaushik and C.P. Kaushik, Perspectives in Environment Studies, 4th Edition, New Age International Publishers,2013
[R6]   Environmental Engineering by Gerard Kiely, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2010.

APPLIED PHYSICS LAB – II

Paper Code: ETPH-152   **P**   **C**
Paper: Applied Physics Lab – II   **2**   **1**

LIST OF EXPERIMENTS

1. To determine the e/m ratio of an electron by J.J. Thomson method.
2. To measure the frequency of a sine-wave voltage obtained from signal generator and to obtain lissajous pattern on the CRO screen by feeding two sine wave signals from two signal generators.
3. To determine the frequency of A.C. mains by using Sonometer .
4. To determine the frequency of electrically maintained tuning fork by Melde's   method.
5. Computer simulation (simple application of Monte Carlo): Brownian motion, charging & discharging of a capacitor.
6. To study the charging and discharging of a capacitor and to find out the time constant.
7. To study the Hall effect.
8. To verify Stefan's law.
9. To determine the energy band gap of a semiconductor by four probe method/or by   measuring the variation of reverse saturation current with temperature.
10. To study the I-V characteristics of Zener diode.
11.   To find the thermal conductivity of a poor conductor by Lee's disk method.
12.   To study the thermo emf using thermocouple and resistance using Pt. Resistance thermometer.

Suggested Books:
[T1] C. L. Arora 'B. Sc. Practical Physics' S. Chand, Latest edition.
Note: Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.

Electronic Devices

Paper Code: ETEC-156   **P   C**
Paper: Electronic Devices Lab   **2   1**

LIST OF EXPERIMENTS

1. Introduction to C.R.O, Function Generator& Bread Board Kit & to generate different types of waveform with the help of Function Generator & to calculate their frequency, amplitude AC & DC voltage.
2. Identification & testing of Active & passive components
3. To plot V-I characteristics of a semiconductor diode &
   Calculate Static & Dynamic Resistance
4. To Study the Reverse characteristics of Zener diode
5. To Study the Rectifier circuit.
   a) Half Wave Rectifier
   b) Centre Tapped Rectifier.
   c) Bridge Rectifier.
6. To Study the output waveforms of different Filter Ckts of Rectifier.
7. To Plot Input & Output characteristics CB transistor.
8. To Plot Input & Output characteristics of CE transistor.
9. Realization of basic gates.
10. Implementation of Boolean functions (two or three variables).
11. Few experiments mentioned above to be performed on P-spice.
12. To develop a working model of any electronic circuit.

Note:- Any 8-10 Experiments out of the list may be chosen.

ENGINEERING MECHANICS LAB

Paper Code: ETME-158 **P** **C**
Paper: Engineering Mechanics Lab **2** **1**

LIST OF EXPERIMENTS:

1. To verify the law of Force Polygon
2. To verify the law of Moments using Parallel Force apparatus. (simply supported type)
3. To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.
4. To find the forces in the members of Jib Crane.
5. To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.
6. To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the Wheel and Axle
7. To determine the MA, VR, □□of Worm Wheel (2-start)
8. Verification of force transmitted by members of given truss.
9. To verify the law of moments using Bell crank lever
10. To find CG and moment of Inertia of an irregular body using Computation method.

Note:- Any 8-10 Experiments out of the list may be chosen.

PROGRAMMING LAB

				P	C
Paper Code	:	**ETCS 154**			
Paper	:	**Programming Lab**		**2**	**1**

LIST OF EXPERIMENTS

For program development an IDE e.g. CodeBlock[a] , Eclipse CDT [b], Netbeans[c] is recommended

1. Write a program to find divisor or factorial of a given number.
2. Write a program to find sum of a geometric series
3. Write a recursive program for tower of Hanoi problem
4. Write a recursive program to print the first m Fibonacci number
5. Write a menu driven program for matrices to do the following operation
   depending on whether the operation requires one or two matrices

Addition of two matrices

Subtraction of two matrices

Finding upper and lower triangular matrices

Transpose of a matrix

Product of two matrices.

6. Write a program to copy one file to other, use command line arguments.
7. An array of record contains information of managers and workers of a company.
   Print all the data of managers and workers in separate files.
8. Write a program to perform the following operators an Strings without using String
   functions
   To find the Length of String.
   To concatenate two string.
   To find Reverse of a string.
   To Copy one sting to another string.
9. Write a Program to store records of an student in student file. The data must be stored
   using Binary File.Read the record stored in "Student.txt" file in Binary code.Edit the record stored in
   Binary File.Append a record in the Student file.
10. Write a programmed to count the no of Lowercase, Uppercase numbers and special
    Characters presents in the contents of File.
11. Two Mini Projects based on the skills learned in experiments 1-10 [These mini projects may be done
    in a group not exceeding group size of 4]
    [a] http://www.codeblocks.org/
    [b] http://www.eclipse.org/cdt/
    [c] https://netbeans.org/features/cpp/
    Note:- Any 8-10 Experiments out of the list may be chosen.

ENVIRONMENTAL STUDIES LAB

Paper Code –ETEN-160   **P**   **C**
Paper : Environmental Studies Lab   **2**   **1**

LIST OF EXPERIMENTS

1.   Determination of pH, conductivity and turbidity in drinking water sample.
2.   Determination of pH and conductivity of soil/sludge samples.
3.   Determination of moisture content of soil sample.
4.   Determination of Total Dissolved Solids (TDS) of water sample.
5.   Determination of dissolved oxygen (DO) in the water sample.
6.   Determination of Biological oxygen demand (BOD) in the water sample.
7.   Determination of Chemical oxygen demand (COD) in the water sample.
8.   Determination of Residual Chlorine in the water sample.
9.   Determination of ammonia in the water sample.
10. Determination of carbon dioxide in the water sample.
11. Determination of nitrate ions or sulphate ions in water using spectrophotometer.
12. Determination of the molecular weight of polystyrene sample using viscometer method.
13. Base catalyzed aldol condensation by Green Methodology.
14. Acetylation of primary amines using eco-friendly method.
15. To determine the concentration of particulate matter in the ambient air using High Volume Sampler.

P.S.: For better understanding of various aspects of environment visits to local areas, depending upon easy access and importance may be planned to any nearby river, forest, grassland, hills and students should write a report based on their observations.

Suggested Books:
1.   A. I. Vogel, G. H. Jeffery, *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5th Edition, 1989.
2.   dst.gov.in/green-chem.pdf (monograph of green chemistry laboratory experiments).
3.   S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3rd Edition, 2008.
4.   S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2nd Edition, 2003.
5.   W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
6.   A. Kaushik and C. P. Kaushik, *Perspectives in Environment Studies*, 4th Edition, New Age International Publishers, 2013.

   Note:- Any 8-10 Experiments out of the list may be chosen.

APPLIED MATHEMATICS-I

		L	**T**	**C**
Paper Code : ETMA-101		3	1	4
Paper : Applied Mathematics-I				

> **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 Applied Mathematics that are required for an engineering student.

UNIT- I

Successive differentiation: Leibnitz theorem for n^{th} derivative (without proof). Infinite series: Convergence and divergence of infinite series, positive terms infinite series, necessary condition, comparison test (Limit test), D'Alembert ratio test, Integral Test, Cauchy's root test, Raabe's test and Logarithmic test(without proof). Alternating series, Leibnitz test, conditional and absolutely convergence. Taylor's and Maclaurin's expansion(without proof) of function (e^x, log(1+x), cos x , sin x) with remainder terms ,Taylor's and Maclaurin's series, Error and approximation.

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

UNIT- II

Asymptotes to Cartesian curves. Radius of curvature and curve tracing for Cartesian, parametric and polar curves. Integration: integration using reduction formula for $\int_0^{\frac{\pi}{2}} sin^n\theta \, d\theta$, $\int_0^{\frac{\pi}{2}} cos^n\theta d\theta$, $\int_0^{\frac{\pi}{2}} sin^n\theta cos^m\theta d\theta$. Application of integration : Area under the curve, length of the curve, volumes and surface area of solids of revolution about axis only .Gamma and Beta functions.

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

UNIT- III

Matrices: Orthogonal matrix, Hermitian matrix, Skew-Hermitian matrix and Unitary matrix. Inverse of matrix by Gauss-Jordan Method (without proof). Rank of matrix by echelon and Normal (canonical) form. Linear dependence and linear independence of vectors. Consistency and inconsistency of linear system of homogeneous and non homogeneous equations . Eigen values and Eigen vectors. Properties of Eigen values (without proof). Cayley-Hamilton theorem (without proof). Diagonlization of matrix. Quadratic form, reduction of quadratic form to canonical form.

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

UNIT-IV

Ordinary differential equations: First order linear differential equations, Leibnitz and Bernaulli's equation. Exact differential equations , Equations reducible to exact differential equations. Linear differential equation of higher order with constant coefficients, Homogeneous and non homogeneous differential equations reducible to linear differential equations with constant coefficients. Method of variation of parameters. Bessel's and Legendre's equations (without series solutions), Bessel's and Legendre's functions and their properties.

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

Text:
[T1]   B. S. Grewal,"Higher Engineering Mathematics" Khanna Publications.
[T2].   R. K. Jain and S.R.K. Iyengar,"Advanced Engineering Mathematics "Narosa Publications.

References:
[R1]   E. kresyzig," Advance Engineering Mathematics", Wiley publications
[R2]   G.Hadley, " Linear Algebra" Narosa Publication
[R3]   N.M. Kapoor, " A Text Book of Differential Equations", Pitambar publication.
[R4]   Wylie R, " Advance Engineering mathematics" , McGraw-Hill
[R5]   Schaum's Outline on Linear Algebra, Tata McGraw-Hill
[R6]   Polking and Arnold, " Ordinary Differential Equation using MatLab" Pearson.

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APPLIED PHYSICS – I

		L	T	C
Paper Code: ETPH – 103		**2**	**1**	**3**
Paper : Applied Physics – I				

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 Applied Physics aspects that are required for his understanding of basic physics.

UNIT I

Interference: Introduction, Interference due to division of wave front: Fresnel's Biprism, Interference due to division of amplitude: wedge shaped film, Newton's rings.

Diffraction: Introduction, Difference between Fresnel and Fraunhofer diffraction, Single slit diffraction, Transmission diffraction grating, Absent spectra.

[T1], [T2](No. of Hrs. 8)

UNIT II

Polarization: Introduction, Uniaxial crystals, Double refraction, Nicol prism, Quarter and half wave plates, Theory of production of plane, circularly and elliptically polarized lights, Specific rotation, Laurents half shade polarimeter.

Laser: Spontaneous and stimulated emissions, Einstein's coefficients, Laser and its principle, He-Ne laser.

Fibre optics: Introduction,   Single mode fibre, Step index and graded index multimode fibres, Acceptance angle and numerical aperture.

[T1], [T2](No. of Hrs. 8)

UNIT III

Theory of Relativity: Introduction, Frame of reference, Galilean transformation, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Mass energy relation

Ultrasonics: Introduction, Production of ultrasonics by magnetostriction and Piezoelectric methods, Applications.

[T1], [T2](No. of Hrs. 8)

UNIT IV

Nuclear Physics: Introduction, Radioactivity, Alpha decay, Beta decay, Gamma decay, Q value, Threshold energy, Nuclear reactions, Nuclear fission: Liquid drop model, Nuclear fusion, Particle accelerators: Linear accelerator, Cyclotron, Radiation detectors: Ionization chamber, Geiger Mueller Counter.

[T1](No. of Hrs. 8)

Text Books:
[T1].   Arthur Beiser, 'Concepts of Modern Physics', [McGraw-Hill], 6th Edition 2009
[T2].   A. S.Vasudeva, 'Modern Engineering Physics', S. Chand, 6th Edition, 2013.

Reference Books
[R1].   A. Ghatak 'Optics' , TMH, 5th Edition, 2013
[R2].   G. Aruldhas 'Engineering Physics' PHI 1st Edition, 2010.
[R3].   Fundamentals of Optics : Jenkins and White , Latest Edition
[R4].   C. Kittle, "Mechanics", Berkeley Physics Course, Vol.- I.
[R5].   Feynman " The Feynman lectures on Physics Pearson Volume 3 Millennium Edition, 2013
[R6].   Uma Mukhrji 'Engineering Physics' Narosa, 3rd Edition, 2010.
[R7].   H.K. Malik & A. K. Singh 'Engineering Physics' [McGraw-Hill], 1st Edition, 2009.

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MANUFACTURING PROCESSES

		L	T	C
Paper Code: ETME-105				
Paper: Manufacturing Processes		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 basic Manufacturing processes.

Unit-I
Introduction: Introduction of Manufacturing processes and their classification, Basic Metals & Alloys : Properties and Applications. Properties of Materials: Strength, elasticity, stiffness, malleability, ductility, brittleness, toughness and hardness. Ferrous Materials: Carbon steels, its classification based on % carbon as low, mild, medium & high carbon steel, its properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching & tempering and case- hardening.
Non-Ferrous metals & alloys: Properties and uses of various non-ferrous metals & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin.
Casting Processes:
Principles of metal casting, Pattern materials, types and allowance, composition and properties of moulding sand, foundry tools, concept of cores and core print, elements of gating system, description and operation of cupola, special casting processes e.g. die-casting; permanent mould casting; centrifugal casting; investment casting; casting defects.

           $(T_1, T_2, R_1, R_2, R_3, R_4, R_5)$ **[No. of Hrs.12]**

UNIT-II
Smithy and Forging:
Hot working and cold working, Forging tools and equipments, Forging operations, Forging types: Smith forging, Drop forging, Press forging, Machine forging; Forging defects; Extrusion, wire drawing, swaging.

BENCH WORK AND FITTING:
Fitting shop tools, operation: Fitting; sawing; chipping; thread cutting (with taps and dies);

Marking and marking tools.

           $(T_1, T_2, R_1, R_2, R_3, R_4, R_5)$ **[No. of Hrs. 12]**

Unit-III
Metal joining: Welding principles, classification of welding techniques, Oxyacetylene Gas welding, equipment and field of application, Arc-welding, metal arc, Carbon arc welding, submerged arc welding and atomic hydrogen welding, TIG and MIG welding, Electric resistance welding: spot; seam; flash; butt and percussion welding, Flux: composition; properties and function, Electrodes, Types of joints and edge preparation, Brazing and soldering, welding defects.

           $(T_1, T_2, R_1, R_2, R_3, R_4, R_5)$**[No. of Hrs. 12]**

Unit-IV
Sheet Metal Work:
Tools and equipments used in sheet metal work, metals used for sheets, standard specification for sheets, Types of sheet metal operations: shearing, drawing, bending. Other operations like spinning, stretch forming, embossing and coining.
Powder Metallurgy: Introduction of powder metallurgy process: powder production, blending, compaction, sintering.

           $(T_1, T_2, R_1, R_2, R_3, R_4, R_5)$**[No. of Hrs. 12]**

Text Books:
[T1].   Manufacturing Process by Raghuvanshi.(Dhanpat Rai and Co.)
[T2].   Manufacturing Technology by P.N.Rao (TMH publications)
Reference Books:

[R1].   Workshop Technology by Hazra-Chowdhary (Media Promoters and Publishers Pvt. Ltd.)
[R2].   Production Engineering by R.K.Jain (Khanna Publishers)
[R3].   Workshop Technology by Chapman (Elsevier Butterworth-Heinemann)
[R4].   Fundamentals of Modern Manufacturing by Mikell P. Groover (Wiley India Edition)
[R5].   Manufacturing Processes for Engineering Materials by Kalpakjian and Schmid (Pearson)

ELECTRICAL TECHNOLOGY

Paper Code: ETEE-107   **L**   **T**   **C**
Paper : Electrical Technology   3   0   3

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

4. This is first introductory course in electrical technology to the students of all the branches of engineering in first year.
5. 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.
6. 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 exposure to the students in respects of the basics of different aspects of electrical engineering with emphasis on constructional, measurement and applications of various types of instruments and equipments.

UNIT – I: DC Circuits
Introduction of Circuit parameters and energy sources (Dependent and Independent), Mesh and Nodal Analysis, Superposition, Thevenin's, Norton's, Reciprocity, Maximum Power Transfer and Millman's Theorems, Star-Delta Transformation and their Applications to the Analysis of DC circuits.

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

UNIT – II: A.C.Circuits
A.C. Fundamentals, Phasor representation, Steady State Response of Series and Parallel R-L, R-C and R-L-C circuits using j-notation, Series and Parallel resonance of RLC Circuits, Quality factor, Bandwidth, Complex Power, Introduction to balanced 3-phase circuits with Star- Delta Connections.

[T1],[T2][No. of Hrs. 14]

UNIT – III: Measuring Instruments
Basics of measuring instruments and their types ,Working principles and applications of moving coil, moving iron (ammeter & voltmeter) and Extension of their ranges, dynamometer- type Wattmeter , induction-type Energy Meter , Two-wattmeter method for the measurement of power in three phase circuits, Introduction to digital voltmeter, digital Multimeter and Electronic Energy Meter.

[T1],[T2],[R2][No. of Hrs. 11]

UNIT – IV: Transformer and Rotating Machines
Fundamentals of Magnetic Circuits, Hysteresis and Eddy current losses, working principle, equivalent circuit, efficiency and voltage regulation of single phase transformer and its applications. Introduction to DC and Induction motors (both three phase and single phase), Stepper Motor and Permanent Magnet Brushless DC Motor.

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

Text Books:
[T1]   S.N Singh, "Basic Electrical Engineering" PHI India Ed 2012
[T2]   Chakrabarti, Chanda,Nath "Basic Electrical Engineering" TMH India", Ed 2012.
Reference Books:
[R1]   William Hayt "Engineering Circuit Analysis" TMH India Ed 2012
[R2]   Giorgio Rizzoni "Principles and Application of Electrical Engineering" Fifth Edition TMH India.

HUMAN VALUES & PROFESSIONAL ETHICS

		L	T	C
Paper Code: ETHS-109		1	1	1
Paper : Human Values & Professional Ethics				

Non-University Examination Scheme (NUES)
Note: There will be no End-Term External University Examination. Marks are to be given on the basis of two internal sessional test of 30 marks each and one final Viva-voce project report Examination of 40 marks.

Objectives:

This introductory course input is intended

d. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

e. To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on the correct understanding of the Human reality and the rest of the Existence. Such a Holistic perspective forms the basis of value-based living in a natural way.

f. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

UNIT-1: Introduction to Value Education   No.   of lectures: 03+1

1. Understanding the need, basic guidelines, content and process for value education.
2. Basic Human Aspirations: Prosperity and happiness
3. Methods to fulfil the human aspirations – understanding and living in harmony at various levels.
4. Practice Session – 1.   **[T1], [R1], [R4]**

UNIT-2: Harmony in the Human Being   No. of lectures: 05+1

1. Co-existence of the sentient "I" and the material body – understanding their needs – Happiness & Conveniences.
2. Understanding the Harmony of "I" with the body – Correct appraisal of physical needs and the meaning of prosperity.
3. Programme to ensure harmony of "I" and Body-Mental and Physical health and happiness.
4. Harmony in family and society: Understanding Human-human relationship in terms of mutual trust and respect.
5. Understanding society and nation as extensions of family and society respectively.
6. Practice Session – 02   **[T2], [R1], [R2]**

UNIT-3: Basics of Professional Ethics   No. of lectures: 04+1

1. **Ethical Human Conduct** – based on acceptance of basic human values.
2. **Humanistic Constitution and universal human order** – skills, sincerity and fidelity.
3. **To identify the scope and characteristics of people** – friendly and eco-friendly production system, Technologies and management systems.
4. Practice Session – 03.   **[T1],[R4]**

UNIT-4: Professional Ethics in practice   No. of lectures: 04+1

5. **Profession and Professionalism** – Professional Accountability, Roles of a professional, Ethics and image of profession.
6. **Engineering Profession and Ethics -** Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world.
7. **Professional Responsibilities –** Collegiality, Loyalty, Confidentiality, Conflict of Interest, Whistle Blowing
8. Practice Session – 04   **[T1], [T2], [T3], [R3]**

Text Books:

[T1]   Professional Ethics, R. Subramanian, Oxford University Press.
[T2]   Professional Ethics & Human Values: S.B. Srivasthva, SciTech Publications (India) Pvt. Ltd. New Delhi.
[T3]   Professional Ethics & Human Values: Prof. D.R. Kiran, TATA Mc Graw Hill Education.

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

References:
[R1]   Success Secrets for Engineering Students: Prof. K.V. SubbaRaju, Ph.D., Published by SMARTstudent.
[R2]   Ethics in Engineering Mike W. Martin, Department of Philosophy, Chapman University and Roland Schinzinger, School of Engineering, University of California, Irvine.
[R3]   Human Values: A. N. Tripathy (2003, New Age International Publishers)
[R4]   Value Education website, http.//www.universalhumanvalues.info[16]
[R5]   Fundamentals of Ethics, Edmond G. Seebauer & Robert L. Barry, Oxford University Press.
[R6]   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.

*PRACTICAL SESSIONS OF 14 HOME ASSIGNMENTS will be followed by the students pursuing this paper. (Ref: Professional Ethics & Human Values: S.B. Srivastava, SciTech Publications (India) Pvt. Ltd. New Delhi.)

<div align="center"><u>**CONTENT OF PRACTICE SESSION**</u></div>

Module 1: Course Introduction – Needs, Basic Guidelines, Content and Process of Value Education

PS-1: Imagine yourself in detail. What are the goals of your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcoming in your life? Observe and analyze them.

Expected Outcome:
The students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

PS-2: Now a days there is lot of voice about techno-genie maladies such as energy and natural resource depletion, environmental Pollution, Global Warming, Ozone depletion, Deforestation, etc. – all these scenes are man-made problems threatening the survival of life on the earth – what is root cause of these maladies and what is the way out in your opinion?
On the other hand there is rapidly growing danger because of nuclear proliferation, arm race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression and suicidal attempts, etc - what do you think the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

Expected Outcome:
The students start finding out that technical education with study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all the problems and the sustained solution could emerge only through understanding of human values and value based living. Any solutions brought out through fear, temptation or dogma will not be sustainable.

PS-3:1.Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of following:
a)What is naturally acceptable to you in relationship – feeling of respect or disrespect?
b)What is naturally acceptable to you - to nurture or to exploit others? Is your living the same as your natural acceptance or different?
2.Out of three basic requirements for fulfillment of your aspirations, right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time and efforts you devote for each in your daily routine.

Expected Outcome:
4.   The students are able to see that verification on the basis of natural acceptance and experiential
        validation through living is the only way to verify the right or wrong, and referring to any external
        source life text or instrument or any other person cannot enable them to verify with authenticity, it will
        only develop assumptions.
5.   The students are able to see that their practice in living is not in harmony with their natural
        acceptance at most of the time, and all they need to do is to refer to their natural acceptance to remove
        this disharmony.

6.   The students are able to see that lack of right understanding leading to lack of relationship is the major cause of the problems in their family and the lack of physical facilities in most of the cases; while they have given higher priority to earning of physical facilities in their life ignoring relationship and not being aware that right understanding is the most important requirement for any human being.

Module 2: Understanding harmony in human being – Harmony in myself!

PS-4: Prepare the list of your desires. Observe whether the desires. Observe whether the desires are related with self "I" or body. If it appears to be related with the both, see which part of it is related to self "I" and which part is related to body.

Expected Outcome:
The students are able to see that they can enlist their desires and the desires are not vague, also they are able to relate their desires to "I" and "body" distinctly. If, any desire appears to be related with both, they are able to see that feeling is related to "I" while the physical facility is related to the body. They are also able to see that "I" and "body" are two realities, and most of their desires are related to "I" and not with the "Body"; while their efforts are mostly connected on the fulfillment of the need of the body assuming that it will meet the needs of "I" too.

PS-5:
2.   {A}.   Observe that any physical facilities you use, follows the given sequence with time; Necessary and tasteful – unnecessary & tasteful – unnecessary & tasteless.
        {B}.   In contrast, observe that any feelings in you are either naturally acceptable or not acceptable at all. If, naturally acceptable, you want it continuously and if not acceptable, you do not want it at any moment.
2.   List Down all your activities. Observe whether the activity is of "I" or of "body" or with the participation both "I" and "body".
3.   Observe the activities with "I". Identify the object of your attention for different moments (over a period say 5 to 10 minute) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

Expected Outcome:
1.   The students are able to see that all physical facilities they use are required for limited time in a limited quantity. Also they are able to see that cause of feeling, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable eve for a single moment.
2.   The students are able to see that activities like understanding, desires, thoughts and selection are the activities of "I" only; the activities like breathing, palpitation of different parts of the body are fully the activities of the body. With the acceptance of "I", while activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs, etc. are such activities that require the participation of both "I" and "body"
3.   The students become aware of their activities of "I" and start finding their focus of attention at different moments. Also they are able see that most of their desires are coming from outsides (through preconditioning or sensation) and are not based on their natural acceptance.

PS-6:   1.Chalk out the program to ensure that you are responsible to your body – for the nurturing, protection and right utilization of the body.
            2.Find out the plants and shrubs growing in and your campus. Find out their use for curing different diseases.

Expected Outcome:
The students are able to list down activities related to a proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing the different diseases.

Module 3: Understanding harmony in the family and society - Harmony in Human – Human relationship

PS-7: Form small groups in the class and in that group initiate the dialogue and ask the eight questions related to trust. The eight questions are-

S.No.	Intention (Natural Acceptance)	S.No.	Competence
1.a.	Do I want to make myself happy?	1.b.	Am I liable to make myself always Happy?
2.a.	Do I want to make the other happy?	2.b.	Am I liable to make the other always happy?
3.a.	Does the other want to make him happy?	3.b.	Is the other able to make him always happy?
4.a.	Does the other want to make me happy? What is answer?	4.b.	Is the other able to make me always happy? What is answer?

Let each student answer the question for himself and everyone else. Discuss the difference between intention and competence.

Expected Outcome:
The students are able to see that the first four questions are related to our natural acceptance i.e. intention and the next four to our competence. They are able to note that the intention is always correct, only competence is lacking. We generally evaluate ourselves on the basis of our intention and other on the basis of their competence. We seldom look at our competence and other's intention as a result we conclude that I am a good person and other is a bad person.

PS-8:
1. Observe that on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasion you are disrespecting by way of under evaluation, over evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

Expected Outcome:
The students are able to see that respect is right evaluation and only right evaluation leads to fulfilment of relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect) like gender biasness, generation gap, caste conflicts, class struggle, and domination through poor play, communal violence, and clash of isms and so on so forth.
All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

PS-9:
1. Write a note in the form of a story, poem, skit, essay, narration, dialogue, to educate a child.
   Evaluate it in a group.
2. Develop three chapters to introduce "social science", its needs, scope and content in the primary education of children.

Expected Outcome:
The students are able to use their creativity for educating children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

Module 4: Understanding harmony in the nature and existence – Whole existence as Co – existence -

PS-10: Prepare the list of units (things) around you. Classify them into four orders. Observe and explain the mutual fulfilment of each unit with other orders.

Expected Outcome:
The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them. They are also able to see that human beings are not fulfilling to their orders today and need to take appropriate steps to ensure right participation (in term of nurturing, protection and right utilization) in the nature.

PS-11:
3. Make a chart for the whole existence. List down different courses of studies and relate them to different or levels in the existence.
4. Choose any one subject being taught today. Evaluate and suggest suitable modifications to make it appropriate and holistic.

Expected Outcome:
The students are confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are liable to make out how these courses can be made appropriate and holistic.

Module 5: Implication of the above Holistic Understanding of Harmony at all Levels of Existence.

PS-12: Choose any two current problem of different kind in the society and suggest how they can be solved on the basis of the natural acceptance of human values. Suggest the steps you will take in present conditions.

Expected Outcome:
The students are liable to present sustainable solutions to the problem in society and nature. They are also able to see that these solutions are practicable and draw road maps to achieve them.

PS-13:
1.   Suggest ways in which you can use your knowledge of engineering / technology / management for universal human order from your family to world family.
2.   Suggest one format of humanistic constitution at the level of nation from your side.

Expected Outcome:
The students are able to grasp the right utilization of their knowledge in their streams of technology / engineering / management to ensure mutually enriching and recyclable production systems.

PS-14: The course is going to be over now. Evaluate your state before and after the course in terms of-
*   Thoughts
*   Behavior
*   Work and
*   Realization
        Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

Expected Outcome:
The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for happy and prosperous society.

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Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

FUNDAMENTALS OF COMPUTING

Paper Code: ETCS-111	**L**	**T**	**C**
Paper: Fundamentals of Computing	**2**	**0**	**2**

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 10 marks

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Objective: The objective of the paper is to facilitate the student with applied working knowledge of computers. This is the first course of computing and does not assume any pre-requisite.

UNIT-I

Five Component Model of a Computer, System and Application software (introduction) storage devices , primary (RAM, ROM, PROM, EPROM, cache) Memory and secondary (magnetic tape, hard disk, Compact disks) memory , peripheral devices , printers.

[T1], [T2][8 Hours]

UNIT-II

Operating Systems: DOS Internal, External commands, Windows (2000 and NT) , Overview of architecture of Windows, tools and system utilities including registry , partitioning of hard disk , Overview of Linux architecture , File system , file and permissions , concept of user and group , installation of rpm and deb based packages.

[T1], [T2][8 Hours]

UNIT-III

Basics of programming through flow chart , Networking Basics - Uses of a network and Common types of networks , Network topologies and protocols , Network media and hardware , Overview of Database Management System.

[T1],[T2],[R1][8 Hours]

UNIT-IV

Libre / Open Office Writer : Editing and Reviewing, Drawing, Tables, Graphs, Templates
Libre / Open Office Calc : Worksheet Management , Formulas, Functions, Charts
Libre / Open Office Impress: designing powerful power-point presentation

[R2][R3] [8 Hours]

Text:
[T1]   Peter Norton, Introduction to computers, Sixth Edition Tata McGraw Hill (2007).
[T2]   Andrews Jean, A+Guide to Managing & Maintaining Your PC, Cengage Publication 6/e
References:
[R1]   Anita Goel, Computer Fundamentals, Pearson Education.
[R2]   Joiner Associates Staff, Flowcharts: Plain & Simple: Learning & Application Guide , Oriel Inc
[R3]   http://www.openoffice.org/why/
[R4]   http://www.libreoffice.org/get-help/documentation/

<u>**Applied Chemistry**</u>

	L	T	C
Paper Code: ETCH – 113			
Paper : Applied Chemistry	2	1	3

INSTRUCTIONS TO PAPER SETTER: **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. Each 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 Applied Chemistry aspects that are required for his understanding of basic chemistry

UNIT I: FUELS

Definition, Classification & Calorific value of fuels (gross and net), Dulong's formula **(Numericals)**, Determination of calorific value of fuels using bomb's calorimeter **(Numericals)**, Determination of calorific value of fuels using Boy's Gas Calorimeter **(Numericals),** Cracking – Thermal & catalytic cracking, Octane & Cetane numbers with their significance. High & Low temperature carbonization, Manufacture of coke (Otto – Hoffmann oven) Proximate and ultimate analysis of Coal **(Numericals)** Combustion of fuels **(Numericals)**.

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

UNIT II: THE PHASE RULE & CATALYSIS

Definition of various terms, Gibb's Phase rule & its derivation, Application of phase rule to One component system- The water system, Application of phase rule to Two component system- The Lead-Silver system (Pattinson's process).

Catalyst and its characteristics, Types of catalysts, Concept of promoters, inhibitors and poisons. Theories of catalysis: Intermediate compound formation theory, adsorption or contact theory. Application of catalysts for industrially important processes Enzyme catalysis: Characteristics, Kinetics & Mechanism of enzyme catalysed reaction (Michaelis-Menten equation), Acid-Base catalysis: Types, Kinetics & Mechanism, Catalysis by metals salts (Wilkinson's Catalyst), Auto-catalysis, Heterogeneous catalysis (Langmuir-Hinshelwood mechanism.

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

UNIT III: WATER

Introduction and specifications of water , Hardness and its determination by EDTA method **(Numericals)**, Alkalinity and its determination **(Numericals)**, Reverse Osmosis, Electrodialysis, Disinfection by break-point chlorination. Boiler feed water, boiler problems– scale, sludge, priming & foaming: causes & prevention, Boiler problems– caustic embrittlement & corrosion: causes & prevention, Water Softening by Internal Treatment: carbonate & phosphate conditioning, colloidal conditioning & calgon treatment Water Softening by External Treatment: Lime-Soda Process **(Numericals)** Zeolite & Ion-Exchange Process.

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

UNIT IV: CORROSION & ITS CONTROL

Causes, effects & consequences; Chemical or Dry corrosion & its mechanism (Pilling-Bedworth Rule) Electrochemial or Wet Corrosion & Its mechanism, Rusting of Iron Passivity, Galvanic series, Galvanic Corrosion, Soil Corrosion Pitting Corrosion, Concentration Cell or Differential Aeration Corrosion, Stress Corrosion. Factors Influencing Corrosion: Nature of metal and nature of corroding environment; Protective measures: Galvanization, Tinning Cathodic Protection, Sacrificial Anodic protection, Electroplating, Electroless plating, Prevention of Corrosion by Material selection & Design.

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

 Text Books:
[T1]   P. C. Jain & Monika Jain, *Engineering Chemistry*, Latest edition, Dhanpat Rai Publishing Co., 2002.
[T2]   P. Mathew, *Advance Chemistry*, 1 & 2 Combined Editions, Cambridge University Press, 2003.

Reference Books:
[R1]   P. W. Atkins and J. De Paula, *Atkins' Physical Chemistry*, Oxford, 2010.
[R2]   T. Engel and P. Reid, *Physical Chemistry*, Pearson Education, 2013.
[R3]   K. Qanungo, *Engineering Chemistry*, PHI Learning Private Limited, New Delhi, 2009.
[R4]   O. G. Palanna, *Engineering Chemistry*, Tata McGraw Hill Education Private Limited, 2012.
[R5]   D. A. Jones, *Principles and Prevention of Corrosion*, Prentice Hall, 2nd Edition, 1996.
[R6]   H. K. Chopra and A. Parmar, *Engineering Chemistry- A Text Book*, Narosa Publishing House, 2012.
[R7]   S. Chawla, *Engineering Chemistry*-All India Edition, Dhanpat Rai & Co., 2003.
[R8]   R. Gadi, S. Rattan and S. Mohapatra, *Environmental Studies*, S.K. Kataria & Sons, 2nd Edition 2009.

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

APPLIED PHYSICS LAB – I

Paper Code: ETPH-151   **P**   **C**
Paper : Applied Physics Lab – I   **2**   **1**

LIST OF EXPERIMENTS
10. To determine the wavelength of sodium light by Newton's Rings.
11. To determine the wavelength of sodium light by Fresnel's biprism.
12. To determine the wavelength of sodium light using diffraction grating.
13. To determine the refractive index of a prism using spectrometer.
14. To determine the dispersive power of prism using spectrometer and mercury source.
15. To determine the specific rotation of cane sugar solution with the help of half shade polarimeter.
16. To find the wavelength of He-Ne laser using transmission diffraction grating.
17. To determine the numeral aperture (NA) of an optical fibre.
18. To plot a graph between the distance of the knife-edge from the center of the gravity and the time period of bar pendulum. From the graph, find
    (a) The acceleration due to gravity
    (b) The radius of gyration and the moment of inertia of the bar about an axis.

  10. To determine the velocity of ultrasound waves using an ultrasonic spectrometer in a given liquid (Kerosene Oil).
   11. To verify inverse square law.
   12. To determine Planck's constant.

Text Books:
[T1] C. L. Arora 'B. Sc. Practical Physics' S. Chand

Note: Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.

ELECTRICAL TECHNOLOGY LAB

Paper Code: ETEE 153   **L   P   C**
Paper: Electrical Technology Lab   **0   2   1**

LIST OF EXPERIMENTS

13. To Design the circuit for a given load and selection of its various Components and instruments from the safety point of view
14. Study and applications of CRO for measurement of voltage, frequency and phase of signals.
15. Connection of lamp by
    (1)Single Switch Method.(2) Two-way Switch Method.
    OR
    Performance comparison of of fluorescent Tube & CFL Lamp.
16. To Verify Thevenin's & Norton's Theorem
    OR
    To Verify Superposition &Reciprocity Theorem.
    OR
    To Verify Maximum Power Transfer Theorem.
17. To Measure Power & Power Factor in a Single-Phase A.C Circuit using Three Ammeters or three Voltmeters.
18. To Measure Power & Power Factor in a Balanced Three Phase Circuit using Two Single Phase Wattcmeters.
19. To study of Resonance in a series R-L-C or Parallel R-L-C Circuits.
20. To perform open circuit and short circuit test on 1-phase transformer.
21. Starting, Reversing and speed control of DC shunt Motor
22. Starting, Reversing and speed control of 3-phase Induction Motor
23. To Study different types of Storage Batteries & its charging system.
24. .To Study different types of earthing methods including earth leakage circuit breaker (GFCI)

Note:- Any 8-10 Experiments out of the list may be chosen.

WORKSHOP PRACTICE

Paper Code: ETME-155　　　　　　　　　　　　　　　　　　　　　　　　**L**　　**P**　　**C**
Paper: Workshop Practice　　　　　　　　　　　　　　　　　　　　　　**0**　　**3**　　**2**

LIST OF EXPERIMENTS

Sheet Metal Shop
1. To study the tools and machineries used in sheet metal shop.
2. To make a tray using sheet metal tools.
3. To make a Funnel using sheet metal tools.
4. To make a cylindrical mug in sheet metal shop.

Foundry Shop
5. To make a mould in Foundry Shop.

Carpentry Shop
6. To make a half lap T-joint in Carpentry Shop.
7. To make a half cross lap joint in Carpentry Shop.
8. To make a pattern using Carpentry Tools.

Welding Shop
9. To study arc and gas welding equipments and tools.
10. To make Lap Joint, T-Joint and Butt Joint in Welding shop.

Fitting Shop
11. To make V-Section and T-Slot in fitting shop.

Machine Shop
12. To study basic operations on lathe, shaper, milling, drilling and grinding machines..
13. To perform step turning, knurling and threading operations on lathe.
14. To prepare a simple job on shaper.

Note:- Any 8-10 Experiments out of the list may be chosen.

ENGINEERING GRAPHICS

Paper Code: ETME-157   **L** **P** **C**
Paper: Engineering Graphics Lab   **0** **3** **2**

LIST OF EXPERIMENTS

UNIT - I
General: Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications,
Projections of Point and Lines: Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.
$(T_1, T_2, R_1, R_2, R_3)$

Unit - II
Planes other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.
Projections of Plane Figures: Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.
$(T_1, T_2, R_1, R_2, R_3)$

Unit - III
Projection of Solids: Simple cases when solid are placed in different positions, Axis faces and lines lying in the faces of the solid making given angles. $(T_1, T_2, R_1, R_2, R_3)$

Unit-IV
Isometric Projection of plain surface and bodies. $(T_1, T_2, R_1, R_2, R_3)$

Text Books:
[T1]   Engineering drawing by N.D.Bhatt (Charotar Publications).
[T2]   Engineering Drawing by S.C.Sharma & Navin Kumar (Galgotia Publications)

Reference Books:
[R1]   Engineering Drawing by Venugopalan, (New Age International).
[R2]   Engineering Drawing by P.S.Gill (S.K. Kataria & Sons)
[R3]   Engineering Graphics by K.C.John (PHI)

Note:- Any 8-10 Experiments out of the list may be chosen.

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APPLIED CHEMISTRY LAB

Paper Code –ETCH-161   **P**   **C**
Paper : Applied Chemistry Lab   **2**   **1**

LIST OF EXPERIMENTS

16. Determination of alkalinity of water sample.
17. Determination of hardness of water sample by EDTA method.
18. Determine the percentage composition of sodium hydroxide in the given mixture of sodium hydroxide and sodium chloride.
19. Determine the amount of oxalic acid and Sulphuric acid in one litre of solution, given standard sodium hydroxide and Potassium Permanganate.
20. Determine the amount of copper in the copper ore solution, provided hypo-solution (Iodometric Titration).
21. Determine the amount of chloride ions present in water using silver nitrate (Mohr's Precipitation Method).
22. Determine the strength of $MgSO_4$ solution by Complexometric titration.
23. Determine the surface tension of a liquid using drop number method.
24. Determine the viscosity of a given liquid (density to be determined).
25. Determine the cell constant of conductivity cell and titration of strong acid/strong base conductometrically.
26. To determine (a) λ max of the solution of $KMnO_4$. (b) Verify Beer's law and find out the concentration of unknown solution by spectrophotometer.
27. Determination of the concentration of iron in water sample by using spectrophotometer.
28. Determination of the concentration of Iron (III) by complexometric titration.
29. Proximate analysis of coal.
30. Determination of eutectic point and congruent melting point for a two component system by method of cooling curve.

    (At least 8 to 10 experiments are to be performed)

Suggested Books:

1. A. I. Vogel, G. H. Jeffery, *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5th Edition, 1989.
2. S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3rd Edition, 2008.
3. S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2nd Edition, 2003.
4. O. P. Pandey, D. N. Bajpai and S. Giri, *Practical Chemistry*, Published by S. Chand, 2005.
5. M. S. Kaurav, *Engineering Chemistry with Laboratory Experiments*, Published by PHI Learning Private Limited, 2011.
6. S. K. Bhasin and Sudha Rani, *Laboratory Manual on Engineering Chemistry*, Published by Dhanpat Rai Publishing Company, 2006.

    Note:- Any 8-10 Experiments out of the list may be chosen.

APPLIED MATHEMATICS-II

Paper Code	: ETMA-102	**L**	**T**	**C**
Paper: APPLIED MATHEMATICS-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 the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student.

Unit –I
Partial differentiation and its Applications: Partial derivatives of first and second order. Euler's theorem for homogeneous functions (without proof). Derivatives of Implicit Functions, total derivatives. Change of variables. Jacobian. Taylor's theorem for function of two variables(without proof). Error and approximation. Extreme values of function of several variables(maxima ,minima, saddle points). Lagrange method of undetermined multipliers. Partial differential equations: Formulation, solution of first order equations, Lagranges equations, Charpit's method.

[T2][No. of 12hrs.]

Unit-II
Laplace Transformation: Definition, Laplace transformation of basic functions , existence condition for Laplace transformation, Properties of Laplace transformation(Linearity, scaling and shifting). Unit step function, Impulse Function, Periodic Functions. Laplace transformation of derivatives, Laplace transformation of integrals, differentiation of transforms, Integration of transforms, Convolution theorem ,inverse Laplace transformation. Solution of ordinary Differential equations.

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

Unit-III
Complex Function: Definition, Derivatives, Analytic function, Cauchy's Riemann equation (without proof). Conformal and bilinear mappings, Complex Integration: Complex Line integration, Cauchy's integral theorem and integral formula(without proof). Zeros and Singularities, Taylor's and Laurent's series (without proof). Residues, Residue theorem (without proof). Evaluation of real definite integrals: Integration around the unit circle, Integration around a small semi circle and integration around rectangular contours.

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

Unit-IV
Multiple integrals: Double integrals, Change of order of integration, Triple integrals. Vector Calculus: Scalar and vector functions, Gradient, Divergence and curl. Directional derivatives, Line Integrals. Surface integrals, volume integrals. Green's theorem, Stoke's theorem and Gauss divergence theorem (without proof).

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

Text:
[T1].   E. kresyzig," Advance Engineering Mathematics", Wiley publications
[T2]   Michael Greenberg, "Advance Engineering mathematics", Pearson.

References:
[R1]   R.K. Jain and S.R.K. Iyengar,"Advanced Engineering Mathematics "Narosa Publications
[R2]   B. S. Grewal,"Higher Engineering Mathematics" Khanna Publications.
[R3]   S. Ponnusamy, "Foundation of Complex Analysis" Narosa Publication
[R4]   G.B. Thomas and R. N. Finny " Calculus and Analytic Geometry" Addison Wesley/ Narosa
[R5]   Wylie R, " Advance Engineering mathematics" , McGraw-Hill
[R6]   M. Spiegel, "Schaum's Outline on Laplace Transform, Tata McGraw-Hill

APPLIED PHYSICS – II

Paper Code: ETPH-104

Paper : APPLIED PHYSICS – II

| | L | T | C |
| | 2 | 1 | 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 Applied Physics aspects that are required for his understanding of basic physics.

UNIT I
Electromagnetic Theory : Gradient, Divergence, Curl, Gauss' law, Ampere's Law, Continuity equation, Maxwell's equations (differential and integral forms), Significance of Maxwell's equations, Poynting Theorem, Electromagnetic wave propagation in dielectrics and conductors.

[T1], [T2][No. of Hrs. 8]

UNIT II
Statistical Physics: Black body radiation, Planck's radiation formula, Wien's and Rayleigh-Jeans Laws, Distribution laws: Qualitative features of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics & their comparison (without derivation).

Quantum Mechanics: Postulates of Quantum mechanics, de-Broglie hypothesis, Davisson Germer experiment, Wave function and its physical significance, Wave Packet, Phase and group velocities, Uncertainty principle, Schrodinger equation for free particle, Time dependent Schrodinger equation, Particle in a box (1-D).

[T1][T2][No. of Hrs. 8]

UNIT III
Crystal Structure: Types of solids, Unit cell, Types of crystals, Translation vectors, Lattice planes, Miller indices, Simple crystal structures, Interplaner spacing, Crystal structure analysis: Bragg's law, Laue method, Point defects: Schottcky and Frankel defects.

[T1], [T2][No. of Hrs. 8]

UNIT IV
Band Theory of Solids: Introduction, Kronig-Penney model: E-k diagram, Effective mass of an electron, Intrinsic semiconductors: Electron concentration in conduction band, Hole concentration in valence band, Extrinsic semiconductor: p-type and n-type semiconductors, Fermi level, Hall Effect: Hall voltage and Hall coefficient.

[T1][T2][No. of Hrs. 8]

Text Books:
[T1].   Arthur Beiser 'Concepts of Modern Physics', [McGraw-Hill], 6th Edition 2009.
[T2].   A. S.Vasudeva, 'Modern Engineering Physics', S. Chand, 6th Edition, 2013.

Reference Books
[R1].   Richard Wolfson 'Essential University Physics' Pearson, Ist edition, 2009.
[R2].   H.K. Malik & A. K. Singh 'Engineering Physics' [McGraw-Hill], Ist Edition, 2009.
[R3].   C. Kittle, 'Mechanics', Berkeley Physics Course, Vol.- I. Latest Edition.
[R4].   Irving Kaplan 'Nuclear Physics' Latest Edition.
[R5].   John R. Taylor, Chris D. Zafirator and Michael A. Dubson, 'Modern Physics For Scientists and Engineers', PHI, 2nd Edition.
[R6].   D.J. Griffith, 'Introduction to Electrodynamics', Prentice Hall, Latest Edition.

ELECTRONIC DEVICES

	L	**T**	**C**
Paper Code: ETEC-106	**3**	**0**	**3**
Paper : Electronic Devices			

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

4. This is the first introductory course in Electronics Engineering to the students of all the branches of engineering during the first year.
5. Question No.1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions from each unit. It should be of 25 marks.
6. 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: Objective of the paper is to facilitate the student with the basics of electronic aspects that are required for his understanding and applications in their respective field of study. The pre-requisites are, to have a basic understanding of Applied Physics and Mathematics.

Unit-I
Evaluation Of Electronics: Introduction & Application Of Electronics, Energy Band Theory Of Crystals, Energy Band Structures In Metals, Semiconductors And Insulators, Theory Of Semiconductors: Classification Of Semiconductors, Conductivity Of Semiconductors, Carrier Concentration In Intrinsic & Extrinsic Semiconductors, Properties Of Intrinsic And Extrinsic Semiconductors, Variation In Semiconductors Parameters With Temperature, Fermi-Dirac Function, Fermi Level In A Semiconductor Having Impurities,   Band Structure Of Open-Circuited P-N Junction, Drift And Diffusion Currents, Carrier Life Time, Continuity Equation (Elementary Treatment Only)

[T1][T2][T3][No. Of Hours: 12]

Unit – II
Theory of p-n junction Diode: Diode Current Equation, Diode Resistance, Transition Capacitance, Diffusion Capacitance, (Elementary treatment only), Effect of Temperature on p-n Junction Diode, Switching Characteristics, Piecewise Linear Model, **Special Diodes:** Zener Diode, Varactor Diode, Tunnel Diode, Photodiode, Light Emitting Diodes, Schottky Barrier Diode, **Applications of Diodes:** Half-Wave Diode Rectifier, Full-Wave Rectifier, Clippers and Clampers (Elementary treatment only).

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

Unit – III
Bipolar junction transistor: Introduction of transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations, Eber-moll's model.

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

Unit – IV
Application of BJT: CB, CE, CC configurations, hybrid model for transistor at low frequencies, Introduction to FETs and MOSFETs.
Fundamentals of digital electronics: Digital and analog signals, number systems, Boolean algebra, logic gates with simple applications, logic gates, karnaugh maps.

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

Text Books
1. S. Salivahanan, N. Suresh Kr. & A. Vallavaraj, "Electronic Devices & Circuit", Tata McGraw Hill, 2008
2. Millman, Halkias and Jit, "Electronic devices and circuits" McGraw Hill
3. Boylestad & Nashelsky, "Electronic Devices & Circuits", Pearson Education, 10TH Edition.

Reference Books
1. Sedra & Smith, "Micro Electronic Circuits" Oxford University Press, VI Edition
2. Robert T. Paynter, "Introducing Electronic Devices & Circuits", Pearson Education, VII Edition, 2006

INTRODUCTION TO PROGRAMMING

Paper Code: ETCS-108   **L   T   C**
Paper: Introduction to Programming   **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 the paper is to facilitate the student with the basics of programming aspects, using C as the primary language. This course focuses on the programming constructs which are used in other languages as well. This is the first course on programming and does not assume any prerequisite.

UNIT I
Concept of algorithms, Flow Charts, Overview of the compiler (preferably GCC) , Assembler, linker and loader , Structure of a simple Hello World Program in C ,Overview of compilation and execution process in an IDE (preferably Code Block)

[T1],[T2], [R4][R5][No. of hrs 8]

UNIT II
Programming using C: Preprocessor Directive, C primitive input output using get char and put char , simple I/O Function calls from library , data type in C including enumeration , arithmetic, relational and logical operations, conditional executing using if, else, switch and break .Concept of loops , for, while and do-while , Storage Classes: Auto, Register, Static and Extern

[T1], [T2], [R7][No. of hrs 8]

UNIT III
Arrays (one and two dimensional), 2-d arrays used in matrix computation. Concept of Sub-programming, functions. Parameter transmission schemes i.e. call by value and call by reference, Pointers, relationship between array and pointer, Argument passing using pointers, Array of pointer, passing arrays as arguments

[T2], [R1], [R7][No. of hrs 8]

UNIT IV
Structure and unions , Strings and C string library, File Handling in C Using File Pointers,fopen( ), fclose( ),Input and Output using file pointers, Character Input and Output with Files , String Input / Output Functions , Formatted Input / Output Functions,Block Input / Output Functions, Sequential Vs Random Access Files , Positioning the File Pointer

[T1], [T2],[R2][R7][No. of hrs 8]

Text Books:
[T1]   Herbert Schildt, "C: The Complete Reference", OsbourneMcgraw Hill, 4th Edition, 2002.
[T2]   Forouzan Behrouz A. "Computer Science: A Structured Programming Approach Using C, Cengage Learning 2/e

Reference Books:
[R1]   Kernighan & Ritchie, "C Programming Language", The (Ansi C version), PHI, 2/e
[R2]   K.R Venugopal, "Mastering C ", TMH
[R3]   R.S. Salaria "Application Programming in C " Khanna Publishers4/e
[R4]   Yashwant Kanetkar " Test your C Skills " , BPB Publications
[R5]   http://www.codeblocks.org/
[R6]   http://gcc.gnu.org/
[R7]   Programming in ANSI C, E. Balagurusamy; Mc Graw Hill, 6th Edition.

ENGINEERING MECHANICS

Paper Code: ETME 110
Paper: Engineering Mechanics

	L	T	C
	2	1	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 GIVE THE BASIC PRINCIPLES OF MECHANIC APPLIED IN DIFFERENT DISCIPLINES OF ENGINEERING.

UNIT- I

Force system: Free body diagram, Parallel force system, concurrent force system, Equilibrium equations and applications in different force systems.
Friction: Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, Belt drive- derivation of equation $T_1/T_2 = e^{\mu\theta}$ and its application, M.A, V.R and Efficiency of Screw Jack, Application of friction in pivot and collar bearing..

[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

UNIT- II

Structure: Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section, graphical method.
Distributed Force: Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, Pappus theorems, polar moment of inertia.

[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

Unit-III

Kinematics of Particles: Rectilinear motion, plane curvilinear motion-rectangular coordinates, normal and tangential component.
Kinetics of Particles: Equation of motion, rectilinear motion and curvilinear motion, work energy equation, conservation of energy, impulse and momentum, conservation of momentum, impact of bodies, co-efficient of restitution, loss of energy during impact.

[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

Unit-IV

Kinematics of Rigid Bodies: Concept of rigid body, type of rigid body motion, absolute motion, introduction to relative velocity, instantaneous center of velocity, Velocity polygons for four bar mechanism and single slider mechanism.
Kinetics of Rigid Bodies: Equation of motion, translatory motion and fixed axis rotation, application of work energy principles to rigid bodies conservation of energy.
Shear force and bending Moment Diagram.   **[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]**

Text Books:
T1. Engg Mechanics by A.K.Tayal (Umesh Publications).
T2. Engg Mechanics by Basudeb Bhattacharya (Oxford university Press)
Reference Books:
R1. Engg Mechanics by Irving H. Shames (Pearson publications).
R2. Engg Mechanics by U.C.Jindal (Galgotia Publications).
R3. Engg Mechanics by Beer & Johnston(TMH).
R4. Engg Mechanics by K.L.Kumar (TMH).
R5. Engg Mechanics by Sadhu Singh (Khanna Publishers).

COMMUNICATION SKILLS

		L	**T**	**C**
Paper Code: ETHS – 112		**2**	**1**	**3**
Paper: Communication Skills				

INSTRUCTIONS TO PAPER SETTERS: **MAXMIUM 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 language and communication competence of professional students with emphasis on English for Specific Purposes (ESP) through communication skills related activities.

UNIT-I

I. **Basic Remedial Grammar** (Errors in Parts of Speech, Tenses, Verbs and Modal; Reported Speech; Active and Passive Voice; Conditional clauses; Question Tags and Short Responses)

[T1],[R2],[R3]**[No. of hrs 06]**

UNIT-II

II. **Vocabulary and usage** (Synonyms and Antonyms; Suffixes and Prefixes; Homophones and Homonyms; One-word substitution; Prepositions; Phrasal verbs and Idioms, Indianism)

[T1],[R2],[R3]**[No. of hrs 06]**

UNIT-III

(A)
- IV.   Types of writing (Expository, Descriptive, Narrative, Analytical and Argumentative)
- V.   Definition, description and explanation of scientific objects, instruments and processes etc.
- VI.   Interpretation and use of charts, graphs and tables in technical writing.[T1],[R1]

(B)
- IV.   Paragraph writing
- V.   Precis writing
- VI.   Comprehension   [T1],[R2],[R3]

[No. of hrs 10]

UNIT-IV

- VIII.   Reading different types of texts (speed and purpose)[T1]
- IX.   Reading five essays [T2]
- X.   E.M. FORSTER, *What I Believe*   (Pg-123)
- XI.   JAMES BRYCE, *Some Hints on Public Speaking*   (Pg-135)
- XII.   L.A. HILL, *Principles of Good Writing*   (Pg-150)
- XIII.   A.P.J. ABDUL KALAM, *Work Brings Solace*   (Pg-207)
- XIV.   SALIM ALI, *Man and Nature in India: The Ecological Balance*   (Pg-213)

[No. of hrs 10]

TEXT BOOKS

[T1]   Technical Communication: Principles and practice (OUP), (Meenakshi Raman and Sangeeta Sharma) OXFORD UNIVERSITY PRESS

[T2]   Communication Skills for Engineers, Murli Krishna, Pearson.

[T3]   Wren and Martin: High School English Grammar and Composition; S. Chand

[T4]   Exploration of Ideas; An Anthology of Prose: Orient Blackswan.

REFERENCE BOOKS:

[R1]   Professional Communication: Aruna Koneru, MCGRAW HILLS EDUCATION PVT. LTD

[R2]   Wren and Martin: High School English Grammar and Composition; S. Chand

[R3]   Advanced English Grammar and Composition: Gurudas Mukherjee & Inidbar Mukherjee; (ANE BOOKS PVT. LTD.)

ENVIRONMENTAL STUDIES

Paper Code: ETEN-114   **L**   **T**   **C**
Paper : Environmental Studies   **2**   **1**   **3**

INSTRUCTIONS TO PAPER SETTER: **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. Each 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 make students environment conscious. They will be exposed through the fundamental concepts of environment and ecosystem so that they can appreciate the importance of individual and collective efforts to preserve and protect our environment. This course must raise various questions in student's mind that how our environment is inter dependent on various factors and how human being must care for their natural surroundings.

UNIT I: Environmental Studies: Ecosystems, Bio-diversity and its Conservation

(i) The Multidisciplinary Nature of Environmental Studies-

Definition, scope and importance of Environmental Studies. Biotic and a biotic component of environment, need for environmental awareness.

(ii) Ecosystems

Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structures and function of the following ecosystem:

(a) Forest ecosystem
(b) Grassland ecosystem
(c) Desert ecosystem
(d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

(iii) Bio-diversity and its Conservation

Introduction to biodiversity —definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, national and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity : Habitat loss, Poaching of wildlife, man-wildlife conflicts, rare endangered and threatened species(RET) endemic species of India, method of biodiversity conservation: *In-situ* and *ex-situ* conservation.

[T1], [R3][No. of hrs. 08]

UNITII: Natural Resources: problems and prospects

  (ii) Renewable and Non-renewable Natural Resources

 Concept and definition of Natural Resources and need for their management

- *Forest resources:* Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.
- *Water resources:* Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems, Water conservation, rain water harvesting, watershed management.
- *Mineral resources:* Uses are exploitation, environmental effects of extracting and using mineral resources, case studies.
- *Food resources:* World food problems, changes causes by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- *Energy resources:* Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Urban problems related to energy, case studies.
- *Land resources:* Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

[T1], [R3][No. of hrs. 08]

UNIT III: Environmental Chemistry and Pollution Control
(i) *Chemistry of Environment*
    (c) Green Technology

Principles of Green technology, Zero Waste Technology, Green Chemistry & Its basic principles, Atom Economy, Green Methodologies. clean development mechanisms (CDM), concept of environmental impact assessment,

    (d) Eco-Friendly polymers

Environmental degradation of polymers, Biodegradable, Photo-biodegradable polymers, Hydrolysis & Hydrobiodegradable, Biopolymers & Bioplastics: polylactic acid, polyhydroxybutyrate, polycaprolactone,. Concept of bioremediation.

(ii) *Environmental Pollution*

Definition, types, causes, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards. Pollution case studies. Solid waste and its management: causes, effects and control measures of urban and industrial waste.

Chemical toxicology-Terms related to toxicity, impact of chemicals (Hg, As, Cd, Cr, Pb) on environment.

[T1], [R3][No. of hrs. 08]

UNIT IV: Disaster Management, Social Issues, Human Population and the Environment
    (ii) Disaster Management

Disaster management: floods, earthquake, cyclone and land-slides, nuclear accidents and holocaust, *case studies*.

    (ii) Social Issues, Human Population and the Environment

Sustainable development, Climate change, global warming, acid rain, ozone layer depletion, Environmental ethics: Issues and possible solutions, Consumerism and waste products, , Wasteland reclamation. Population growth, problems of urbanisation.

Environment Protection Act, 1986; Air (Prevention and Control of Pollution) Act, 1981; Water (Prevention and Control of Pollution) Act, 1974; Wildlife Protection Act, 1972; Forest Conservation Act, 1980; Environmental management system standards-ISO 14000 series.

[T1][No. of hrs. 08]

Text Books:
[T1]   E. Barucha, *Textbook of Environmental Studies for Undergraduate Courses*,
        Universities Press (India) Pvt. Ltd., 2005.
[T2]   S. Chawla, *A Textbook of Environmental Studies,* McGraw Hill Education Private Limited, 2012

References Books:
[R1]   G. T. Miller, *Environmental Science*, Thomas Learning, 2012
[R2]   W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
[R3]   R. Rajagopalan, *Environmental Studies*: From Crisis to Cure, 2nd Edition, Oxford University Press, 2011.
[R4]   A.K. De, *Environmental Chemistry*, New Age Int. Publ. 2012,,
[R5]   A. Kaushik and C.P. Kaushik, Perspectives in Environment Studies, 4th Edition, New Age International Publishers,2013
[R6]   Environmental Engineering by Gerard Kiely, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2010.

APPLIED PHYSICS LAB – II

Paper Code: ETPH-152	**P**	**C**
Paper: Applied Physics Lab – II	**2**	**1**

LIST OF EXPERIMENTS

13. To determine the e/m ratio of an electron by J.J. Thomson method.
14. To measure the frequency of a sine-wave voltage obtained from signal generator and to obtain lissajous pattern on the CRO screen by feeding two sine wave signals from two signal generators.
15. To determine the frequency of A.C. mains by using Sonometer .
16. To determine the frequency of electrically maintained tuning fork by Melde's   method.
17. Computer simulation (simple application of Monte Carlo): Brownian motion, charging & discharging of a capacitor.
18. To study the charging and discharging of a capacitor and to find out the time constant.
19. To study the Hall effect.
20. To verify Stefan's law.
21. To determine the energy band gap of a semiconductor by four probe method/or by   measuring the variation of reverse saturation current with temperature.
22. To study the I-V characteristics of Zener diode.
23.   To find the thermal conductivity of a poor conductor by Lee's disk method.
24.   To study the thermo emf using thermocouple and resistance using Pt. Resistance thermometer.

Suggested Books:

[T1] C. L. Arora 'B. Sc. Practical Physics' S. Chand, Latest edition.

Note: Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.

Electronic Devices

Paper Code: ETEC-156   **P   C**
Paper: Electronic Devices Lab   **2   1**

LIST OF EXPERIMENTS

2.   Introduction to C.R.O, Function Generator& Bread Board Kit & to generate different types of waveform with the help of Function Generator & to calculate their frequency, amplitude AC & DC voltage.
2.   Identification & testing of Active & passive components
4.   To plot V-I characteristics of a semiconductor diode &
     Calculate Static & Dynamic Resistance
4. To Study the Reverse characteristics of Zener diode
5. To Study the Rectifier circuit.
     a) Half Wave Rectifier
     b) Centre Tapped Rectifier.
     c) Bridge Rectifier.
6.   To Study the output waveforms of different Filter Ckts of Rectifier.
7. To Plot Input & Output characteristics CB transistor.
8. To Plot Input & Output characteristics of CE transistor.
9. Realization of basic gates.
10. Implementation of Boolean functions (two or three variables).
11. Few experiments mentioned above to be performed on P-spice.
12. To develop a working model of any electronic circuit.

Note:- Any 8-10 Experiments out of the list may be chosen.

ENGINEERING MECHANICS LAB

Paper Code: ETME-158   **P**   **C**
Paper: Engineering Mechanics Lab   **2**   **1**

LIST OF EXPERIMENTS:

1. To verify the law of Force Polygon
2. To verify the law of Moments using Parallel Force apparatus. (simply supported type)
3. To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.
4. To find the forces in the members of Jib Crane.
5. To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.
6. To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the Wheel and Axle
7. To determine the MA, VR, of Worm Wheel (2-start)
8. Verification of force transmitted by members of given truss.
9. To verify the law of moments using Bell crank lever
10. To find CG and moment of Inertia of an irregular body using Computation method.

Note:- Any 8-10 Experiments out of the list may be chosen.

PROGRAMMING LAB

					P	C
Paper Code	:	**ETCS 154**				
Paper	:	**Programming Lab**			**2**	**1**

LIST OF EXPERIMENTS

For program development an IDE e.g. CodeBlock[a] , Eclipse CDT [b], Netbeans[c] is recommended

12. Write a program to find divisor or factorial of a given number.
13. Write a program to find sum of a geometric series
14. Write a recursive program for tower of Hanoi problem
15. Write a recursive program to print the first m Fibonacci number
16. Write a menu driven program for matrices to do the following operation
    depending on whether the operation requires one or two matrices

Addition of two matrices

Subtraction of two matrices

Finding upper and lower triangular matrices

Transpose of a matrix

Product of two matrices.

17. Write a program to copy one file to other, use command line arguments.
18. An array of record contains information of managers and workers of a company.
    Print all the data of managers and workers in separate files.
19. Write a program to perform the following operators an Strings without using String
    functions
    To find the Length of String.
    To concatenate two string.
    To find Reverse of a string.
    To Copy one sting to another string.
20. Write a Program to store records of an student in student file. The data must be stored
    using Binary File.Read the record stored in "Student.txt" file in Binary code.Edit the record stored in
    Binary File.Append a record in the Student file.
21. Write a programmed to count the no of Lowercase, Uppercase numbers and special
    Characters presents in the contents of File.
22. Two Mini Projects based on the skills learned in experiments 1-10 [These mini projects may be done
    in a group not exceeding group size of 4]
    [a] http://www.codeblocks.org/
    [b] http://www.eclipse.org/cdt/
    [c] https://netbeans.org/features/cpp/
    Note:- Any 8-10 Experiments out of the list may be chosen.

ENVIRONMENTAL STUDIES LAB

Paper Code –ETEN-160   **P**   **C**
Paper : Environmental Studies Lab   **2**   **1**

LIST OF EXPERIMENTS

16. Determination of pH, conductivity and turbidity in drinking water sample.
17. Determination of pH and conductivity of soil/sludge samples.
18. Determination of moisture content of soil sample.
19. Determination of Total Dissolved Solids (TDS) of water sample.
20. Determination of dissolved oxygen (DO) in the water sample.
21. Determination of Biological oxygen demand (BOD) in the water sample.
22. Determination of Chemical oxygen demand (COD) in the water sample.
23. Determination of Residual Chlorine in the water sample.
24. Determination of ammonia in the water sample.
25. Determination of carbon dioxide in the water sample.
26. Determination of nitrate ions or sulphate ions in water using spectrophotometer.
27. Determination of the molecular weight of polystyrene sample using viscometer method.
28. Base catalyzed aldol condensation by Green Methodology.
29. Acetylation of primary amines using eco-friendly method.
30. To determine the concentration of particulate matter in the ambient air using High Volume Sampler.

P.S.: For better understanding of various aspects of environment visits to local areas, depending upon easy access and importance may be planned to any nearby river, forest, grassland, hills and students should write a report based on their observations.

Suggested Books:

1. A. I. Vogel, G. H. Jeffery, *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5th Edition, 1989.
2. dst.gov.in/green-chem.pdf (monograph of green chemistry laboratory experiments).
3. S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3rd Edition, 2008.
4. S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2nd Edition, 2003.
5. W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
6. A. Kaushik and C. P. Kaushik, *Perspectives in Environment Studies*, 4th Edition, New Age International Publishers, 2013.

Note:- Any 8-10 Experiments out of the list may be chosen.

APPLIED MATHEMATICS-III

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

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

SENSORS AND TRANSDUCERS

Paper Code: ETIC-203   **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

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SWITCHING THEORY AND LOGIC DESIGN

</div>

	L	**T/P**	**C**
Paper Code: ETEC-205	3	1	4
Paper: Switching Theory and Logic Design			

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 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

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

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 Hours: 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 Hours: 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 Hours: 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 Hours: 10]

Text Books:
[T1]   W H Hayt "Engineering Circuit Analysis" TMH Eighth Edition
[T2]   D. R. Choudhary, "Networks and Systems" New Age International, 1999.

Reference Books:
[R1]   S Salivahanan   "Circuit Theory " Vikas Publishing House 1st Edition 2014
[R2]   Valkenburg, " Network analysis" PHI, 2000.
[R3]   Bhise, Chadda, Kulshreshtha, " Engineering network analysis and filter design" Umesh publication, 2000.
[R4]   Kuo, "Network analysis and synthesis" John Weily and Sons, 2nd Edition.
[R5]   Allan H Robbins, W.C.Miller "Circuit Analysis theory and Practice"Cengage Learning Pub 5th Edition 2013
[R6]   Bell "Electric Circuit", 7th Edition, Oxford Publications

DATA STRUCTURES

Paper Code: ETCS-209   **L**   **T/P**   **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.

BASICS OF MEASUREMENTS

	L	**T/P**	**C**
Paper Code: ETIC-211	3	1	4
Paper: Basics of Measurements			

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: To provide the basic understanding about the importance of measurement, information about different types of instruments and gadgets used for measurement and their characteristics besides some of its standards and calibration methods.

UNIT-I
Introduction to Measurement:
Significance of measurement, Different methods of measurement, Classification of measuring instruments, Application of measurement systems, typical measurement schemes.
Units and Standards:
MKS, SI units of engineering parameters, Details of different standards-mass, length, time, frequency, temperature, EMF, ampere, sub standards and lab standards .
Performance Characteristics:
Definition of range, span, accuracy, precision, drift, sensitivity, reproducibility, repeatability, dead zone, resolution, hysteresis, threshold, zero error, noise, linearity, loading effect, static characteristics .
[T1][T2][No. of Hours: 10]

UNIT -II
Testing & Calibration of measurement setup:
Dynamic Characteristics:
Dynamic response; Transient response; speed of response, fidelity, measuring lag etc, Linear approximation, Introduction to compensation techniques.
 Significance of testing and calibration, Calibration curve, Standards for calibration, Different calibration procedures-primary, secondary, direct, indirect, routine calibration, Calibration setup:-pressure gauge, level etc. Calibration of Ammeter, Voltmeter and Wattmeter, Energy meter.
[T1][T2][No. of Hours: 12]

UNIT-III
Analysis of Errors:
Definition; Types of errors; Calculation methods of different errors; Gaussian curve; Precision Index; Variance; Standard deviation; Uncertainty in measurement,Chi-Square Test,Curve fitting methods.
Galvanometers:
D'Arsonaval Galvanometer— construction, Torque equation, Dynamic characteristic, Balastic Galvanometer— construction, working principle.
[T1][T2][No. of Hours: 10]

UNIT -IV
Displays and Recorders:
Indicating Instruments- Construction, Operating principle of spring control, gravity control and damping.
Recorders- Working Principle of chart recorder, strip chart, circular chart, magnetic tape recorder, thermal recorders, printer.
Electronic Display- LCD, LED, alphanumeric, storage Oscilloscope.
[T1][T2][No. of Hours: 12]

Text Books:
[T1]   B. C. Nakra., K. K. Chaudhry, "Instrumentation, Measurement and Analysis", 4th Edition, McGraw Hill Education.
[T2]   Albert D.Helfrick, William D.Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI India

Reference Books:

[R1]   E.O.Doebelin,Dhanesh N Manik, "Measurement Systems",6th Edition, McGraw Hill Edu.
[R2]   M.M.S.Anand, "Electronic Instruments and Instrumentation Technology", PHI, 2005
[R3]   A.K. Sawhney, Puneet Sawhney – "A course in Electrical and Electronic Measurements and Instrumentation".

SENSORS AND TRANSDUCERS LAB

Paper Code: ETIC-251   **L   T/P   C**
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.

SWITCHING THEORY AND LOGIC DESIGN LAB

	L	T/P	C
Paper Code: ETEC-253			
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

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

Paper Code: ETEE-257   **L   T/P   C**
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.

MEASUREMENTS AND INSTRUMENTATION

		L	**T/P**	**C**
Paper Code: ETIC-204				
Paper: Measurements and 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 12.5 marks.

Objective:- To provide the basic understanding regarding ac measurements and instrumentation, working principles of associated meters and instrumentation schemes.

UNIT - I
Potentiometer and Bridges:-
A. C. Potentiometer: Theory and operation of coordinate and polar types A. C. Potentiometer, Errors and Applications.
A. C. Bridges: Configurations, Errors and accuracies, different types of bridges and their application, De Sauty Bridge, Schering Bridge, Anderson Bridge, Maxwell Bridge, Wein Bridge, Use of Shielding in Bridges, Wagner Earth Connection, Grounding and Guarding.
[T1][T2][No. of   Hours: 10]

UNIT - II
Instrument Transformers:
Construction, operation, ratio and phase errors in current transformers, compensation techniques for errors in current transformers, testing of current transformers, absolute and comparison methods, Construction, operation, ratio and phase errors in potential transformers, compensation techniques for errors in potential transformers, testing of potential transformers.
[T1][T2][No. of Hours: 10]

UNIT - III
AC instruments and Meters:
Induction type instruments; Theory, operation, adjustments and calibration of single phase energy meter, Polyphase energy meter, Ampere Hour Meters, Measurement of Volt-ampere and reactive volt amperes, Power Factor Meters, Frequency Meters, Synchroscopes, Phase sequence
Indicators, maximum demand meters.
Regulated Power Supplies, Function Generator: Sine, Cosine, Square and triangular wave, Instrumentation amplifier and their applications.
[T1][T2][No. of Hours: 12]

UNIT - IV
Electronic Measuring Instruments:
General purpose Cathode Ray Oscilloscope: Construction & working, principles, various controls, applications in measurement, Digital storage Oscilloscope (DSO).
Digital Instruments:- Voltmeter, Multimeter, Multi-parameter indicator, Signal Conditioning, Introduction to active filters and their applications.
[T1] [T2][No. of Hours: 12]

Text Books:
[T1]   P.Purkait,B.Biswas,Sanatanu Das,C. Koley, "Electrical and Electronic Measurements and Instrumentation", McGraw Hill Edu.
[T2]   Albert D.Helfrick,William D.Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI India,
Reference Books:
[R1]   E.W. Golding & Widdis, "Electrical Measurements & Measuring Instruments", Wheeler Publication.
[R2]   H. S. Kalsi, "Electronic Instrumentation", 3rd Edition, McGraw Hill Edu.
[R3]   Kishore-Electronic Instrumentation and Measurement", Pearson

CONTROL SYSTEMS

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

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**: 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. types ,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 close 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

POWER ELECTRONICS

		L	T/P	C
Paper Code: ETIC-206		3	1	4
Paper: Power Electronics				

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

THEORY AND APPLICATION OF INTEGRATED CIRCUITS

Paper Code: ETIC-208	**L**	**T/P**	**C**
Paper: Theory and Application of Integrated Circuits	**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 students with the knowledge of solid state device with theoretically infinite number of operating states or infinite discrete I/O states. And all the advantages of different transistor configuration is put into a single IC Op-amp.

UNIT- I: Fundamentals of IC Fabrication and Circuit Configurations for Linear IC
IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic ICs and packaging. Differential Amplifier, Differential Amplifier Configurations, Bipolar differential Amplifier, AC and DC characteristics. Current mirror and BJT Current Source. Current source as Active load. Voltage Sources, voltage reference. Operational Amplifiers IC 741, DC and AC performance characteristics, Open and closed loop configurations.

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

UNIT- II: Applications of Operational Amplifiers
Inverting and non inverting Amplifier, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

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

UNIT- III: Analog Multiplier, PLL, A/D and D/A Convertor
Analog Multiplier using Emitter Coupled Transistor Pair – Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope type – A/D Converter using Voltage-to-Time Conversion.

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

UNIT- IV: Waveform Generators and Special Function ICs
Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators – IC 723 general purpose regulator – Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Opto-couplers.

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

Text Books:
[T1]   Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3rd Edition, TMH, 2007.
[T2]   D. Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000

Reference Books:
[R1]   Ramakant A. Gayakwad, OP-AMP and Linear ICs, Prentice Hall/Pearson Education, 4th Edition, 2001.
[R2]   K Lal Kishore, Operational Amplifier and Linear Integrated Circuits, Pearson Education, 2006.
[R3]   S.Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.
[R4]   J.Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.

ELECTRICAL MACHINES

Paper Code: ETIC-210   **L   T/P   C**
Paper: Electrical Machines   **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

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Objective: The objective of this paper is to make students understand principle of electromechanical energy conversion and electrical machines.

UNIT- I : Principles of Electromechanical Energy Conversion.
DC machines: construction, armature windings, induced EMF equation, torque production, magnetization curve. Types of generators and motors, characteristics, commutation and interpoles, armature reaction, Speed control of dc motor and starting.
PMDC machine: Introduction and need of brushless motors.
                                                        [T1, T2][No. of Hrs. 11]
UNIT- II: **Transformers**: construction, ideal and practical transformer, equivalent circuits, voltage regulation, maximum efficiency criterion. Open circuit and short circuit tests. Phasor diagrams on no load, full load, lagging and leading power factor loads. Three phase transformer.
Introduction to polyphase induction machines, production of rotating magnetic flux vector, principle of operation, importance of air gap, comparison with transformer, types of rotor.
                                                        [T1, T2][No. of Hrs. 10]
UNIT- III: **Induction motors**: Development of an equivalent circuit, estimation of parameters, no load and block rotor tests. Torque slip characteristics, starting of induction motors methods, deep bar and double cage rotor, power relations, speed control of induction motors.
Single phase induction motor, double field revolving theory, starting methods of single phase induction motors, universal motor and introduction to switched reluctance motor.
                                                        [T1, T2][No. of Hrs. 11]
UNIT- IV: **Synchronous Machine**: construction, pitch factor and distribution factor, induced emf equation, equivalent circuits and phasor diagrams, power relations, OCC and SCC characteristics for voltage regulation of alternator, salient pole and cylindrical rotor machines and phasors. Effect of excitation and V curves. Power factor correction and parallel operation of synchronous generator.
                                                        [T1, T2][No. of Hrs. 10]

Text books:
[T1]   I.J Nagrath and D.P.Kothari, "Electrical Machines", Tata Mc Graw Hill, 2010, Fourth Edition
[T2]   Bhag S. Guru, Huseyin R. Hiziroglu, "Electric Machinery and Transformers", Oxford Pub., 3rd Ed.

Reference Books:
[R1]   M. V. Deshpande, **"**Electrical Machines" PHI
[R2]   PC Sen, "Principles of Electric Machinery and Power Electronics", Wiley and Sons, Third Edition**.**
[R3]   Ashfaq Hussain, "Electrical Machines", Dhanpat Rai
[R4]   Fitzgeral, A.E. , C.Kingslay & Umans, "Electrical Machines", Mc Graw Hill.
[R5]   Ghosh, " Electrical Machines", Pearson

COMMUNICATION SYSTEMS

Paper Code: ETIC-212   **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

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Objective: This is the first course which introduces the concepts of communication systems, channels and various analog modulation methods. Further, an insight into the behavior of noise is dealt.

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", Pearson, 5th Edition
[R3]   K. Sam Shanmugam, "Digital & Analog Communication system", John Wiley & Sons 1998.

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

MEASUREMENTS AND INSTRUMENTS LAB

Paper Code: ETIC-252   **L**   **T/P**   **C**
Paper: Measurements and Instruments Lab   **0**   **2**   **1**

List of Experiments:

1. To measure inductance using Maxwell / Anderson Bridge.
2. To measure Capacitance using Schering Bridge.
3. To measure the low resistance using Kevin Double Bridge.
4. To perform calibration of single phase energy meter (Analog Vs. Digital).
5. Unknown voltage measurement using potentiometer.
6. To measure frequency and Phase of various signals using CRO.
7. Testing of phase error and ratio error of current transformer (CT).
8. Study the characteristics of instrumentation amplifier.
9. Study the frequency response of passive filters.
10. Measurement of power line parameters (V, I, W, F, VAR, KWH, KVR etc) using series R-L-C load.

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

CONTROL SYSTEMS LAB

Paper Code: ETEE-260　　　　　　　　　　　　　　　　　　　　　**L**　　**T/P**　　**C**
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 2nd 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 2nd 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.

POWER ELECTRONICS LAB

Paper Code: ETIC-256   **L**   **T/P**   **C**
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.

THEORY AND APPLICATION OF INTEGRATED CIRCUITS LAB

Paper Code: ETIC-258   **L**   **T/P**   **C**
Paper: Theory and Application of Integrated Circuits Lab   **0**   **2**   **1**

List of Experiments:

1. Measure the DC characteristics of Operational amplifier 741.
2. To construct and test the performance of an Inverting, Non-inverting amplifier and Differential amplifier using IC µA 741.
3. To construct and test the performance of an Integrator and Differentiator using IC µA 741.
4. To design and verify the operation of instrumentation amplifier using IC µA 741.
5. To design and verify the operation of the Active low pass, High pass and Band pass filters using IC µA 741.
6. To design and construct an Astable, Monostable multivibrators and Schmitt trigger using IC µA 741.
7. To design and test RC phase shift and Wien bridge oscillators using IC µA 741.
8. To design and construct an Astable and Monostable multivibrators using NE555 Timer.
9. To design and construct a PLL Characteristics and Frequency multiplier using NE 565.
10. To design and construct a DC Power Supply using LM317 and LM78XX and LM79XX.

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

ELECTRICAL MACHINE LAB

Paper Code: ETIC-254   **L**   **T/P**   **C**
Paper: Electrical Machine Lab   **0**   **2**   **1**

List of Experiments

1. To obtain magnetization characteristics of DC shunt generator and determine critical field resistance and critical speed.
2. To perform load test on DC shunt generator and determine the characteristics.
3. To perform speed control of DC shunt motor by field and armature control.
4. To perform Open circuit and short circuit tests on single phase transformer for parameter estimation of the transformer.
5. To obtain star-star, star-delta and delta-delta connections for three phase transformers.
6. To perform parallel operation of two single phase transformers with non linear load.
7. To perform block rotor test and no load test on induction motor(three phase) for parameter estimation.
8. To perform SCC and OCC of an alternator and calculate voltage regulation at UPF, .8 leading and .8 lagging pf.

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.

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

[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.

INDUSTRIAL INSTRUMENTATION

	L	**T/P**	**C**
Paper Code: ETIC-303	3	1	4
Paper: Industrial Instrumentation			

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 familiarize the students with the measurement schemes, used for monitoring various analytical and non electrical parameters encountered in industrial applications.

UNIT-I
Temperature Measurements: Importance, advantage and limitation of different instruments ,Seeback effect, peltier effect used for temperature measurement, thermocouples, Advantage and limitation of- Vapour filled, gas filled, Liquid filled, mercury in glass, Bimetallic, Pressure spring thermometer, pyrometers, thermistors, IC based metering, Low temperature and high temperature measurement schemes.

Level Measurements: Importance, advantage and limitation of different instruments, visual level indicators, float type, Purge method of measuring level, Buoyancy method, Resistance and capcitance probes for level measurement, limit switches, level measurement in pressurized vessels, solid level measurement techniques, modern techniques for level measurements and their applications.

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

UNIT -II
Pressure Measurements: Principle of measurement of absolute/gauge/ Vaccuum, Different type of manometers, Pressure switches, pirani gauge.

Flow Measurements: Mechanical flow meter, Interferential type, Rotating vane, propeller type, orifice plate, venturi tube, flow nozzle, pivot tube, variable area flow meters, rotameters, Electromagnetic and ultrasonic flow meters, mass flow meters, and turbine flow meters, selection of flow meters and typical application scheme for very low flow and highly viscous fluid.

Force and Torque Measurement: Various measuring methods, Mechanical weighing systems, Ballistic Weighing, Hydraulic and pneumatic system, Torque Measurement, Transmission Dynamometers, Combined Force and Moment Measurement**.

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

UNIT-III
Density Measurement: Displacement and float type densitometry, hydrometer, hydrostatic densitometry, miscellaneous densitometry, oscillating densitometer, radiation densitometer, vibrating densitometer & gas densitometer.

Displacement, Linear Velocity Measurement: Gauge blocks, surface plates, use of comparators, optical methods, displacement transducer and typical applications.

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

UNIT – IV
Moisture and Humidity Measurement: Wet analysis and Dry analysis based methods, Principle Moisture sensing devices- electrical conductivity/capacitance methods/ impendence sensors/radio frequency/ microwave/Infrared absorption meters, vibrating quartz crystal moisture sensors, principle of operational instrument for measurement of humidity, modern techniques for measurement of humidity.

Vibration and Noise Measurements: Importance and harmful effects, liming/permissible value under various types of industrial environments, modern measurement techniques.

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

Text Books:
[T1]   K. Krishnaswamy, S. Vijaychitra, "Industrial Instrumentation", New Age International Publishers, 2nd Edition, 2010
[T2]   A.K.Ghosh,"Introduction to Measurements and Instrumentation", 4th Edition, PHI

Reference Books:
[R1]   S.K.Singh, "Industrial Instruments", PHI.
[R2]   W. D. Cooper, "Modern Electronics Instrumentation & Measurement Techniques", PHI.
[R3]   T. G. Beckwith, "Mechanical Measurements", 6th Edition, Addison Wesley Pub.
[R4]   C.R.Alavala, "Principles of Industrial Instrumentation and Control Systems" Cengage Learning.

MICROPROCESSORS AND MICROCONTROLLERS

Paper Code: ETEC-305	**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.

DIGITAL SYSTEM DESIGN

Paper Code: ETEC-309   **L   T/P   C**
Paper: Digital System 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

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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.

OBJECT ORIENTED PROGRAMMING USING JAVA

	L	**T/P**	**C**
Paper Code: ETIC-309	3	0	3
Paper: Object Oriented Programming using JAVA			

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

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Objective: This course introduces the fundamental programming concepts and techniques in Java and is intended for all who plan to use computer programming in their studies and careers.

UNIT I

Java fundamentals: Features of Java, OOPs concepts, Java virtual machine, Reflection byte codes, Byte code interpretation, Data types, variable, arrays, expressions, operators, and control structures.

Introducing java classes: Abstract classes, Static classes, Inner classes, Packages, Wrapper classes, Interfaces, This, Super, Access control objects and methods: defining a class, adding variables and methods, creating objects, constructors, class inheritance.

Arrays and String: Creating an array, one and two dimensional arrays, string array and methods, Classes: String and String Buffer classes.

[T1, T2, T3][No. of Hrs. 12]

UNIT II

Exception handling**:** Exception as objects**,** Exception hierarchy**,** uncaught exceptions, built in exception, creating your own exceptions, Try, final**,** Throw, throws

IO package: Input streams**,** Output streams**,** Object serialization**,** Deserialization**,** Sample programs on IO files**,** Filter and pipe streams

Multi threading: Thread Life cycle**,** Multi threading advantages and issues**,** Simple thread program**,** Java thread model: priorities, synchronization, messaging, thread classes, Run able interface, and inter thread Communication, suspending, resuming and stopping threads.

[T1,T2,T3][No. of Hrs. 12]

UNIT III

GUI: Introduction to AWT programming, Layout and component managers and menus, handling Image, animation, sound and video.

Event handling: Different Mechanism, the Delegation Event Model, Event Classes, Event Listener Interfaces.

Applet class: Applet life-cycle, passing parameters embedding in HTML, Swing components – JApplet, JButton, JFrame, etc., Sample swing programs, servlets.

[T1,T2,T3][No. of Hrs. 12]

UNIT IV

Networking: Basics, networking classes and interfaces, using java.net package, doing TCP/IP and Data-gram Programming.

Database Connectivity: JDBC architecture, connectivity and working with connection interface, Working with statements, Creating and executing SQL statements, working with Result Set.

[T1,T2,T3][No. of Hrs. 12]

Text Books:
[T1]   Patrick Naughton and Herbertz Schildt, "Java-2 The Complete Reference", 1999, TMH
[T2]   Rick Dranell, "HTML 4 unleashed", Techmedia Publication, 2004.
[T3]   Shelley Powers, "Dynamic Web Publishing", 2nd Ed., Techmedia, 1998.

Reference Books:
[R1]   E. Balaguruswamy, "Programming with Java: A Primer", TMH, 1998.
[R2]   Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley, 2004.
[R3]   Decker & Hirshfield, "Programming Java: A introduction to programming using JAVA", Vikas Publication, 2000.
[R4]   Tmy Gaddies, "Starting out with Java", Wiley Dreamtech, 2005.
[R5]   Holzner, "HTML Blackbook", Wiley Dreamtech, 2005.

INDUSTRIAL MANAGEMENT

Paper Code: ETMS-311	**L**	**T/P**	**C**
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

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.

INDUSTRIAL INSTRUMENTATION LAB

		L	T/P	C
Paper Code: ETIC-353		**0**	**2**	**1**
Paper: Industrial Instrumentation Lab				

List of Experiments:

1. Measurement of pH, conductivity and turbidity.
2. Measurement of flow using orifice/electromagnetic/positive displacement/turbine/ rotameter flow meters.
3. Measurement of vibration on text bench.
4. Study and operation of a typical Pneumatic/Hydraulic control scheme.
5. Measurement of low pressure using Pirani gauge.
6. Introduction and application of LabVIEW for Industrial applications.
7. Measurement of Temperature (Thermistro/RTD/Thermocouple) using LabVIEW.
8. Measurement of speed using LabVIEW.
9. Measurement of Level using LabVIEW.
10. Measurement of flow (turbine flow meter) using LabVIEW.
11. Measurement of Pressure using LabVIEW.

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

MICROPROCESSORS AND MICROCONTROLLERS LAB

Paper Code: ETEC-355		**L**	**T/P**	**C**
Paper: Microprocessors and Microcontrollers Lab		**0**	**2**	**1**

<u>**List of Experiments:**</u>

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.

DIGITAL SYSTEM DESIGN LAB

Paper Code: ETEC-351   **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
     i) half adder
     ii) full adder
3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
     i) multiplexer
     ii) demultiplexer
4. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
     i) decoder
     ii) 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
     i)   ALU
     ii) shift register

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

OBJECT ORIENTED PROGRAMMING USING JAVA LAB

Paper Code: ETIC-357	**L**	**T/P**	**C**
Paper: Object Oriented Programming Using Java Lab	**0**	**2**	**1**

List of Experiments:

To define a class describe its constructor, overload the constructor and instantiate its object.

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the 5 exception keywords.
5. Convert the content of a given file into the uppercase content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

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

PNEUMATIC AND HYDRAULIC INSTRUMENTATION

	L	T/P	C
Paper Code: ETIC-302			
Paper: Pneumatic and Hydraulic Instrumentation	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 students with the working and applications of a large class of pneumatic and hydraulic instruments used in various plants and industries.

UNIT - I
Introduction: Basic requirement for Pneumatic System, Servicing compressed air: Air compressors, air treatment stages, pressure regulation (FRL unit) Introduction to hydraulic system, comparison of pneumatic & hydraulic system.

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

UNIT - II
Pneumatic & hydraulic Actuators, cylinders valve positioner, piston & motor actuators, electro pneumatic actuators, cylinder lubrication, cylinder with sensors, hydraulic actuators, control valves types of control valves.

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

UNIT - III
Basic pneumatic circuits, Timing & sequence diagram: Cylinder sequencing hydraulic & pneumatic Accessories pneumatic telemetry systems: Pneumatic temperature & pressure transmitters their working and applications, electrical control in pneumatic circuit.

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

UNIT - IV
Pneumatic & Hydraulic Controllers (P,PI,PID), P&ID diagrams, converters : I/P,P/I, Pneumatic Relay, Pneumatic Sensors, Flapper nozzle assembly. Maintenance & troubleshooting of pneumatic & hydraulic systems. Introduction to Mechatronic Systems & their applications.

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

Text Books:
[T1] C. D. Johnson , "Process Control Instrumentation Technology", PHI, 2002
[T2] Andrew Parr, "Pneumatic & Hydraulic", PHI, 1999.

Reference Books:
[R1] D. Considine , "Process Industrial Instruments & Control Handbook", McGraw Hill ,1993.
[R2] B. G Liptak, "Instrument Engineers Handbook", Chilton Book Co.
[R3] S. R. Majumdar, "Pneumatic system", Tata McGraw-Hill Education

PROCESS CONTROL

		L	**T/P**	**C**
Paper Code: ETIC–304				
Paper: Process Control		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 give students comprehension about the architectures, mechanisms and algorithms for maintaining the output of a specific process within a desired range. To give students knowledge about various tuning methods of feedback controllers and multiloop controllers.

UNIT - I

Design Aspects of a process control system: Design Elements of a control system. Control aspects of a complete chemical plant, Development of a Mathematical model, Modelling considerations for control purposes, Dynamic Behavior of First order system, second order system and higher –order systems, introduction to Feedback control, Dynamic Behaviour of feedback-controlled processes, stability Analysis of feedback systems

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

UNIT - II

Design of Feedback controllers: Design problems of controllers, Selection of type of feedback controller, time–Integral performance criterion, Process Reaction Curve and frequency response characteristic, Ziegler-Nichol Rule, effect of dead time, dead time compensator and inverse response compensator

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

UNIT - III

Study of multiple loops controller: Cascade Control System, Selective control system, Split Range Control, Feed forward and Ratio control, Adaptive and Inferential control systems.

[T1, T2] [No. Of Hours 11]

UNIT – IV

Interaction & De-coupling of control loop: Interaction of control loops, relative gain array and selection of the loops. Design of non-interaction control loop, Multivariable model, Predictive control, Simple and multivariable dynamic matrix control loop.

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

Text Books:
[T1]   B. Wayne Bequette, "Process Control Modeling Design and Simulation", PHI, 2003
[T2]   G. Stephanopulous, "Chemical Process Control", PHI, 1997.

Reference Books:
[R1]   B.G Liptak, "Instrumentation Engineers Handbook", BH Publication, 1999
[R2]   D.R. Coughanour," Process system and analysis and control", TMH
[R3]   W.H. Ray," Advanced Process Control", Tata McGraw Hill

DIGITAL SIGNAL PROCESSING

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

INSTRUCTIONS TO PAPER SETTER: **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 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. **[T1]**
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 **[T1]**
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

[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.

[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.

ANALYTICAL INSTRUMENTATION

Paper Code: ETIC-308   **L   T/P   C**
Paper: Analytical Instrumentation   **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 students with a large class of instruments used to analyze materials and to establish the composition.

UNIT- I
Fundamentals of Analytical Instruments: Elements of an analytical system, signal conditioning in analytical, performance requirements of analytical instruments, validation
Gas Chromatography: Theory of Chromatography, Construction and working of gas chromatography, gas-solid chromatography, Liquid Chromatography: types of liquid chromatography, high pressure liquid chromatography.

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

UNIT- II
Mass Spectrometer: Introduction, types of mass spectrometers, components of mass spectrometers, Resolution, applications, gas chromatograph-mass spectrometer (GC-MS), liquid chromatograph-mass spectrometer.
Spectrometer: Raman spectrometer, photoacoustic and photothermal spectrometer, NMR spectrometer, ESR Spectrometer, Electron and ion spectrometer, X-ray spectrometer

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

UNIT- III
Calorimeters and Spectrophotometers: Visible-Ultraviolet spectrophotometers, infrared photometers, Atomic absorption spectrophotometers, flame photometers.
pH meters: principle, electrodes for pH measurements, types of pH meters, Ion Analyzers, Industrial Gas Analyzers, Blood Gas Analyzers.

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

UNIT- IV:
Environmental Pollution Monitoring Instruments: Air pollution monitoring instruments: Carbon Monoxide, Sulphur Dioxide, Nitrogen Oxides, Hydrocarbons, Water pollution monitoring instruments.

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

Text Books:
[T1]   R.S.Khandpur, "Handbook of Analytical Instruments", (18th reprint), Tata McGraw Hill Pub, New Delhi (2000).
[T2]   D Patranbis, "Principles of Industrial Instrumentation", Tata McGraw Hill Pub., New Delhi (1991)

Reference Books:
[R1]   E B Jones, "Instrument Technology" vol. II, Butterworths Scientific Publication, London (1985)
[R2]   Gillan McMohon "Analytical Instrumentation: A Guide to Laboratory, Portable and Miniaturized Instruments", Wiley-Interscience Publisher, 2008

MODERN CONTROL SYSTEMS

Paper Code: ETIC-310　　　　　　　　　　　　　　　　　　　　　　**L**　　**T/P**　　**C**
Paper: Modern 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 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 behaviour 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.

DATA COMMUNICATION AND NETWORKS

Paper Code: ETEC-310   **L   T/P   C**
Paper: Data Communication and Networks   **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

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Objective: To understand the basics of data communication and networking protocols.

UNIT I
Data Communication: Introduction of Data Communication: Networks, Protocols and standards, Standards organizations, Line configurations, Topology, Transmission mode, Categories of networks, Network Models and Architecture ,Detailed Functions of the OSI layers. Multiplexing: TDM, FDM, WDM, Spread Spectrum Techniques, Transmission media: Guided and Unguided media, Transmission impairment, Performance issues.
[T1][R1][R4][No of Hours: 10]

UNIT II
Error detection and correction: Types of errors detection, Vertical Redundancy Check (VRC), Longitudinal Redundancy Check (LRC), Cyclic Redundancy Check (CRC), Check sum, Error correction Mechanism. Data link control: Line discipline, Flow control, Error control. Data link protocols: Asynchronous protocols, Synchronous protocols, Character oriented protocols, Bit oriented protocols, Link access procedures, HDLC.
[T1][T2][R4][No of Hours: 12]

UNIT III
Multiple Access Control: Channel assignment techniques, ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA ,Controlled Access (Polling, Token Passing), Channelization: TDMA, CDMA, FDMA 802.x Standards: 802.11 and 802.15(Adhoc Networks) SONET / SDH: Synchronous transport signals ,Physical configuration , SONET layers , Applications. Switching: Circuit switching, Packet switching, Message switching. Frame relay: Introduction as legacy networks. ATM: Design goals, ATM architecture, ATM layers, ATM applications , Quality of Service, ATM over X(SDH/SONET).
[T1][T2][R2][R4][No of Hours: 12]

UNIT IV
Networking and internetworking devices: Repeaters , Bridges , Gateways and Other devices, Unicast and Multicast Routing, Virtual LANs Network layers: Addressing (IPV4, IPV6), Subnetting, Supernetting, Internetworking - Other protocols and network layers. TCP / IP protocol suite: Overview of TCP/IP.
[T1][R1][R3][No of Hours: 10]

Text Books:
[T1]   Behrouz A.Forouzan, 'Data Communication and Networking', 5th Edition, Tata McGraw Hill, 2013
[T2]   Andrew Tannenbaum. S. 'Computer Networks', Pearson Education, 4th Edition, 2003

Reference Books:
[R1]   William Stallings, 'Data and Computer Communication', 8th Edition, Pearson Education, 2003
[R2]   Introduction to Data communications and Networking. Tomasi, Pearson Education

PNEUMATIC AND HYDRAULIC INSTRUMENTATION LAB

Paper Code: ETIC-352   **L**   **T/P**   **C**
Paper: Pneumatic and Hydraulic Instrumentation Lab   **0**   **2**   **1**

List of Experiments:

1. Operating single acting cylinder and double acting cylinder using 3/2 push button valve.
2. Operating double acting cylinder using 5/2 pilot operated valve.
3. Operating double acting hydraulic cylinder using hydraulic 4/3 and 4/2 valve.
4. Operating single and double acting cylinder using special purpose valve – Time delay valve, Quick exhaust
    i)   valve, Twin pressure valve, Check valve etc.
5. Write a program for sequencing of two cylinders using pneumatic components only.
6. Write a program for sequencing of two cylinders using electro pneumatic components.
7. Sequencing of multiple double acting piston cylinder arrangement using electro-pneumatic components.
8. PLC programming- Operate single acting cylinder and double acting cylinder using push button and direction
    i)   Control valve. Use push buttons in the AND, OR and Latching conditions.
9. Write a PLC program for to and fro motion of single acting cylinder and double acting cylinder automatically.
10. Write a PLC program for sequencing of three cylinders in following sequence

    1.   A+B+C-A+B+C+ A- B+C+ A+B+C+
    2.   A+ B-C- A+B+C- A+B+C+
    3.   A+B+C- A+B-C- A- B-C-

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

PROCESS CONTROL LAB

		L	T/P	C
Paper Code: ETIC–354				
Paper: Process Control Lab		0	2	1

List of Experiments:

1. To implement SILO Control using PLC.
2. To control the PH of reaction Vessel using PLC.
3. To Control the operation of Bottling plant using PLC.
4. To control a chemical process using PLC.
5. To control the operation of Washing Machine using PLC.
6. To implement cascade control using Process Control Trainer.
7. To study the operation of PID Control using Process control Trainer.
8. To implement feed forward control using Process Control Trainer.
9. To implement ON-OFF control using Process Control Trainer.
10. To study the characteristics of Control Valve using Process Control Trainer.

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.

MODERN CONTROL SYSTEMS LAB

Paper Code: ETIC-358   **L   T/P   C**
Paper: Modern 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.

DATA COMMUNICATION AND NETWORKS LAB

		L	T/P	C
Paper Code: ETEC-358				
Paper: Data Communication and Networks Lab		0	2	1

List of Experiments:

1. Introduction to Computer Network laboratory
   Introduction to Discrete Event Simulation
   Discrete Event Simulation Tools - ns2/ns3, Omnet++
2. Using Free Open Source Software tools for network simulation – I Preliminary usage of the tool ns3
   Simulate telnet and ftp between N sources - N sinks (N = 1, 2, 3). Evaluate the effect of increasing data rate on congestion.
3. Using Free Open Source Software tools for network simulation - II
   Advanced usage of the tool ns3
   Simulating the effect of queueing disciplines on network performance - Random Early Detection/Weighted RED / Adaptive RED (This can be used as a lead up to DiffServ / IntServ later).
4. Using Free Open Source Software tools for network simulation - III
   Advanced usage of the tool ns3 Simulate http, ftp and DBMS access in networks
5. Using Free Open Source Software tools for network simulation - IV
   Advanced usage of the tool ns3
   Effect of VLAN on network performance - multiple VLANs and single router.
6. Using Free Open Source Software tools for network simulation - IV
   Advanced usage of the tool ns3
   Effect of VLAN on network performance - multiple VLANs with separate multiple routers.
7. Using Free Open Source Software tools for network simulation - V
   Advanced usage of the tool ns3
   Simulating the effect of DiffServ / IntServ in routers on throughput enhancement.
8. Using Free Open Source Software tools for network simulation - VI
   Advanced usage of the tool ns3
   Simulating the performance of wireless networks
9. Case Study I : Evaluating the effect of Network Components on Network Performance
   To Design and Implement LAN With Various Topologies and To Evaluate Network Performance Parameters for DBMS etc)
10. Case Study II : Evaluating the effect of Network Components on Network Performance
    To Design and Implement LAN Using Switch/Hub/Router As Interconnecting Devices For Two Different LANs and To Evaluate Network Performance Parameters.
11. Mini project - one experiment to be styled as a project of duration 1 month (the last month)

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

DIGITAL CONTROL SYSTEMS

Paper Code: ETIC–401   **L**   **T/P**   **C**
Paper: Digital 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: This involves students in the construction of a control theory for discrete-time models. To give comprehension about the Z transforms and design of discrete time control systems with different methods of stability in Z domain.

UNIT - I
Introduction to Discrete Time Control Systems
Introduction, Digital control systems, Quantizing and Quantization error, Data Acquisition, conversion and Distribution systems, The Sampling Process introduction, Mathematical Analysis of the Sampling Process, Mathematical Description of the Ideal Sampling Process-The Ideal Sampler, Construction of Sampled Signals, Data Reconstruction by Polynomial Extrapolation, The Zero Order Hold, The First Order Hold Z-Transforms, Transform of Elementary function, Important properties and theorems of the Z transform, The Inverse Z-Transformation, z transform method for solving Difference Equations, The Limitations of the Z-Transform Method, Modified z transform, Theorem of the Modified Z-Transforms
[T1, T2][No. of Hours: 12]

UNIT - II
Z plane Analysis of Discrete-Time control systems:
Introduction, Impulse sampling and Data Hold, Signal Flow Graph and Matrix Representation of Sampled Data System: Block Diagram Analysis and Transfer Functions of Closed Loop Sampled Data Systems, Signal Flow Graphs of Sampled Data Systems, The pulse transfer function.
[T1, T2][No. of Hours: 10]

UNIT - III
Design of Discrete –Time control system by Conventional Methods:
System characteristic equation, Time response, Mapping S-plane into Z-plane, Steady state accuracy, Stability Techniques, Bi-linear transformation, Routh Hurwitz Criterion, Jury stability test, Root locus, Nyquist criterion, Bode diagram, interpretation of frequency response, Closed loop frequency response, State-Space Representations of Discrete-time system, Solving Discrete-time State –space Equations, Pulse Transfer function, Discretization of continuous- time state–space equations
[T1, T2][No. of Hours: 11]

UNIT – IV
Digital Controller Design: Introduction to controller design, Control system specification, Compensation, phase lag compensator, phase lead compensator, phase lead design procedure, lag lead compensator, PID controllers, Analysis and design of Digital Control Systems using root locus and transform techniques.
[T1, T2][No. of Hours: 11]

Text Books:
[T1]   K. Ogata, "Discrete Time Control System", Prentice Hall International.
[T2]   B.C. Kuo, "Digital Control Systems", Oxford, 2007

Reference Books:
[R1]   Charles L.Phillips & H.Troy Nagle, "Digital Control system Analysis and Design" Prentice Hall International Pub.
[R2]   V.I. George, C.P. Kurian, "Digital Control Systems" Cenage Learning 2012
[R3]   Kavita Singh, Rashmi Vashisth, "Digital Control Systems", Galgotia Publications, 2013
[R4]   M. Gopal, "Digital Control & Sate Variable Methods", TMH

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

ARTIFICIAL NEURAL NETWORKS

	L	T/P	C
Paper Code: ETIC–405	3	1	4
Paper: Artificial Neural Networks			

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 give students knowledge about modeling biological neuron networks. To provide students with the neural networks ability to perform computations based on the flexibility and power of human brain by artificial means.

UNIT - I
Introduction:
Neural networks characteristics, History of development in neural networks principles, Artificial neural terminology, Model of a neuron, Topology, Neural Networks: biological concepts, neuron model, transfer functions, feed forward, feedback, supervised and unsupervised models, Learning methods- Hebbs, delta, back-propagation and competitive learning.

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

UNIT - II
Learning Methods & Neural Network Models:
Fundamental Concepts and Models, Learning Process, Learning Rules, Single Layer Perceptron Classifier, Multilayer Feedforward Network, Single-Layer Feedback Networks, types of learning, Supervised, Unsupervised, Re-inforcement learning, Knowledge, representation and acquisition. Basic Hop field model, Competitive learning, K-means clustering algorithm, Kohonen's feature maps.

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

UNIT - III
Artificial Neural Networks:
Autoassociative Memory, Performance Analysis of Recurrent Autoassociative Memory, Bidirectional Autoassociative Memory, Associative Memory of Spatio-temporal Patterns Radial basis function neural networks, Basic earning laws in RBF nets, Recurrent back propagation. Introduction to counter propagation networks, CMAC network and ART networks. Matching and Self-Organizing Networks Hamming Net and MAXNET, Unsupervised Learning of Clusters, Counter propagation Network, Feature Mapping, Self-Organizing Feature Maps, Cluster Discovery Network.

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

UNIT – IV
Applications of neural networks:
Applications such as pattern recognition, Pattern mapping, Associative memories, Optimization, Speech and decision-making, VLSI implementation of neural networks.

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

Text Books:
[T1]   B. Yegnanarayana, " Artificial Neural Networks", PHI.
[T2]   J.M. Zurada, "Introduction to artificial neural systems", Jaico Publishing House.

Reference Books:
[R1]   S. Rajasekaran, G. A. Vijaylakshmi Pai, "Neural Network, Fuzzy Logic & Genetic Algorithms Synthesis & Application", PHI, 1st edition, 2009.
[R2]   Simon Haykin, "Neural Networks", PHI, 3rd edition, 2010.

INDUSTRIAL AUTOMATION AND CONTROL

	L	**T/P**	**C**
Paper Code: ETIC-407			
Paper: Industrial Automation and 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 students with a large class of industrial processes and methods to include automation in them.

UNIT - 1
Introduction and Architecture of Industrial Automation & Control Systems; Control strategies: Feed-forward and Ratio Control, Predictive Control, Control of Systems with Inverse Response, Special Control Structures: Cascade, Override and Split Range Control.

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

UNIT - II
PLC: Introduction to Sequence/Logic Control and Programmable Logic Controllers; Software Environment and Programming of PLCs, Formal Modelling of Sequence Control Specifications and Structured RLL Programming, Programming of PLCs— Sequential Function Charts; The PLC Hardware Environment.

[T2][No. of Hrs. 11]

UNIT - III
Introduction to Computer Numerically Controlled (CNC) Machines; Interpolation, Control and Drive, Control Valves, Electric, Pneumatic and Hydraulic Actuators, Analog and Digital I/O system, Signal conditioning components; DAQ, Data acquisition software overview; DAQ cards and their applications.

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

UNIT - IV
Higher Levels of Automation Systems: Supervisory Control; Distributed Digital Control Systems (DCS), Direct digital control (DDC), SCADA— Introduction; field data interface devices, communication network and other details, System Architecture— monolithic, distributed, networked, SCADA protocols in short; Significance; application of SCADA in industry; installation of SCADA Systems; security and weakness of SCADA Systems.

[T2][No. of Hrs. 11]

Text Books:
[T1]   S. Gupta, JP Gupta , "PC interface For Data Acquiring & Process Control", 2nd Ed., Instrument Society of America 1994.
[T2]   John W. Web, Ronald A. Reis, "Programmable Logic Controllers" 5th Edition, PHI

Reference Books:
[R1]   Liptak, B. G. (E.d.), "Instrument Engineers Handbook", vol. I to III, Chilton Book Co.
[R2]   Bhatkar, Marshal , "Distributed Computer control & Industrial Automation", Dekker Publication
[R3]   Frank D. Petruzella, "Programmable Logic Controllers", 3rd Edition, McGraw Hill
[R4]   Gary John Son, "Labview Graphical Programming", II Edition, McGraw Hill, 1977.

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

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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.

ELECTRICAL DRIVES

		L	T/P	C
Paper Code: ETEE-401				
Paper: Electrical Drives		3	0	3

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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.

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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

INSTRUMENTATION DIAGNOSTICS

Paper Code: ETIC-413   **L**   **T/P**   **C**
Paper: Instrumentation Diagnostics   **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 students with the techniques to monitor and diagnose the faults in industrial instruments and maintenance strategies for them.

UNIT - I
Introduction to fault model & fault simulation. Fault location & Board level testing, Test generation for combinational circuits. D - Algorithm & its improvement.

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

UNIT - II
Introduction Maintenance Concepts, Maintenance Strategies- Corrective, Preventive and predictive maintenance.

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

UNIT - III
Condition Monitoring Techniques & Signature Analysis Applications - Vibration Monitoring, Oil Analysis, Temperature and current Monitoring, Performance Monitoring and Non-destructive Techniques. Maintenance Planning, Maintenance Documentation.

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

UNIT - IV
Training and Safety Aspects in Maintenance, Filtration and Contamination Control, Introduction to residual life assessment studies. Some Case Studies.

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

Text Books:

[T1]   B C Nakra, K K Chaudhry, "Instrumentation Measurement & Analysis.", PHI, 2003

[T2]   R.A. Colacott, "Mechanical Fault Diagnosis and Condition Monitoring", John Wiley & Sons,1997

Reference Books:

[R1]   Handbook of condition monitoring, B. K. N. Rao, Elsevier

[R2]   Liptak, B. G. (E.d.), "Instrument Engineers Handbook", Vol. I to III, Chilton Book Co.

PROCESS MODELLING & OPTIMIZATION TECHNIQUES

		L	T	C
Paper Code: ETMT-415				
Paper: Process Modelling & Optimization Techniques		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 students with the field concerned with the modeling and optimization techniques of various industrial processes.

UNIT - I

Process modelling, SISO and MIMO processes, Coupled processes, Study of Biochemical reactors, CSTR, Steam drum level, surge vessel level control, Batch reactor and Biomedical systems.

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

UNIT - II

Introduction to Control and optimization of Boiler, Cooling Tower, Distillation column, Reactors, Heat exchangers, condenser and evaporator.

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

UNIT - III

Overview of optimisation techniques, Cost functions, supervised and unsupervised methods, Linear Optimisation–Least squares method, Recursive Least square, subset selection.

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

UNIT - IV

Nonlinear Local optimisation- Direct search algorithms, general gradient based algorithms, constrained nonlinear optimisation. Nonlinear Global optimisation – Simulated annealing, Genetic algorithms, Ant colony optimisation, Process Modelling using soft computing methods.

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

Text Books:
[T1]   Oliver Nelles, "Process Nonlinear System Identification", Springer
[T2]   Stephanopoulos G. "Chemical Process Control: An Introduction to Theory and Practice", PHI

Reference Books:
[R1]   Bela G. Liptak, 'Process Control- Instrument Engineers' Handbook, Chilton Book Co.
[R2]   Regina M Murphy, 'Introduction to Chemical Processes', McGraw Hill Education
[R3]   John E. Hewson, "Process Instrumentation Manifolds", Instrumentation society of America.
[R4]   W. L. Luben, "Process Modeling & Simulation Control for Chemical Engineers", McGraw Hill. 1995
[R5]   B. Wayne Bequette, "Process Control- Modelling, Design and Simulation", PHI

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.

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

SELECTED TOPICS IN ICE

Paper Code: ETIC-417   **L   T/P   C**
Paper: Selected Topics in ICE   **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.

Objectives: To study and understand a few topics of current interest and utility to control and instrumentation Engineers.

UNIT I
Power Plant Instrumentation: Types of power plants, thermal/hydro/nuclear/non-conventional. Overall scheme from generation to power station terminals, number and types of various parameters monitored. Signal Pick up, transmission, communication to control room.

[T1] [No. of Hours:11]

UNIT II
Control Room: Lay out and details, parameter monitoring in display and recording, log sheets. Inhouse parameter monitoring and recording, Generation parameter monitoring and recording,. Control of critical parameters, P and I diagrams of important loops.

[T1] [No. of Hours:12]

UNIT III
Vibrations and Industrial Noise Control: Introduction to Vibration, Classification of Vibrations and Vibrating systems, Elementary Parts of Vibrating Systems, Undamped and Damped Vibrations of single degree of freedom Systems, Vibration Measuring Instruments and Support Excitation, Noise, DB Scale, Industrial Noise Control, Typical Applications.

[T2] [No. of Hours:10]

UNIT IV
Non Destructive Testing:
Basic philosophy and importance of NDT techniques, critical parameters/status/malfunctioning/identification. Applications of various techniques and case studies in respect of various industrial products.

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

Text Books:
[T1]   K. Krishnaswamy, M. P. Bala, "Power Plant Instrumentation", PHI
[T2]   L. G. Lasithan, "Mechanical Vibrations and Industrial noise control", PHI

Reference Books:-
[R1]   P. K. Nag, "Power Plant Engineering" Tata McGraw Hill, New Delhi
[R2]   C. D. Johnson, "Instrumentation and Control", Wiley
[R3]   Journals and Publications on NDT

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

ENGINEERING MATERIALS

		L	T/P	C
Paper Code: ETIC-419		3	0	3
Paper: Engineering Materials				

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 students with the field concerned with the design, manufacture and use of all classes of materials.

UNIT- I
Introduction to Materials science & engineering: Classification of engineering materials- functional & structural, Equilibrium & Kinetics- stability, metastability, basic thermodynamic function, statistical nature of entropy.

Crystal Geometry & Structure Determination: Geometry of crystal, structure determination by X-Ray diffraction.

Atomic Structure and Chemical bonding: structure & electronic structure of atom, quantum states, periodic table, bond energy, bond type, bond length, various types of bonding & variation in bonding character & properties.

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

UNIT- II
Structure of solid: Crystalline states & non crystalline states, Inorganic & alloy, structure of silica & silicates, Polymers- classification, structure & crystallinity of long chain polymers.

Crystal Imperfection: point imperfection, geometry of dislocation, surface imperfection.

Phase Diagram: phase rule, single component system, binary phase diagram, the lever rule.

Diffusion in solids: Fick's laws of diffusion, Kirkendall effect, atomic model of diffusion.

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

UNIT- III
Oxidation & Corrosion: Mechanism of oxidation, oxidation resistant materials, principles of corrosion, protection against corrosion.

Electrical properties of materials: Electrical conductivity, electron mobility, resistance, energy gaps in solids.

Mechanical properties of metals: Stress, strain, elasticity, tensile strength

Conductors & Resistors: resistivity range, free electron theory, conduction by free electrons, conductor and resistor materials, superconducting materials

Semiconductors: Energy band gaps in solids, Intrinsic Semiconductors, Extrinsic Semiconductor, Semiconductor materials, fabrication of integrated circuits.

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

UNIT- IV
Polymers: Structure, characteristics and applications.

Composites: Introduction, Particle reinforced composites, fiber reinforced composites & structural composites.

Magnetic Materials: terminology & classification, magnetic moments due to electron spin, ferromagnetism and related phenomena, the domain structure, soft and hard magnetic materials.

Dielectric Materials: polarization, temperature & frequency effects, electric breakdown, ferromagnetic materials.

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

Text Books:
[T1]   V.Raghavan, " Materials Science and Engineering", PHI, 5th Edition.
[T2]   William D. Callister, David G. Rethwisch, "Material Science & Engineering- An   Introduction", John Wiley & Sons, 8th edition.

Reference Books:
[R1]   Askeland, Fulay,Wright, Balani, "The Science and Engineering of Materials", Cengage Learning, 6th Ed
[R2]   R.K.Rajput, "Engineering Materials", S. Chand Pub., 2008.
[R3]   B.K.Agrawal, "Introduction to Engineering Materials", TMH, 1988.

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[R4]   A J Dekker, "Electrical Engineering Materials", Prentice Hall, 1959.

COMPUTER ARCHITECTURE

Paper Code: ETIC-421	L	T/P	C
Paper: Computer Architecture	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, 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 of 12.5 marks.

Objective: The objective of the paper is to be introducing the student about the computer arithmetic and register transfer language, control design and internal architecture of 8085 microprocessor.

UNIT- I
Computer Arithmetic and Register transfer language:
Unsigned notation, signed notation, binary coded decimal, floating point numbers, IEEE 754 floating point standard, Micro-operation, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro operation, Arithmetic Logic Shift Unit.

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

UNIT- II
Instruction set architecture & computer organization:
Levels of programming languages, assembly language instructions, 8085 instruction set architecture, Instruction Codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycle, Memory Reference Instructions, Input-Output and Interrupts

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

UNIT- III
Control Design:
Instruction sequencing & interpretation, Hardwired & Micro Programmed (Control Unit), Micrprogrammed computers, Microcoded CPU: Pentium processor. Specifying a CPU, Design & implementation of simple CPU. General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Internal architecture of 8085 microprocessor.

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

UNIT- IV
Memory & Input/Output organization: Memory Technology, Main Memory (RAM and ROM Chips), Virtual memory, High-speed memories.
Asynchronous Data Transfers, Programmed I/O, interrupts, Direct memory Access, Serial communication, UARTs, **RS-232-C & RS-422** standard.

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

Text Books:
[T1]   J. D. Carpinelli, "Computer Systems Organization and Architecture", Pearson Education, 2006.
[T2]   J. P. Hayes, "Computer Architecture and Organization", McGraw Hill, 1988.

Reference Books:
[R1]   J. L Hennessy and D. A. Patterson, "Computer Architecture: A quantitative approach", Morgon Kauffman, 1992.
[R2]   W. Stallings, "Computer organization and Architecture", PHI, 7th ed, 2005.
[R3]   B. Parhami, "Computer Architecture: From Microprocessors to Supercomputers", Oxford University press, 2006.

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SOFTWARE ENGINEERING

	L	**T/P**	**C**
Paper Code: ETIC-423	3	0	3
Paper: Software Engineering			

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 make the student well versed with the current software requirements of the industry.

UNIT I
Introduction - The Software, Software Crisis, Software Process, Definition of Software Engineering, Software Engineering Approach, Characteristics of a Software Process. The process of software development - Process models, Agile Model, Project Management Process**.**
Software Requirements Analysis and Specification, Problem Analysis, Requirement Management, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams Behavioral and non-behavioral requirements, Feasibility Analysis**.**
                                                                                [T1][R1][No. of Hours: 11]

UNIT II
Software measurement - Software process improvement by Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics.
Planning a Software Project - Project Scheduling, Staffing and Personnel Planning, Project Monitoring Plans, Risk Management. Effort and cost estimation techniques -The COCOMO model, Putnam Resource Allocation Model.
                                                                                [T1][T2][No. of Hours: 10]

UNIT III
Design concepts and principles - Abstraction, Refinement, Modularity, Architectural design - Cohesion, coupling, Refactoring of designs. Function-oriented Design - Design Principles, Module-Level Concepts , Design Notation and Specification, Structured Design – Notations , Methodology, User Interface Design.
Coding And Implementation - Top-down and Bottom-up approaches, structured programming, Object Oriented Programming**.**
Software Testing: Functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing: Path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools & Standards**.**
                                                                        [T1][T2][R4][R5][No. of Hours: 12]

UNIT IV
Software Reliability: Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Calendar time Component, Reliability Allocation, The ISO 9000 Quality standards ,Capability Maturity Model (CMM), Software Reengineering - Software reengineering process model, Reverse engineering, Software maintenance. Software Quality Assurance (SQA), Software configuration Management.
                                                                                [T1][R1][No. of Hours: 10]

Text Books:
[T1]   K.K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International, 2005.
[T2]   Pankaj Jalote, "An Integrated Approach to Software Engineering", Second Edition, Springer.

References Books:
[R1]   R. S. Pressman, "Software Engineering – A practitioner's approach", 6th ed., McGraw Hill, 1992.
[R2]   I. Sommerville, "Software Engineering", Addison Wesley, 1999.
[R3]   R. Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.
[R4]   I. Jacobson, "Object-Oriented Software Engineering: A Use Case Driven Approach", Pearson, 1992.
[R5]   Yogesh Singh, "Software Testing", Cambridge University Press, 2011.

OPERATING SYSTEMS

Paper Code: ETIC-427   **L**   **T/P**   **C**
Paper: Operating 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 goal of this course is to provide an introduction to the internal operation of modern operating systems. The course will cover processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems.

UNIT I
Introduction: What is an Operating System, Simple Batch Systems, Multiprogrammed Batches systems, Time-Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems, OS – A Resource Manager.
Memory Organization & Management: Memory Organization, Memory Hierarchy, Memory Management Strategies, Contiguous versus non- Contiguous memory allocation, Partition Management Techniques, Logical versus Physical Address space, swapping, Paging, Segmentation, Segmentation with Paging
Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Thrashing, Demand Segmentation, Overlay Concepts
[T1] [T2][R2][R3] [No. of Hours: 10]

UNITII
Processes: Introduction, Process states, process management, Interrupts, Interprocess Communication
Threads: Introduction, Thread states, Thread Operation, Threading Models.
Processor Scheduling: Scheduling levels, pre emptive vs no pre emptive scheduling, priorities, scheduling objective, scheduling criteria, scheduling algorithms, demand scheduling, real time scheduling.
Process Synchronization: Mutual exclusion, software solution to Mutual exclusion problem, hardware solution to Mutual exclusion problem, semaphores, Critical section problems. Case study on Dining philosopher problem, Barber shop problem etc.
[T1][T2][[R3][No. of Hours: 10]

UNIT III
Deadlocks: examples of deadlock, resource concepts, necessary conditions for deadlock, deadlock solution, deadlock prevention, deadlock avoidance with Bankers algorithms, deadlock detection, deadlock recovery.
Device Management: Disk Scheduling Strategies, Rotational Optimization, System Consideration, Caching and Buffering
[T1][T2][R1][No. of Hours: 10]

UNIT IV
File System: Introduction, File Organization, Logical File System, Physical File System , File Allocation strategy, Free Space Management, File Access Control, Data Access Techniques, Data Integrity Protection, Case study on file system viz FAT32,NTFS,Ext2/Ext3etc.
[T1][T2][R4][R5][No.ofHours:10]

Text Books:
[T1]   Deitel & Dietel, "Operating System", Pearson, 3rd Ed., 2011
[T2]   Silbersachatz and Galvin, "Operating System Concepts", Pearson, 5th Ed., 2001
[T3]   Madnick & Donovan, "Operating System", TMH, 1st Ed., 2001

References Books:
[R1]   Tannenbaum, "Operating Systems", PHI, 4th Edition, 2000
[R2]   Godbole, "Operating Systems", Tata McGraw Hill, 3rd edition, 2014
[R3]   Chauhan, "Principles of Operating Systems", Oxford Uni. Press, 2014
[R4]   Dhamdhere, "Operating Systems", Tata McGraw Hill, 3rd edition, 2012
[R5]   Loomis, "Data Management & File Structure", PHI, 2nd Ed.

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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

DIGITAL CONTROL SYSTEMS LAB

Paper Code: ETIC–451   L   T/P   C
Paper: Digital Control Systems Lab   0   2   1

List of Experiments:

Write MATLAB Programs for the following:

1. . Obtain the inverse Z –transform of the following:

$$X(z)= \frac{z^2+2z}{Z^2-2z+1} \quad \text{and} \quad f(z)=\frac{z(z+1)}{(z-1)^3}$$

2. For the LTI systems described by the following difference equations generate its impulse response and unit step response:
   1. $Y(n)= x(n)+2x(n-1)$
   2. $Y(n)=0.9y(n-1)+x(n)$ also find the analytical expression
   3. $Y(n)-0.3695y(n-1)+0.1958y(n-2)= 0.2066x(n)+0.4131x(n-1)+0.2066x(n-2)$

3. For the discrete-time transfer function

$$H(z) = \frac{0.25^3-0.6273z^2+0.5153z-0.1367}{Z^3-2.811z^2+2.652z-0.8395} \quad , \text{ obtain the following}$$

   - Transfer function to polo-zero conversion
   - Draw the polo-zero plot
   - Polo-zero to transfer function
   - Find the partial fraction expression of the transfer function
   - r , p , k to transfer function
   - Root locus and stability analysis

4. Find the ZOH equivalent transfer function of $\frac{10}{5s+1}$ .Obtained with the sampling period Ts=0.5sec.

5. Obtain the six different realizations of the pulse transfer function

$$\frac{y(z)}{u(z)} = \frac{z+3}{z^3+9z^2+24z+20}$$

6. For the sampled data system shown in fig. below, find the response to step   input
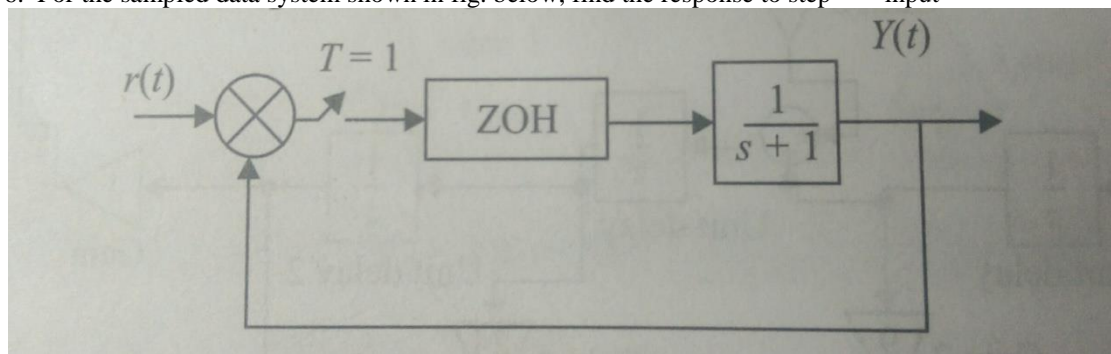
7. Find the gain for stability.
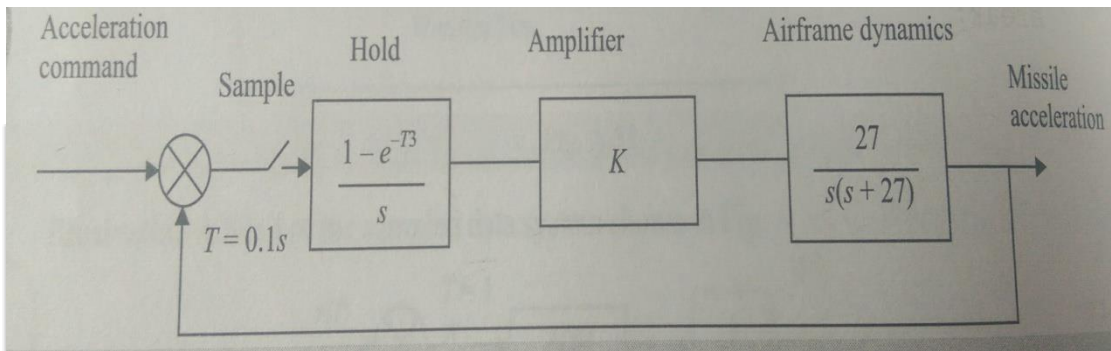
8. Determine whether the system is observable and state controllable.

$$x = \begin{bmatrix} -2 & -1 & -3 \\ 0 & -2 & 1 \\ -7 & -8 & -9 \end{bmatrix} x + \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix} u; y = \begin{bmatrix} 4 & 6 & 8 \end{bmatrix} x$$

9. Obtain bilinear transformation for
    (i) $z^3 - 1.3z^2 + 0.08z + 0.24 = 0$ and analyse the stability.
    (ii) Obtain the root locus and analyze the stability.

10. Find the pulse transfer function of the given continuous-time system given below
    A= [0 0;1 -0.1]; B= [0.1; 0]; C= [0 1]; D=[0] For sampling time Ts = 0.2 s.

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

BIOMEDICAL INSTRUMENTATION LAB

Paper Code: ETIC-453	**L**	**T/P**	**C**
Paper: Biomedical Instrumentation Lab	**0**	**2**	**1**

List of Experiments:

1. To study various transducers for biomedical applications

2. To study various functions of Bedside & Central Patient Monitoring Unit.

3. To measure blood pressure using Patient Monitoring Unit.

4. To study working principle & measure blood pressure using Sphygmomanometer.

5. To measure percentage amount of oxygenated arterial blood using Patient Monitoring Unit.

6. To measure ECG using Patient Monitoring Unit.

7. To measure body temperature using Patient Monitoring Unit.

8. To study working principle & measure body temperature using Digital Thermometer.

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

ELECTRICAL DRIVES LAB

Paper Code: ETIC-461(ELECTIVE)   **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.

DATABASE MANAGEMENT SYSTEMS LAB

		L	T/P	C
Paper Code: ETIC-461(ELECTIVE)				
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:

1. 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.

SOFTWARE ENGINEERING

Paper Code: ETIC-461(ELECTIVE) **L T/P C**
Paper: Software Engineering **0 2 1**

Required: Rational Rose Enterprise Edition

List of Experiments:

1. Write down the problem statement for a suggested system of relevance.
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
4. To perform the user's view analysis for the suggested system: Use case diagram.
5. To draw the structural view diagram for the system: Class diagram, object diagram.
6. To draw the behavioral view diagram : State-chart diagram, Activity diagram
7. To perform the behavioral view diagram for the suggested system : Sequence diagram, Collaboration diagram
8. To perform the implementation view diagram: Component diagram for the system.
9. To perform the environmental view diagram: Deployment diagram for the system.
10. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.
11. Perform Estimation of effort using FP Estimation for chosen system.
12. To prepare time line chart/Gantt Chart/PERT Chart for selected software project.

Text Books:
1. K.K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International, 2005
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", Second Edition, Springer.

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/P**	**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 teachers 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 Hours: 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 Hours: 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 Hours: 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 Hours: 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)

 # Non-University Examination Scheme (NUES)

*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.

<u>OATH TO BE TAKEN BY ENGINEERING GRADUATES</u>

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: _____

INTELLIGENT SYSTEMS AND CONTROL

Paper Code: ETIC–404   **L**   **T/P**   **C**
Paper: Intelligent Systems and Control   **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 give students concept of intelligent control with fuzzy logic and mmethodologies developed in the field of soft-computing which can lead to accommodation of more complex processes, improved performance and considerable time savings and cost reductions.

UNIT - I

Basic concepts of Fuzzy logic: Fuzzy sets, operations of Fuzzy sets, properties of Fuzzy sets, Fuzzy relations, composition of Fuzzy relation, cylindrical extension, projection, Different implications of Fuzzy If-Then rules, Fundamental issues in Control Engineering, Mamdani architecture for Fuzzy Control, The Sugeno Takagi architecture**,** FKBC Design Parameter: The FKBC architecture, choice of variable and contents of rules, knowledge representation in KBC and derivation of rules, choice of membership functions, choice of scaling factors, choice of fuzzification procedures, choice of defuzzification procedures, comparison and evaluation of defuzzification methods.

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

UNIT - II

Nonlinear and Adaptive Fuzzy Control: The FKBC as a Non-Linear Transfer Element, Types of FKBC such as PID-like FKBC, sliding Mode FKBC, Performance Evaluation, Approaches to Design such as membership function tuning using gradient descent, membership function tuning using performance criteria, the self-organizing controller, model based controller Stability of Fuzzy Control Systems: State space Approach, Stability & Robustness indices, Input-output stability, The Circle criterion, The Conicity criterion.

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

UNIT - III

Neuro fuzzy Systems: Neural networks and Fuzzy Logic, Supervised neural Network Learning of Fuzzy Models, Reinforcement based learning of Fuzzy models, Using Neural Networks to partition the input space, Neuro fuzzy Modelling.

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

UNIT – IV

Genetic Algorithms and Fuzzy Logic: An Overview, GA in problem solving, Implementation of GA, Design issues in GA, GA based Fuzzy Model Identification

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

Text Books:
[T1]   John Yen, Reza Langari," Fuzzy Logic Intelligence, Control and Information" Pearson
[T2]   T.J. Ross," Fuzzy Logic & Control Applications" Tata McGraw Hill

Reference Books:
[R1]   Fakhreddine O. Karray, Clarence De Silva," Soft Computing and Intelligent Systems Design Theory Tools and Applications" Pearson
[R2]   T. Tarano, Asai & M. Sugeno," Fuzzy System Theory & Application", Academic Press
[R3]   D. Driankov. H.Hellendoom & M. Reinfrank ,"An Introduction to Fuzzy Control" by Narosa Pub. House, New Delhi

VIRTUAL INSTRUMENTATION

Paper Code: ETIC–406   **L**   **T/P**   **C**
Paper: Virtual 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: Virtual Instrumentation gives students a concept for the design and integration of customized applications for Instrumentation, automation and control systems in real time.

UNIT - I
Introduction to LabVIEW: Definition and architecture of virtual instrumentation system, salient features and application area of virtual instrumentation, Detail of Software environment, loops, structures and tunnels, arrays, clusters, plotting data

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

UNIT - II
Data Flow Programming Techniques: Graphical programming in data flow, comparison with conventional programming, popular data flow and VI software packages. Building a VI front panel and block diagram, sub VI, for and while loops, case and sequence structure, formula nodes, local and global variables, string and file I/O, array and clusters, charts and graphs, attributes nodes

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

UNIT - III
Instrument Control: GPIB communication, hardware and software architecture and specifications, instrument I/O assistant, VISA, Instrument Drivers, Serial Port communications.

Data Acquisition: Transducers, signal conditioning, DAQ hardware configuration, DAQ hardware, Analogy I/O, Counters, Digital I/O, DAQ assistant, selecting and configuring a data acquisition device.

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

UNIT – IV
IMAQ Vision: Vision basics, image processing and analysis, particle analysis, machine vision, machine vision hardware and software, building a complete machine vision system.

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

Text Books:
[T1]   Jerome Jovitha, "Virtual Instrumentation Using LabVIEW", PHI
[T2]   Sanjay Gupta, Joseph John, "Virtual Instrumentation Using LabVIEW", TMH

Reference Books:
[R1]   Gary Johnson, "LabVIEW Graphical Programming", Second Edition, TMH
[R2]   Ronald W Larsen, "LabVIEW for Engineers", Prentice Hall Ltd.

SYSTEM MODELLING & SIMULATION

Paper Code: ETIC-408	L	T/P	C
Paper: System Modelling & Simulation	**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 students with the knowledge how something will behave without actually testing it in real life. To ensure that the results of simulation are applicable to the real world, students must understand the assumptions, conceptualizations, and implementation constraints of this emerging field.

UNIT - I
System Concept and System Models: Concept of system, stochastic activities, Continuous and discrete systems, system modelling, principles of modelling, types of models- static physical, dynamic physical, static mathematical, dynamic mathematical.
Introduction to Simulation: Need for simulation, steps of simulation models, types of simulation, discrete event simulation- Monte- Carlo simulation, estimation of demand of product & determination of the value of π. Cobweb models, Progress of a simulation study.

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

UNIT -II
Continuous system simulation: continuous system models, differential equations, analog & hybrid computers, analog methods, digital analog simulator, hybrid simulation, feedback systems & real time simulations
System Dynamics: Exponential growth & decay models, logistic curves , generalization of growth models, system dynamics diagrams, multi segment models, representation of time delays, feedback in soci-economic systems.

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

UNIT - III
Methods of Random Number Generation & their tests: Introduction, Mid Square Method, Multiplicative Congruential Method, Combined Multiple Recursive Generator, Testing Randomness of Random Numbers: Chi-Square Method, Kolmogorov-Simirnov Test, Bartels Ratio Test, Run test, run up& down test.
Probability Distribution and Random Variates: Introduction, Probability Distribution, Uniform Distribution, Exponential Distribution, Poisson distribution, Normal Distribution, Gamma Distribution, Erlang Distribution.

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

UNIT - IV
Queueing Theory: Introduction, Terminologies, Empirical Queuing Models: (M/M/1) queues, finite capacity queues, multiple servers, (M/M/c) queues. Simulation with high level languages.
Discrete system simulation: discrete events, representation of time, generation of arrival pattern, simulation of telephone system, simulation programming tasks.

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

Text Books:
[T1]   Geoffrey Gordon, "System Simulation", PHI, 2nd Edition.
[T2]   R. Panneerselvam, P. Senthilkumar, "System Simulation, Modelling and Languages", PHI.

Reference Books:
[R1]   Frank L. Severance, "System Modelling and Simulation", Wiley, 2001.
[R2]   J. Banks, J.S.Carson, B. Nelson, "Discrete Event system simulation", (2E) Prentice Hall, 1996.
[R3]   Jerry Banks and John Carson, "Discrete Event System Simulation", Fourth Edition, PHI, 2005.

EMBEDDED SYSTEMS

Paper Code: ETIC-410   **L**   **T/P**   **C**
Paper: Embedded Systems   **3**   **0**   **3**

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. 14]

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. 08]

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. 08]

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.

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", 3^Rd 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.

VLSI DESIGN

Paper Code: ETIC-414   **L**   **T/P**   **C**
Paper: VLSI 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 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

CONSUMER ELECTRONICS

Paper Code: ETEC-408   **L   T/P   C**
Paper: Consumer Electronics   **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 teaching this subject is to give students in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices like audio-systems, CD systems, TV, VCR and other items like fax machine washing machine, microwave ovens, digital camera & iPODS etc,. which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

UNIT I
Audio System: Microphones, Construction, Working principles and applications of microphone:
Carbon, Moving coil, velocity, crystal, condenser type, Cordless microphone, Dynamic & wireless microphone.
Loud Speakers: Direct radiating, horn loaded, woofer, tweeter and squeaker, baffles and enclosures.
Sound recording on magnetic tape its principles, block diagram and tape transport mechanism, Wow, Flutter & Rumble distortion. Relationship between gap width, tape speed and frequency. Optical recording and reproduction system, Blue ray technology,
VCD & DVD system, HI- Fi system, condition for good acoustic features, stereo amplifiers
[T1, T2][No. of Hours: 11]

UNIT II
Television: Monochrome TV Communication**:** Elements of TV communication system; Scanning – its need for picture transmission; Need synchronizing and blanking pulses; Progressive scanning, interlaced scanning, ell effect, resolution and band width requirement, Composite Video signal (CVS)at the end of even and odd fields, advantage & disadvantage of negative modulation, need of pre & post Equalizing pulses; Monochrome picture tube– construction and working, comparison of magnetic and electric of Construction and working of camera tube: vidicon and plumbicon, night vision camera.
Block diagram of a TV receiver: function of each block and wave form at the input and output of each block; Frequency range of various VHF bands and channels used in India, Major specification of the CCIR B standard.
Typical circuits of scanning and EHT stages of TV receiver, keyed AGC,SAW filter; trap circuit, Identification of faulty stage by analyzing the symptoms and basic idea of a few important faults and there remedies.
[T1, T2][No. of Hours: 12]

UNIT III
Color TV: Primary colors, trisimulus values, trichromitc coefficients, concepts of additive and subtracting mixing of colours, concepts of luminance, Hue and saturation, Compatibility of colour TV system with monochrome system. Block diagram of colour TV camera, Construction and working principles of Trinitron, delta gun and PIL types of colour picture tubes. Concepts of degaussing, purity, beam shifting; burst signal and its need, chrominance signal; analysis of G-Y signal is not transmitted, Block diagram of PAL TV receiver.
[T1,T2] [No. of Hours: 11]

UNIT IV
Comparison of digital TV LCD, LED, HDTV, Plasma TV &Three dimension TV.
Cable Television**:** Block diagram and principle of working of STB and DTH, Study of FAX machine,group-3 fax machine, Fuzzy logic washing machine, study of digital camera, RFID & Bluetooth technology, study of iPods,MP4 players & accessories, block diagram of microwave oven and its function of each block.
[T1,T2] [No. of Hours: 11]

Text Books:
[T1]   R. R. Gulati, "Modern Television Practice" New Age International, 2nd Edition.
[T2]   S. P. Bali, "Consumer Electronics" Pearson Education, 1st Edition.

Reference Books:
[R1]   A. Dhake, "Television & Video Engineering" TMH – 2nd Edition.
[R2]   R.R. Gulati, "Monochrome & Colour Television" New age International Publisher, 2nd Edition.
[R3]   R.G. Gupta, "Audio & Video Systems" TMH – 2nd Edition.

MOBILE COMMUNICATION

Paper Code: ETIC-418		**L**	**T/P**	**C**
Paper: Mobile communication		3	0	3

INSTRUCTION TO PAPER SETTER:　　　　　　　　　　**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 student about cellular concept, mobile radio propagation, fundamentals of equalizer, GSM and CDMA technique.

UNIT I:
The Cellular Concept-System Design Fundamentals
Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies: Prioritizing Handoffs, Practical Handoff Considerations. Interference and system: Capacity–Co-channel Interference and System Capacity, Channel Planning for Wireless Systems, Adjacent Channel interference. Improving Coverage & Capacity in Cellular Systems: Cell Splitting, Sectoring.
Mobile Radio Propagation: Large-Scale Path Loss
Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection: Reflection from Dielectrics, Brewster Angle, Reflection from Prefect Conductors. Ground Reflection (Two-Ray) Model, Diffraction: Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple Knife-edge Diffraction.　　　　　　**[T1,T2][No. of Hours: 11]**

UNIT–II
Scattering, Outdoor Propagation Models: Longley-Rice Model, Okumura Model, Hata Model. Indoor Propagation Models: Partition losses (same floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model.
Mobile Radio Propagation: Small –Scale Fading and Multipath
Small Scale Multipath propagation: Factors Influencing Small Scale Fading, Doppler shift. Impulse Response Model of a Multipath Channel: Relationship Between Bandwidth and Received power. Small-Scale Multipath Measurements: Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding.

　　　　　　[T1, T2] [No. of Hours: 11]

UNIT–III
Parameters of Mobile Multipath Channels: Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time. Types of Small-Scale Fading: Fading effects Due to Multipath Time Delay Spread-Flat Fading, Frequency Selective Fading. Fading effects Due to Doppler Spread: Fast Fading, Slow Fading.
Equalization and Diversity:
Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a Communication Receiver, Linear Equalizers, Nonlinear Equalization: Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer. Algorithms for Adaptive Equalization: Zero Forcing Algorithm, Least Mean Square Algorithm, and Recursive Least Squares Algorithm.
Diversity Techniques: Derivation of Selection Diversity Improvement, Derivation of Maximal Ratio Combining Improvement, Polarization Diversity, Frequency Diversity, Time Diversity. RAKE Receiver.

　　　　　　[T1,T2] [No. of Hours: 12]

UNIT -IV
Multiple Access Technique in Wireless Communications
Frequency Division Multiple Access, Time Division Multiple Access, Spread Spectrum Multiple Access, Space Division Multiple Access.
GSM: GSM Services and features, GSM System Architecture, GSM Radio Sub-system and GSM Channel Types.
CDMA digital cellular standard (1S-95): Frequency and Channel Specifications of IS-95, Forward and Reverse CDMA channel. Hand off and Power control in 3G system.
Introduction to EDGE, HSPA, WCDMA, LTE etc.

　　　　　　[T1, T2] [No. of Hours: 10]

Text books:
[T1]   Wireless Communications -Theodore S. Rappaport, Prentice Hall of India, PTR Publication
[T2]   Wireless Communications -Andrea Goldsmith, 2005 Cambridge University Press.

Reference books:
[R1]   Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE.
[R2]   Wireless Digital Communications – Kamilo Feher, 1999, PHI.
[R3]   Wireless Communication and Networking – William Stallings, 2003, PHI.
[R4]   Introduction to Wireless and Mobile Systems, Agrawal Dharma P, Cengage Learning. 3rd Edition
[R5]   Wireless Communications and Networking – Vijay K. Gary, Elsevier.
[R6]   Iti Saha Misra, "Wireless Communication and Networks 3G and Beyond", McGraw Hill Edu. (India) Pvt. Ltd.

ADHOC AND SENSOR NETWORKS

Paper Code: ETEC-406 **L T/P C**
Paper: Ad Hoc and Sensor Networks **3 0 3**

INSTRUCTIONS TO PAPER SETTER: **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 prerequisites are data communication networks, wireless communication and networks. The objective of the paper is to introduce infrastructure less wireless networking.

UNIT I
Ad Hoc Wireless Networks:
Introduction. Issues in Ad Hoc Wireless Networks. Ad Hoc Wireless Internet.
MAC Protocols for Ad Hoc Wireless Networks:
Introduction, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks. Design Goals of a MAC Protocol for Ad Hoc Wireless Networks. Classifications of MAC Protocols. Contention-Based Protocols. Contention-Based Protocols with Reservation Mechanisms. Contention-Based MAC Protocols with Scheduling Mechanisms. MAC Protocols in Directional Antennas. Other MAC Protocols

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

UNIT II
Routing Protocols for Ad Hoc Wireless Networks:
Introduction to Routing algorithm, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks. Classifications of Routing Protocols. Table-Driven Routing Protocols. On-Demand Routing Protocols. Hybrid Routing Protocols. Routing Protocols with Efficient Flooding Mechanisms. Hierarchical Routing Protocols. Power-Aware Routing Protocols.
Transport Layer and Security Protocols for Ad Hoc Wireless Networks:
Introduction. Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks. Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks. Classification of Transport Layer Solutions. TCP Over Ad Hoc Wireless Networks. Other Transport Layer Protocols for Ad Hoc Wireless Networks. Security in Ad Hoc Wireless Networks. Network Security Requirements. Issues and Challenges in Security Provisioning. Network Security Attacks. Key Management. Secure Routing in Ad Hoc Wireless Networks.

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

UNIT III
Wireless Sensor Networks:
Introduction. Sensor Network Architecture. Data Dissemination. Data Gathering. MAC Protocols for Sensor Networks. Location Discovery. Quality of a Sensor Network. Evolving Standards. Other Issues.
Hybrid wireless Networks:
Introduction. Next-Generation Hybrid Wireless Architectures. Routing in Hybrid Wireless Networks. Pricing in Multi-Hop Wireless Networks. Power Control Schemes in Hybrid Wireless Networks. Load Balancing in Hybrid Wireless Networks.

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

UNIT IV
Wireless Geolocation Systems:
Introduction. What is wireless Geolocation? Wireless Geolocation System Architecture. Technologies for Wireless Geolocation. Geolocation Standards for E-911 Services. Performance Measures for Geolocation Systems. Questions. Problems.
Recent Advances in Wireless Networks:
Introduction. Ultra-Wide-Band Radio Communication. Wireless Fidelity Systems. Optical Wireless Networks. The Multimode 802.11 -IEEE 802.11a/b/g. The Meghadoot Architecture, introduction to vehicular sensor networks.

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

Text Books:
[T1]   Siva Ram Murthy, C. and Manoj,B. S., Adhoc Wireless Networks Architectures and Protocols, Prentice Hall, PTR, (2004) 2nd ed.
[T2]   Perkins, Charles E., Ad hoc Networking, Addison Wesley, (2000) 3rd ed.

Reference Books

[R1]   Toh, C. K., Ad hoc Mobile Wireless Networks Protocols and Systems, Prentice Hall, PTR, (2001) 3rd Edition.
[R2]   Pahlavan, Kaveh., Krishnamoorthy, Prashant., Principles of Wireless Networks, - A united approach - Pearson Education, (2002) 2nd ed.
[R3]   Wang X. and Poor H.V., Wireless Communication Systems, Pearson education, (2004) 3rd ed.
[R4]   Schiller Jochen., Mobile Communications, Person Education – 2003, 2nd ed.
[R5]   Carlos De Morais Cordeiro and Dharam P Agrawal, "Adhoc and Sensor Networks- Theory & Applications", 2nd Ed, Cambridge Univ Press India Ltd

ROBOTICS

Paper Code: ETMT-402   **L**   **T/P**   **C**
Paper: Robotics   **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 the foundations of robotics. Also, a course on Robotics must use one or more software to not only visualize the motion and characteristics of robots but also to analyzer/synthesize/design robots for a given application.

UNIT - I
Fundamentals of Robot Technology:
Robot definition, automation and robotics, Robot anatomy, Work volume, Drive systems. Control systems and dynamic performance. Accuracy and repeatability. Sensors and actuators used in robotics. Machine Vision, Robot configurations, Path control. Introduction to robot languages. Applications; Types (Mobile, Parallel); Serial: Cartesian, Cylindrical, etc.; Social Issues

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

UNIT - II
Robot Kinematics: Mapping, Homogeneous transformations, Rotation matrix, Forward Kinematics (DH Notation) and inverse kinematics: Closed form solution.
Robot Differential Motion: Linear and Angular velocity of rigid link, Velocity along link, Maipulator jacobian, Statics: Use of jacobian.

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

UNIT – III
Robot Dynamics: Lagrangian Mechanics, Lagrangian Formulation and numericals. Dynamics, Newton-Euler Recursive Algorithm, Simulation. Euler-Lagrange Equations of motion/Any one other formulation like using Decoupled Natural Orthogonal Complements (DeNOC)
End effectors: Mechanical and other types of grippers. Tools as end effectors. Robot and effector interface. Gripper selection and design.

[T1,T2,T3][No. of Hrs: 12]

UNIT - IV
Applications for Manufacturing. Flexible automation. Robot cell layouts. Machine interference. Other considerations in work cell design. Work cell control, interlocks. Robot cycle time analysis. Mechanical design of robot links.
Typical applications of robots in material transfer, machine loading/unloading; processing operations; assembly and inspection.

[T1,T2,T3][No. of Hrs: 10]

Text Books:
[T1]   R.K. Mittal, I.J. Nagrath, "Robotics & Control", Tata McGraw & Hills, 2005.
[T2]   Mikell P Groover , Mitchell Weiss "Industrial Robotics :Technology, Programming and Application" Tata McGraw & Hills, 2009.
[T3]   Saha, S.K., Introduction to Robotics, 2nd Edition, McGraw-Hill Education, New Delhi, 2014

Reference Books:
[R1]   John J.Craig; "Introduction to Robotics Mechanics & Control", Pearson Education, 2004.
[R2]   Robert J. Schilling, "Fundamentals of Robotics, analysis & Control", Prentice Hall (I) P. Ltd., 2002
[R3]   Mark W. Spong, Seth Hutchinson, M. Vidyasagar "Robot Modeling and Control" John Wiley 2nd Ed
[R4]   J Srinivasan, R.V.Dukkipati, K. Ramji, "Robotics control & programming", Narosa.
[R5]   Ghosal, Ashitava, "Robotics: Fundamental Concepts and Analysis," Oxford University Press, 2006
[R6]   M. Murray, M., Li, Zexiang, Sastry, S.S., "A Mathematical Introduction to Robotic Manipulation," CRC Press, 1994
[R7]   Tsai, L.W., "Robot Analysis: The Mechanics of Serial & Parallel Manipulators," Wiley 1999
[R8]   Niku, S. B., "Introduction to Robotics: Analysis, Systems, Applications", Prentice Hall, 2001

Modified Scheme and Syllabus of B. Tech-ICE (1st Semester to 8th Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23rd BOS and 40th AC meeting of USET.

OBJECT ORIENTED SOFTWARE ENGINEERING

Paper Code: ETCS-412	L	T/P	C
Paper: Object Oriented Software 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.

Objective: To make the students well versed with current s/w developments in the industry.

UNIT I:
Introduction – Overview of Object-Orientation; Basic Concepts of Object-Orientation: Data abstraction, Encapsulation, Inheritance, Aggregation, classes, objects, messages, inheritance, polymorphism. Importance of modeling, principles of modeling, Object oriented modeling.
OO Life cycle – Object Oriented analysis, modeling and design; Requirement Elicitation. Introduction to Object Oriented Methodologies, Overview of Requirements Elicitation, Requirements Model-Action & Use cases.

[T1][R1][R2][No. of Hours: 10]

UNIT II:
Architecture: Introduction, System development is model building, model architecture, requirement model, analysis model, design model, implementation model.
Analysis: Introduction, System development based on user requirement, Use case model, interface descriptions, Problem domain objects, interface objects, entity objects, control objects.
Code Design Improvement: Refactoring, Anti patterns, Visitor Patterns.

[T1][R3][No. of Hours: 10]

UNIT III:
Construction: Introduction, the design model, design model dimensions, block design, working with construction.
Testing: Introduction, Object Oriented testing process, testing of analysis and design model, testing of classes.

[T1][R1][No. of Hours: 10]

UNIT IV:
Modelling with UML: Basic Building Blocks of UML, A Conceptual Model of UML.
Basic structural modelling: Classes, interfaces, Dependency , generalization and association relationship, comparison of E-R diagram and UML class Diagram, forward and reverse engineering.
Basic Behavioral Modeling- Use case diagram-relationships between use cases- extend, include, and generalize. Activity diagram-Action state, Activity state, Transition (Fork, Merge, Join), State diagram-events, State Diagram states, transitions, Interaction diagrams: Sequence diagram, Collaboration diagram (iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links.)
Architectural modelling:
Deployment: Common Modelling technique; Modelling processors and devices, modelling distribution of artifacts.
Collaboration: Modeling roles, modelling the realization of a Use Case, modelling the realization of an operation, modelling a mechanism.

[T1][R3][No. of Hours: 10]

Text Books:
[T1]   Ivar Jacobson, "Object Oriented Software Engineering", Pearson.
[T2]   Grady Booch, James Runbaugh, Ivar Jacobson, "The UML User Guide", Pearson.

Reference Books:
[R1]   Rumbaugh et. al, "Object Oriented Modeling and Design", Pearson.
[R2]   Booch, Maksimchuk, Engle, Young, Conallen and Houstan, "Object Oriented Analysis and Design with Applications", Pearson Education.
[R3]   Object-Oriented Analysis and Design: using UML Mike O'Docherty Wiley Publication.
[R4]   Edwards Yourdon. Carl Argila,"Case Studies in object oriented analysis and design" Prentice Hall.

COMPUTER GRAPHICS & MULTIMEDIA

		L	T/P	C
Paper Code: ETIC-428		3	0	3
Paper: Computer Graphics & Multimedia				

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: The objective of this paper is to learn about the computer graphic and multimedia

UNIT- I
Introduction, Applications areas, Components of Interactive Computer Graphics System. Overview of Input devices, Output devices, raster scan CRT displays, random scan CRT displays. DDA and Bresenham's Line Drawing Algorithms, Bresenham's and Mid Point Circle Drawing Algorithms. Homogeneous Coordinate System for 2D and 3D, Various 2D, 3D Transformations (Translation, Scaling, Rotation, Shear).
[T1,T2][No. of Hrs. 12]

UNIT- II
Clipping Algorithms, Sutherland-Cohen line Clipping Algorithm Bezier Curves, B-Spline Curves. Parallel Projection, Perspective Projection, Illumination Model for diffused Reflection, Ambient light, Specular Reflection Model, Reflection Vector.
[T1,T2][No. of Hrs. 10]

UNIT- III
Shading Models, Flat shading, Gourard Shading, Phong Model. Visible surface detection, Back Face Detection, Depth Buffer (Z-Buffer, A-Buffer) Method. Overview of multimedia: Classification, basic concepts of sound/audio MIDI: devices, messages, software. , Authoring tools, Video and Animation: controlling animation, display and transmission of animation
[T1,T2][No. of Hrs. 11]

UNIT- IV
Data Compression: storage space, coding requirements, Basic compression techniques: run length code, Huffman code, Lempel-Ziv JPEG: Image preparation, Lossy sequential DCT, expanded lossy DCT, Lossless mode, Hierarchical mode. MPEG, Media synchronization, Media Integration, Production Standards.
[T1,T2][No. of Hrs. 11]

Text Books:
[T1]   Donald Hearn and M.Pauline Baker, "Computer Graphics C version", Second Edition, Pearson
[T2]   Ralf Steinmetz & Klara Nahrstedt, "Multimedia Computing Communication & Applications", Pearson

Reference Books:
[R1]   C, Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice", Second Edition
[R2]   R. Plastock and G. Kalley, "Theory and Problems of Computer Graphics", Schaum's Series, McGraw Hill, 2nd edition.
[R3]   Fred Halsall, "Multimedia Communications Applications, Networks, Protocols & Standards", Pearson
[R4]   David F. Rogers, "Procedural elements for computer graphics", McGraw- Hill.

ELECTROMAGNETIC FIELD THEORY

		L	T/P	C
Paper Code: ETIC-430		3	0	3
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 how the plane wave solution can be used to approximate real situations, describe the boundary conditions for electric and magnetic fields at dielectric interfaces ,interpret the effects of lossy and low loss dielectrics upon the propagation of electromagnetic waves, and predict this process in specific applications and solve the performance of specific transmission lines.

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 – $\lambda/2$, $\lambda/4$, $\lambda/8$ 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

SATELLITE COMMUNICATION

Paper Code: ETEC-404   L   T/P   C
Paper: Satellite 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.

Objectives: To study the most relevant aspects of satellite communication with emphasis on the most recent application & developments. It covers orbital mechanics, launching techniques, satellite link design, earth & space segment, error control coding and different multiple access techniques.

UNIT- I
Principles of Satellite Communication: Evolution & growth of communication satellite, Satellite frequency allocation & Band spectrum, Advantages of satellite communication, Active & Passive satellite, Applications of satellite communication. Synchronous satellite, Satellite Launch.
Satellite Orbits: Introduction, Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits, LEO, MEO, Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage.

                                              [T1, T2, R1][No. of Hrs. 11]

UNIT- II
Satellite Link Design
Basic transmission, System noise temperature, G/T ratio, design of down links, uplink design, design of specified C/N, Atmospheric Absorption, Rain induced attenuation.
Space Segment: Power Supply, Altitude Control, Station Keeping, Thermal Control, TT&C sub system, Transponders, Antenna Sub system.
Earth Segment: Subsystem of earth station, Transmit-Receive Earth Station, different types of earth stations, frequency coordination.

                                              [T1, T2, R1][No. of Hrs. 11]

UNIT- III
Multiple Access Techniques: FDMA, FDMA down link analysis. TDMA, Satellite-switched TDMA, code division multiple access, DAMA, On board signal processing for FDMA/TDM Operation.
Error Control for Digital Satellite Links: Error detection and correction for digital satellite links, error control coding, Convolutional codes, satellite links concatenated coding and interleaving, Automatic Repeat Request (ARQ).

                                              [T1, T2, R2][No. of Hrs. 10]

UNIT- IV
Interconnection of Satellite Networks: Interconnection with ISDN, Interconnection of television networks.
Satellite Applications: Satellite mobile services, VSAT, GPS, Radarsat, INMARSAT, Satellite navigational system. Direct broadcast satellites (DBS)- Direct to home Broadcast (DTH), Worldspace services, Business TV(BTV)

                                              [T1, R2, R3][No. of Hrs. 10]

Text Books:
[T1]   Dennis Roddy, "Satellite Communication", McGraw Hill International.
[T2]   T. Pratt, "Satellite Communication", John Willy and Sons (Asia) Pvt. Ltd.

Reference Books:
[R1]   T. Ha, "Digital Satellite Communication", McGraw Hill.
[R2]   Bruce R. Elbert, "The Satellite Communication Applications Handbook" ,Artech House Boston.
[R3]   Mark R. Chartrend, "Satellite Communication" Cengage Learning
[R4]   Handbook of Satellite Communication, Wiley.

INTELLIGENT SYSTEMS & CONTROL LAB

Paper Code: ETIC–452		**L**	**T/P**	**C**
Paper: Intelligent Systems & Control Lab		**0**	**2**	**1**

List of Experiments:

1. To generate triangular, trapezoidal and sigmoidal membership function using MATLAB Tool-box.
2. To write MATLAB program to generate sum, difference and product of the above membership function.
3. To compare the response of conventional PI Controller with its Fuzzy Counterpart using MATLAB Simulink.
4. To implement Fuzzy Controller for temperature control system using MATLAB Software.
5. To implement Mamdani type of Fuzzy Controller and to study the control output for different input combination.
6. To implement sugeno type of Fuzzy Controller for different input combination.
7. To implement Fuzzy Controller for $2^{nd}/3^{rd}$ order system using MATLAB.
8. Implementing Fuzzy Controller to control process variable such as temperature, pressure, flow etc.
9. To implement Fuzzy P, PI and PID Controller using Mamdani implication.

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

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VIRTUAL INSTRUMENTATION LAB

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		L	**T/P**	**C**
Paper Code: ETIC–454		0	2	1
Paper: Virtual Instrumentation Lab				

List of Experiments:

Basic operations, Simple Programming Structures.

1. Lab VIEW- Debugging a VI, Sub VI's
2. Lab VIEW ± Traffic Light ± Programming structure, Arrays, Clusters
3. Waveform measurements
4. Voltage to frequency Converter
5. Strain and Temperature with NI ELVIS
6. Signal Generation using NI- DAQmx, Frequency analysis
7. Oscilloscope ± Attribute Nodes, Menus
8. RC Circuit measurement ± Timing issues
9. Digital control of Stepper Motor
10. OPAMP circuits and its Characteristics
11. Digital to Analog Acquisition interfacing

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

EMBEDDED SYSTEMS LAB

Paper Code: ETIC-458(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

CONSUMER ELECTRONICS LAB

Paper Code: ETIC-458(ELECTIVE)　　　　　　　　　　　　**L**　　**T/P**　　**C**
Paper: Consumer Electronics Lab　　　　　　　　　　　　**0**　　**2**　　**1**

List of Experiments:

1. To plot the frequency response of a microphone
2. To plot the frequency response of a loud speaker
3. Demonstration of a tape-transport mechanism
4. Trouble shooting of tape-recorder system
5. To observe the wave forms and voltage B/W and colour T.V receiver.
6. Fault finding of colour T.V receiver.
7. Trouble shooting of C.D. Player
8. Demonstration of DVD Player.
9. Demonstration of the working of a Photostat machine.
10. Demonstration of the working of automatic, semi automatic washing machine & microwave oven.

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

ROBOTICS LAB

Paper Code: ETIC-452(ELECTIVE)   **L**   **T/P**   **C**
Paper: Robotics Lab   **0**   **2**   **1**

List of Experiments:

1. Study of robotic arm, end effectors and its configuration and introduction to any software (such as workspace) used to simulate or program a robot;
2. Program / simulate a robot for moving on a path;
3. Program / simulate a robot for pick and place operation;
4. Program / simulate a robot for welding operation;
5. Program / simulate a robot for water jet machining;
6. Program / simulate a robot for saving it from striking any other object in workspace;
7. Program / simulate two robots working together;
8. Make a 3R robot and simulate its motion.
9. Use a microcontroller to program simple toy robot / model robot;
10. Micro controller program to use different sensors and further move toy robot(s) / model robot;
11. Use MATLAB / Scilab. Any other software to program numericals (Robot Arm kinematics) taught in class.
12. Use MATLAB / Scilab and other robot specific software like Robo-Analizer for the study of kinematic and dynamics of 3R robots.
13. Demos of a real robot; Introduce Virtual Robotics Lab. in ADAMS or SimMechanics of MATLAB.

Note:
a. Total Experiments are to be 12 (Twelve).
b. Experiments suggested by committee are given above- Choose any eight.
c. Rest (In above list / not in list) is liberty of respective institute to choose as per syllabus.
d. Suggested Software

A course on Robotics must use one or more software to not only visualize the motion and characteristics of robots but also to analyzer/synthesize/design robots for a given application (say, as class projects). Typical software which can be used are as follows:
- RoboAnalyzer (Developed by IIT Delhi; http://www.roboanalyzer.com)
- Virtual Labs. (Developed by IIT Kharagpur; http://vlabs.iitkgp.ernet.in/moodle/)
- MATLAB, its modules Simulink and SimMechanics (http://www.mathworks.com)
- Mathematica: Symbolic software (http://www.wolfram.com)
- Multi Bondgraph (http://bondgraph.org)
- ADAMS (by MSC software; http://www.mscsoftware.com)
- RerurDyn (by Function Bay, Korea; http://www.functionbay.co.kr)

e. **Other Aids**
- **Possible Class projects and presentations:** Kinematic/Dynamic modeling, programming, and analyses of a robotic arm (say, an RP manipulator); 2. Modeling of an AGV; 3. Building prototypes using, say, LEGO kits
- Video of practical applications
- Industry visits
- Robocon competitions: A national-level competition held every year during the 1st weekend of March

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

OBJECT ORIENTED SOFTWARE ENGINEERING LAB

Paper Code: ETIC-412(ELECTIVE)   **L**   **T/P**   **C**
Paper: Object Oriented Software Engineering Lab   **0**   **2**   **1**

List of Experiments:

1. Design a case study for a real world scenario with problem statement and requirement specification.
2. Design a use case diagram for the problem statement identified
3. Prepare an object and class diagram with all the relationships, cardinality, attribute & operations.
4. Depict the classes formed for the problem statement as Interaction Diagram(Prepare proper sequential timeline pattern for all the use cases thus derived)
5. Depict the classes so formed as activity diagram.
6. Prepare a state-chart diagram for the problem statement thus formed.
7. Employ common modeling techniques for the component and deployment diagram.

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