SCHEME OF EXAMINATION

&

DETAILED SYLLABUS

for

BACHELOR OF TECHNOLOGY
(Mechanical & Automation Engineering)

GURU GOBIND SINGH
INDRAPRASTHA UNIVERSITY
KASHMERE GATE, DELHI

BACHELOR OF TECHNOLOGY

(B.TECH.) DEGREE COURSE (Common to all branches)

FIRST SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
THEORY PAPERS				
ETMA 101	Applied Mathematics – I	3	1	4
ETPH 103	Applied Physics – I	2	1	3
ETCH 105	Applied Chemistry – I	2	1	3
ETME 107	Manufacturing Process	2	0	2
ETCS 109	Introduction to Computers and Auto CAD	2	1	3
ETEL 111	Communication Skills – I	2	1	3
ETEL 113*	Impact of Science & Technology on Society	1	0	1
PRACTICAL/VIVA VOCE				
ETPH 151	Applied Physics Lab. – I	-	2	1
ETCH 153	Applied Chemistry Lab. – I	-	2	1
ETCS 155	Introduction to Auto CAD Office Automation and Web Design	-	3	2
ETME 157	Workshop Practice	-	3	2
ETME 159	Engineering Graphics Lab.	-	2	1
	TOTAL	**14**	**17**	**26**

ETEL-113* is NUES

BACHELOR OF TECHNOLOGY

(B.TECH.) DEGREE COURSE (Common to all branches)

SECOND SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
THEORY PAPERS				
ETMA 102	Applied Mathematics – II	3	1	4
ETPH 104	Applied Physics – II	2	1	3
ETCH 106	Applied Chemistry – II	2	1	3
ETCS 108	Introduction to Programming	2	1	3
ETME 110	Engineering Mechanics	2	1	3
ETEC 112	Electrical Science	2	1	3
ETEL 114	Communication Skills – II	2	1	3
PRACTICAL/VIVA VOCE				
ETPH 152	Applied Physics Lab. – II	-	2	1
ETCH 154	Applied Chemistry Lab. – II	-	2	1
ETCS 156	C Programming Lab.	-	2	1
ETME 158	Engineering Mechanics Lab.	-	3	2
ETEC 160	Electrical Science Lab.	-	2	1
	TOTAL	**15**	**18**	**28**

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THIRD SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
THEORY PAPERS				
ETMA 201	Numerical Analysis & Programming	3	1	4
ETME 203	Electronics	3	1	4
ETME 205	Thermal Science	3	1	4
ETME 207	Mechanics of Solids	3	1	4
ETME 209	Production Technology	4	0	4
ETME 211	Mechanics of Fluids	3	1	4
PRACTICAL/VIVA VOCE				
ETME 251	Electronics Lab.	0	2	1
ETME 253	Mech. of Solids / Fluid Mech. Lab.	0	2	1
ETME 255	Mechanical Engineering Drawing Lab	0	2	1
ETME 257	Programming-I (Numerical Analysis)	0	2	1
	TOTAL	**19**	**13**	**28**

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FOURTH SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
THEORY PAPERS				
ETME 202	Kinematics & Dynamics of Machines	3	1	4
ETME 204	Heat Transfer	3	1	4
ETME 206	Manufacturing Machines	4	0	4
ETME 208	Electrical Machines	3	1	4
ETMA 210	Operation Research	3	1	4
ETME 212	LAN & Networking	3	1	4
PRACTICAL/VIVA VOCE				
ETME 252	KOM Lab./DOM Lab.	0	2	1
ETME 254	Machine Shop Lab.	0	2	1
ETME 256	Electrical Machines lab.	0	2	1
ETME 258	Programming - II Lab (Operation Research)	0	2	1
ETME 260	LAN & Networking Lab.	0	2	1
	TOTAL	**19**	**15**	**29**

NOTE: 4-6 weeks training will be held after fourth semester. However, Viva-Voce will be conducted in the fifth semester.

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FIFTH SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
THEORY PAPERS				
ETME 301	Microprocessors & Applications	3	1	4
ETME 303	Machine Design- I	4	0	4
ETME 305	Material Science & Metallurgy	4	0	4
ETME 307	Measurements & Controls	3	1	4
ETCS 309	Database Management Systems	3	1	4
PRACTICAL/VIVA VOCE				
ETME 351	Microprocessors & Applications Lab	0	2	1
ETME 353	Machine Design- I Lab	0	4	2
ETME 355	Measurements & Controls Lab	0	2	1
ETME 357	Programming - III Lab. (MATLAB)	0	2	1
ETCS 359	Database Management Systems Lab	0	2	1
ETME 361	#^Practical Training	-	-	1
	TOTAL	**17**	**15**	**27**

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

BACHELOR OF TECHNOLOGY

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SIXTH SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
THEORY PAPERS				
ETME 302	Management of Manufacturing System	4	0	4
ETME 304	Machine Design-II	4	0	4
ETME 306	Metrology	3	1	4
ETME 308	Fluid Systems	3	1	4
ETME 310	Metal Cutting & Tool Design	3	1	4
PRACTICAL/VIVA VOCE				
ETME 352	Machine Design-II Lab.	0	4	2
ETME 354	Metrology Lab.	0	2	1
ETME 356	Fluid Systems Lab.	0	2	1
ETME 358	Metal Cutting & Tool Design Lab	0	2	1
ETME 360	Prog. IV Lab. (Pro-E-I)	0	2	1
	TOTAL	**17**	**15**	**26**

NOTE: 4-6 weeks training will be held after sixth semester. However, Viva-Voce will be conducted in the seventh semester.

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SEVENTH SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
THEORY PAPERS				
ETME 401	Computer Aided Manufacturing	3	1	4
ETME 403	Mechatronics	3	1	4
ELECTIVES (Choose any two)				
ETME 405	Refrigeration & Air-Conditioning	3	1	4
ETME 407	Solar Energy	3	1	4
ETME 409	Personnel Management	3	1	4
ETME 411	Metal Forming	3	1	4
ETME 413	Automotive Engineering	3	1	4
ETME 415	Manufacturing Information Systems	3	1	4
ETME 417	Computer Aided Design	3	1	4
ETME 419	Project	-	-	4
PRACTICAL/VIVA VOCE				
ETME 451	Computer Aided Manufacturing Lab.	0	2	1
ETME 453	Mechatronics Lab.	0	2	1
ETME 455	Practical based on Electives	0	2	1
ETME 457	Programming-V Lab. (Pro-E-II)	0	2	1
ETME 459	*Minor Project	0	8	4
ETME 461	#^Practical Training	-	-	1
	TOTAL	**12**	**20**	**25**

NON UNIVERSITY EXAMINATION SYSTEM

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

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

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EIGHTH SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
THEORY PAPERS				
ETME 402	Quality Control & Quality Assurance	3	1	4
ETME 404	Robotics	3	1	4
ELECTIVES (Choose any two)				
ETME 406	Optimization Techniques	3	1	4
ETME 408	Advanced Methods of Mfg.	3	1	4
ETME 410	Mechanical Vibrations	3	1	4
ETME 412	I.C. Engines, Emissions & Pollution Control	3	1	4
ETME 414	Gear Technology	3	1	4
ETME 416	Financial Management	3	1	4
ETME 418	Reliability & Maintenance Management	3	1	4
ETME 420	Power Plant Practice	3	1	4
ETME 422	Finite Element Methods	3	1	4
PRACTICAL/VIVA VOCE				
ETME 452	Quality Control & Quality Assurance Lab.	0	2	1
ETME 454	Robotics Lab	0	2	1
ETME 456	Practical based on Electives	0	2	1
ETME 458	*Major Project	0	12	6
	TOTAL	**12**	**22**	**25**

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

NOTE:

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

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.

UNIT I

COMPLEX NUMBERS AND INFINITE SERIES: De Moivre's theorem and roots of complex numbers. Euler's theorem, Logarithmic Functions, Circular, Hyperbolic Functions and their Inverses. Convergence and Divergence of Infinite series, Comparison test d'Alembert's ratio test. Higher ratio test, Cauchy's root test. Alternating series, Lebnitz test, Absolute and conditioinal convergence. **[No. of Hrs. 10]**

UNIT II

CALCULUS OF ONE VARIABLE: Successive differentiation. Leibnitz theorem (without proof) McLaurin's and Taylor's expansion of functions, errors and approximation.
Asymptotes of Cartesian curves. Curveture of curves in Cartesian, parametric and polar coordinates, Tracing of curves in Cartesian, parametric and polar coordinates (like conics, astroid, hypocycloid, Folium of Descartes, Cycloid, Circle, Cardiode, Lemniscate of Bernoulli, equiangular spiral). Reduction Formulae for evaluating

Finding area under the curves, Length of the curves, volume and surface of solids of revolution.
[No. of Hrs. 15]

UNIT III

LINEAR ALGEBRA – MATERICES: Rank of matrix, Linear transformations, Hermitian and skeew – Hermitian forms, Inverse of matrix by elementary operations. Consistency of linear simultaneous equations, Diagonalisation of a matrix, Eigen values and eigen vectors. Caley – Hamilton theorem (without proof). **[No. of Hrs. 09]**

UNIT IV

ORDINARY DIFFERENTIAL EQUATIONS: First order differential equations – exact and reducible to exact form. Linear differential equations of higher order with constant coefficients. Solution of simultaneous differential equations. Variation of parameters, Solution of homogeneous differential equations – Canchy and Legendre forms.

(No. of Hrs. 10]

TEXT BOOKS:

1. Kresyzig, E., "Advanced Engineering Mathematics", John Wiley and Sons. (Latest edition).
2. Jain, R. K. and Iyengar, S. R. K., "Advanced Engineering Mathematics", Narosa, 2003 (2^{nd} Ed.).

REFERENCE BOOKS:

1. Mitin, V. V.; Polis, M. P. and Romanov, D. A., "Modern Advanced Mathematics for Engineers", John Wiley and Sons, 2001.
2. Wylie, R., "Advanced Engineering Mathematics", McGraw-Hill, 1995.
3. "Advanced Engineering Mathematics", Dr. A. B. Mathur, V. P. Jaggi (Khanna publications)

Paper Code: ETPH – 103 **L T C**
Paper: APPLIED PHYSICS – I **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.

UNIT - I

Interference of Light: Interference due to division of wavefront and division of amplitude, Young's double slit expt., Interference, Principle of Superposition, Theory of Biprism, Interference from parallel thin films, wedge shaped films, Newton rings, Michelson interferometer.

Diffraction: Fresnel Diffraction, Diffraction at a straight edge, Fraunhoffer diffraction due to N slits, Diffraction grating, absent spectra, dispersive power of Grating, resolving power of prism and grating. **[No. of Hrs. 8]**

UNIT - II

Polarization: Introduction, production of plane polarized light by different methods, Brewster and Malus Laws. Double refraction, Quarter & half wave plate, Nicol prism, specific rotation, Laurent's half shade polarimeter.

Optical Instruments : Ramdson & Huygen Eye pieces, Electron microscope.

[No. of Hrs. 8]

UNIT - III

Laser: Introduction, temporal and spatial coherence, principle of Laser, stimulated and spontaneous emission, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers.

Fibre Optics: Introduction, numerical aperture, step index and graded index fibres, attenuation & dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

[No. of Hrs. 8]

UNIT - IV

Mechanics: Central and non-central forces, Inverse square force, SHM, Damped, undamped and forced Oscillations.

Special theory of Relativity: Frame of reference, Michelson-Morley experiment, basic postulates of special relativity, Lorentz transformations (space – time coordinates & velocity only), mass energy relation.

[No. of Hrs. 8]

TEXT BOOKS:

1. A. Ghatak, "Optics"
2. N. Subrahmanyam and Brij Lal, "Optics"

REFERENCE BOOKS:

1. Jenkins and White, "Fundamentals of Optics"
2. C. Kittle, "Mechanics", Berkeley Physics Course, Vol.- I.
3. A. Beiser, "Concepts of Modern Physics"

Paper Code: ETCH – 105 **L T C**
Paper: Applied Chemistry – I **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.

UNIT - I

Water: Specifications for water, analysis of water – alkalinity, hardness and its determination (EDTA method only). Water for domestic use, Water softening processes – Lime – Soda process, Ion exchange method, boiler feed water, boiler problems-scale, sludge, priming and foaming, caustic embitterment and corrosion, their causes and prevention, removal of silica, removal of dissolved gases, carbonate and phosphate conditioning, colloidal conditioning, calgon treatment, Numerical problems on alkalinity, hardness, Lime-Soda process and Ion exchange method, EDTA method. **[No. of Hrs: 08]**

UNIT - II

Fuels: Classification, combustion and chemical principles involved in it, calorific value: gross and net calorific values and their determination by bomb calorimeter and Boy's gas calorimeter.

Solid Fuels: Proximate and ultimate analysis of coal and their importance, High and low temperature carbonisation, Coke: Its manufacture by Otto Hoffman oven.

Liquid Fuels: Conversion of coal into liquid fuels (Bergius process and Fisher-Tropsch Process) and mechanism, Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical structure, octane number and cetane number and their significance, power alcohol, Analysis of flue gases by Orsat's apparatus, Numerical on calorific value, combustion, proximate and ultimate analysis of coal, flue gas analysis. **[No. of Hrs: 08]**

UNIT - III

Environmental Pollution and Control: Air Pollution: Types of pollutants, source effects, sink and control of primary pollutants – CO, No_x, HC, So_x and particulates, effects of pollutants on man and environment – photochemical smog and acid rain.

Water Pollution: Classification of pollutants, their sources, waste water treatment – domestic and industrial.

Soil Pollution: Composition of soil, classification and effects of soil pollutants and their control.

Solid Waste Pollution: Classification, waste treatment & Disposal methods (Composting, sanitary landfilling, thermal processes, recycling and reuse).

Hazardous Wastes: Classification – radioactive, biomedical and chemical, treatment and disposal – physical, chemical and biological processes. **[No. of Hrs: 08]**

UNIT - IV

Solutions: Ideal and non-ideal solutions, Raoult's Law, Distillation of binary solutions, Henry's Law, Nernst distribution law, Arrhenius theory and special behaviour of strong electrolytes.

Corrosion: Types of corrosion (dry, wet, atmospheric and soil corrosion), theories of corrosion, protective measures against corrosion. **[No. of Hrs: 08]**

TEXT BOOKS:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.), By J.C. Kuriacose & J. Rajaram
2. Environmental Chemistry & Pollution Control (Latest ed.), By S.S. Dara
3. Applied Chemistry (Latest ed.), By H.D. Gesser

Paper Code: ETME 107 **L T C**
Paper: Manufacturing Processes **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 of 12.5 marks.

UNIT - I

Casting Processes:

Principles of metal casting: Pattern materials, types and allowance; Study of moulding, sand moulding, tools, moulding materials, classification of moulds, core, elements of gating system, casting defects, description and operation of cupola: special casting processes e.g. die-casting, permanent mould casting, centrifugal casting, investment casting.

[No. of Hrs. 6]

UNIT - II

Smithy and Forging:

Basic operation e.g. upsetting, fullering, flattening, drawing, swaging: tools and appliances: drop forging, press forging.

Bench Work and Fitting

Fitting, sawing, chipping, thread cutting (die), tapping; Study of hand tools, Marking and marking tools. **[No. of Hrs. 6]**

UNIT - III

Metal joining:

Welding principles, classification of welding techniques; Oxyacetylene Gas welding, equipment and field of application, Arc-welding, metal arc, Carbon arc, submerged arc and atomic hydrogen welding, Electric resistance welding: spot, seam, butt, and percussion welding; Flux: composition, properties and function; Electrodes, Types of joints and edge preparation, Brazing and soldering. **[No. of Hrs. 6]**

UNIT – IV

Sheet Metal Work:

Common processes, tools and equipments; metals used for sheets, standard specification for sheets, spinning, bending, embossing and coining. **[No. of Hrs. 5]**

TEXT BOOKS:

1. Manufacturing Process by Raghuvanshi.
1. Manufacturing Technology by P.N.Rao (TMH publications)

REFERENCE BOOK:

1. Workshop Technology by Hazra-Chowdhary
2. Production Engineering by R.K.Jain
3. Workshop Technology by Chapman

Paper Code: ETCS 109 | ***L*** | ***T*** | ***C***
Paper: Introduction to Computer Systems | **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.

UNIT - I

Introduction to Computer:

Overview of Computer organization and historical perspective computer applications in various fields of science and management.

Data representation: Number systems, character representation codes, Binary, hex, octal codes and their inter conversions.

Binary arithmetic, Floating-point arithmetic, signed and unsigned numbers.

[No. of Hrs. 8]

UNIT - II

Introduction to OS and Office Automation

Concept of computing, Introduction to Operating Systems such as DOS, windows 2000/Xp, UNIX, Client Server Technology, etc. (only brief user level description).

Introduction to World Processing, Spread Sheet & Presentation software e.g. MS-Word, MS-Excel, MS-Power Point. **[No. of Hrs. 8]**

UNIT - III

Introduction to Auto CAD

Coordinate System, 2D drafting: lines, circles, arc, polygon, etc., Editing, 3D, Solid modeling, Rendering, Use of Auto CAD for engineering drawing practices.

[No. of Hrs. 8]

UNIT - IV

Web Technologies

Introduction to World Wide Web, Search engines, e-mail, news, gopher, Audio & Video Conferencing, Internet Protocols: FTP, telnet, TCP/IP, SMTP, HTTP, Languages used for WEB Technology: HTML, practical examples using DHTML and Static HTML

[No. of Hrs. 8]

TEXT BOOKS:

1. Rajaraman, "Fundamentals of Computers", Prentice Hall of India, 3rd Edition.
2. Mark Middlebrook, "Autocad 2004 for Dummies", Wiley Dreamtech, 2000.
3. Vikas Gupta, "Comdex Computer Course Kit", Dreamtech Press, 2004.

REFERENCE BOOKS:

1. Alexis Leon & Mathews Leon, "Fundamentals of Computer Science & Communication Engineering", Leon Techworld, 1998.
2. Omura, "Mastering Autocad 2000 for Mechanical Eng ineers" BPB Publications, 2nd Edition, 1998.
3. A.S. Tanenbaum, " Computer Networks", Pearson Education India Ltd., 3rd Edition, 2002.

Paper Code: ETEL-111 **L T C**
Paper: Communication Skills – I **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.

UNIT - I

Remedial Grammar: Errors of Accidence and syntax with reference to Parts of Speech; Agreement of Subject and Verb; Tense and Concord; Conditional Clauses; Use of connectives in Complex and Compound sentences; Question tags and short responses.

[No. of Hrs: 06]

UNIT - II

Vocabulary and Usage: Word Formations (by adding suffixes and prefixes); Technical Word Formation; Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words; Phrasal Verb Idioms.

[No. of Hrs: 06]

UNIT - III

Technical Writing:

(A) Scientific Attitude and Impersonal Style; Plain Statements, Definitions; Description and Explanations (of objects, instruments, Processes, Scientific Principles, etc.)

Summarizing and abstracting; Expressing ideas within a restricted word limit; Paragraph Writing (Paragraph division, introduction and the conclusion, Variety in sentences and paragraphs)

Interpretation and use of charts, graphs and tables in technical writing.

Punctuation

(B) Reading at various speeds (slow, fast, very fast); reading different kinds of texts for different purpose (e.g. for relaxation, for information, for discussion at a later stage, etc.); reading between the lines.

Comprehension of Unseen Passages **[No. of Hrs: 10]**

UNIT - IV

Text: The following prose pieces from ***Best Science Writing : Reading and Insights*** edited by Robert Gannon prescribed text (Hyderabad: University Press (India) Limited, 1991).

1. Chapter 2: "After 63 years, Why Are They Still Testing Einstein?" by C.P. Gilmore
2. Chapter 5: "Star Wars : The Leaky Shield" By Carl Sagan
3. Chapter 10: "Chaos : The Ultimate Asymmetry" by Arthur Fisher
4. Chapter 11: "Bill Moss, Tentmaker" by Robert Gannon
5. Chapter 12: "Totality - A Report" by Michael Rogers

[No. of Hrs: 10]

TEXT BOOKS:

1. Maison, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980
2. Sharma, R.S. Technical Writing. Delhi: Radha Publication, 1999
3. Sudarsanam, R. Understanding Technical English. Delhi: Sterling Publishers Pvt. Ltd., 1992
4. Gannon, Robert, Edt. Best Science Writing: Readings and Insights. Hyderabad: University Press (India) Limited, 1991.

Paper Code: ETEL-113	L	T	C
Paper: Impact of Science & Technology on Society	1	0	1

***Non University Examination Scheme (NUES)**

There will not be any external examination of the university. The performance of the candidates should continuously be evaluated by an internal committee. The committee may conduct viva-voce at the end for the award of the marks.

Paper Code: ETPH-151	**L**	**P**	**C**
Paper: APPLIED PHYSICS LAB – I	**0**	**2**	**1**

List of Experiments

(1) 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.

(2) To determine the moment of inertia of a flywheel about its own axis of rotation.

(3) To determine the value of acceleration due to gravity using koter's pendulum.

(4) To determine the frequency of A.C. mains using sonometer and an electromagnet.

(5) To determine the frequency of electrically maintained turning fork by Melde's method.

(6) To determine the dispersive power of prism using spectrometer and mercury source.

(7) To determine the wavelength of sodium light by Newton's Ring.

(8) To determine the wavelength of sodium light using diffraction grating.

(9) To determine the refractive index of a prism using spectrometer.

(10) To determine the specific rotation of cane sugar solution with the help of polarimeter.

(11) To find the wavelength of He-Ne Laser using transmission diffraction grating.

(12) To determine the numeral aperture (NA) of a Optical Fibre.

(13) Compute simulation (simple application of Monte Carlo) e.g. Brownian motion, charging & discharging of capacitor.

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

Paper Code: ETCH – 153	**L**	**P**	**C**
Paper: Applied Chemistry Lab – I	**0**	**2**	**1**

List of Experiments

1. To determine the percentage composition of a mixture of Sodium hydroxide and Sodium Chloride.

2. To determine the amount of Sodium Carbonate in the given mixture of Sodium Carbonate and Sodium Bicarbonate.

3. Determine the amount of Oxalic Acid and Sulphuric Acid/Hydrochloric Acid in one litre of solution given standard Sodium Hydroxide and Potassium Permanganate.

4. To determine the Carbonate, Bicarbonate and Chloride contents in irrigation water.

5. To determine the no. of water molecules of crystallization in Mohr's salt provided standard dichromate solution using internal indicator.

6. Determine the amount of Cu in the copper ore solution provided hypo solution.

7. Iodometric Titration of $K_2Cr_2O_7$ v/s $Na_2S_2O_3$ to determine the percentage purity of $K_2Cr_2O_7$ sample.

8. Argentometric titration one each of Vohlard's method and of Mohr's method.

9. Complexometric Titrations.

10. Detrmination of dissolved Oxygen in given sample if water.

TEXT BOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (Latest ed.), Revised by G.H. Jeffery, J. Bassett, J. Mendham & R.C. Denney
2. Applied Chemistry: Theory and Practice (Latest ed.), By O.P. Vermani & A.K. Narula

Paper Code: ETCS 155	**L**	**P**	**C**
Paper: Introduction to AutoCAD, Office Automation and Web Design	**0**	**3**	**2**

List of Experiments

1. Use Microsoft-Word to perform the following:
   a) Send out invitation letter to several people using mail merge facility.
   b) Create tabular data in word and insert graph to represent data.
   c) Create a Macro and use it in an application.

2. Use Microsoft-Excel to perform the following:
   a) Create a Macro and use it in an application
   b) Enter the name and marks of 10 students and perform various mathematical functions on it.
   c) Enter first quarter performance of five companies and create a pie chart showing there shareholders in the market.

3. Use Microsoft Power-Point to perform the following
   a) Create a slide show on any subject of your choice using minimum five slides.
   b) Create slideshow in operating sound.
   c) Create an animation using group, ungroup, order, textbox image insert etc.

4. Use HTML to design a Home page for IGIT using all the features of HTML like buttons, frames, marquee check boxes etc..

5. Use AutoCAD to do the following:
   a) Use of Drawing & Editing Properties: Modify Object Properties and a know how of layers, colors and prototype drawing.
   b) Draw line (Poly line, multi line, linear line), polygon, ellipse, circle, arc, rectangle and use cross hatching, regions, boundary, spline, donut, fillet and extent commands.
   c) Dimensioning commands, styles, control scale factors, drawing set-up, grip editing objects snaps, utility commands.
   d) Projection of points, lines and solids,
   e) Section of Solids
   f) Development and Intersection of Surface
   g) Isomeric Projections

Create a WEB page containing hyperlinks to the pages having information about Science and Technology.

Paper Code: ETME-157	**L**	**P**	**C**
Paper: Workshop Practice	**0**	**3**	**2**

UNIT - I

Materials: Spectrography method for finding composition of materials.
Wood Working Shop: Making of various joints, Pattern making.

UNIT - II

Foundary Shop: Bench moulding with single piece pattern and two piece pattern.
Floor moulding – Making of bend pipe mould etc.
Machine moulding – Making of mould using Match-plate pattern.
Core making- Making and baking of dry sand cores for placing in horizontal, vertical and hanging positions in the mould cavity.

Fitting Shop: Learning use of fitting hand tools, marking tools, marking gauge.
Exercises: Jobs made out of MS Flats, making saw – cut filling V-cut taper at the corners, circular cut, fitting square in square, triangle in square.

UNIT - III

Welding Shop: Electric arc welding, Edge preparations, Exercises making of various joints. Bead formation in horizontal, vertical and overhead positions.
Gas Welding: Oxy-Acetylene welding and cutting of ferrous metals.
Soldering: Dip soldering.
Brazing: With Oxy-Acetylene gas.

UNIT - IV

Sheet Metal Shop: Learning use of sheet-metal tools, Exercises: Making jobs out of GI sheet metal. Cylindrical, Conical and Prismatic shapes.

Project Shop: Extrusion of soft metals, Plastic coating of copper wires, Plastic moulding.

Paper Code: ETME-159	**L**	**P**	**C**
Paper: Engineering Graphics Lab	**0**	**2**	**1**

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.

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.

UNIT - III

Projection of Solids: Simple cases when solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

CADD

UNIT - IV

Isometric Projection

Nomography : Basic Concepts and use.

TEXT BOOKS:

1. Engineering drawing by N.D.Bhatt (Charotar Publications).

REFERENCE BOOKS:

1. Engineering Drawing by S.C.Sharma & Navin Kumar (Galgotia Publications)
2. Engineering Drawing by Venugopalan.
3. Engineering Drawing by P.S.Gill

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 of 12.5 marks.

UNIT - I

CALCULUS OF SEVERAL VARIABLES:

Partial differentiation, ordinary derivatives of first and second order in terms of partial derivaties, Euler's theorem on homogeneous functions, change of variables, Taylor's theorem of two variables and its application to approximate errors. Maxima and Minima of two variables, Langranges method of undermined multipliers and Jacobians.

[No. of Hrs. 12]

UNIT - II

FUNCTIONS OF COMPLEX VARIABLES:

Derivatives of complex functions, Analytic functions, Cauchy-Riemann equations, Harmonic Conjugates, Conformal mapping, Standard mappings – linear, square, inverse and bilinear. Complex line integral, Cauchy's integral theorem, Cauchy's integral formula, Zeros and Singularities / Taylor series, Laurents series, Calculation of residues. Residue theorem, Evaluation and real integrals. **[No. of Hrs. 12]**

Unit - III

VECTOR CALCULUS:

Scalar and Vector point functions, Gradient, Divergence, Curl with geometrical physical interpretations, Directional: derivatives, Properties.

Line integrals and application to work done, Green's Lemma, Surface integrals and Volume integrals, Stoke's theorem and Gauss divergence theorem (both without proof).

[No. of Hrs. 10]

UNIT - IV

LAPLACE TRANSFORMATION:

Existence condition, Laplace transform of standard functions, Properties, Inverse Laplace transform of functions using partial fractions, Convolution and coinvolution theorem. Solving linear differential equations using Laplace transform. Unit step function, Impulse function and Periodic function and their transforms. **[No. of Hrs. 10]**

TEXT BOOKS:

1. E. Kresyzig, "Advanced Engineering Mathematics", John Wiley and Sons. (Latest edition).
2. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", Narosa, 2003 (2^{nd} Ed.).
3. Dr. A. B. Mathur, V. P. Jaggi, "Advanced Engineering Mathematics", Khanna Publishers.

REFERENCE BOOKS:

1. V. V. Mitin, M. P. Polis and D. A. Romanov, "Modern Advanced Mathematics for Engineers", John Wiley and Sons, 2001.
2. R. Wylie, "Advanced Engineering Mathematics", McGraw-Hill, 1995.

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.

UNIT - I

Electromagnetic Theory (EMT)

Motion of Charged Particles in crossed electric & magnetic fields, Velocity Selector & Magnetic focussing, Gauss law, continuity equation, inconsistency in Ampere's Law, Maxwell's equations (differential and integral forms), poynting vector, Poynting Theorem (Statement only), propagation of plane electromagnetic waves in conducting and non-conducting medium.

[No. of Hrs. 8]

UNIT - II

Quantum Mechanics & Statistical Physics:

De-Broglie Hypothesis, Davisson Germer experiment, wave function and its properties, expectation value, Wave Packet, Uncertainity principle. Schrodinger Equation for free Particle, Time Dependent Schrodinger Equation, Particle in a box (1-D), Single step Barrier, Tunneling effect.

Qualitative Features of Maxwell Bollzman, Bose-Einstein and Fermi-Dirac statistics distribution, functions & their comparison (no derivation) **[No. of Hrs. 8]**

UNIT - III

Solid State Physics

Formation of energy bands in metals, semiconductors and insulators; intrinsic and extrinsic semiconductors, Fermi energy levels for doped, undoped semiconductors and pn junction; Tunnel diode, Zener diode.

Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory (Qualitative only), London's equation, properties of superconductors & applications.

[No. of Hrs. 8]

UNIT - IV

X-Rays: production and properties, Crystalline and Anorphous solids (Brief) Bragg's Law, Applications.

Ultrasonics: Introduction, Production of Ultrasonics (Magentostriction and piezoelectric methods), engineering applications. **[No. of Hrs. 8]**

TEXT BOOKS:

1. A. BEISER, "Concept of Modern Physics"
2. Rajam, "Atomic Physics"
3. Greiner, "Quantum Physics"
4. Griffth, "Introduction to Electrodynamics"

REFERENCE BOOKS:

1. Jordan & Balmain, "Electromagnetic waves and Radiating Systems"
2. Kittel, "Solid State Physics"
3. R.L. Singhal, "Solid State Physics"
4. Schiff, "Quantum Mechanics"

Paper Code: ETCH – 106	**L**	**T**	**C**
Paper: Applied Chemistry – 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.

UNIT - I

Chemical Bonding:

Potential Energy curve for H_2 molecule, co-ordinate bond, Werner's theory, effective atomic numbers, isomerism in co-ordinate compounds. Hydrogen bonding, Vander Waal's forces, hybridization including d-orbitals, Valence shell Electron Repulsion Theory (VSEPR). Discussion of structures of IF_3, $SnCl_2$, CO_3^{2-}, Molecular Orbital theory, Linear combination of atomic orbitals (LCAO) method. Structures of simple heteronuclear diatomic molecules such as CO, NO, HF, HCl. **[No. of Hrs: 08]**

UNIT - II

Gaseous State: Gas laws and Kinetic theory of gases, Distribution of molecular velocities, Mean free path, Real gases – non ideal behaviour, causes of deviation from ideal behaviour, Vander Waal's equation. Liquefaction of gases. Numericals based on above topics.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), heat of dilution, heat of hydration, heat of neutralization and heat of combustion, Flame temperature. **[No. of Hrs: 08]**

UNIT - III

Catalysis: Criteria for catalysis : Homogeneous catalysis – acid-base, Enzymatic catalysis, Catalysis by metal salts, Heterogeneous catalysis, concepts of promoters, inhibitors and poisoning, physiosorption, chemisorption, surface area.

The Phase Rule: Definitions of various terms, Gibb's Phase rule, Application of phase rule to one component system – the water system and Sulphur system. Two component system : Lead – Silver, $FeCl_3$ – water, Na_2SO_4 – water. **No. of Hrs: 08]**

UNIT - IV

Polymers and Composites: Functionality, Degree of polymerization, concept of molecular weight (number average, weight average & numerical based on them), Linear, branched and cross-linked polymers, Tacticity of polymers, Homo and Copolymers (Classification based on repeat unit), Structure – property relationship of polymers. Industrial applications of important thermoplastic, thermosetting polymers, Elastomers, Natural Polymers.

Conducting Polymers : Properties and applications.

Composites : Classification, Fibre and particle reinforced composites. **[No. of Hrs: 08]**

TEXT BOOKS:

1. J.D. Lee, "Inorganic Chemistry", Latest ed.
2. J.C. Kuriacose & J. Rajaram, "Chemistry in Engineering & Technology, Vol I & II, Latest ed.
3. Puri, Sharma & Pathania, "Principles of Physical Chemistry", Latest ed.
4. V.R. Gowarikar, N.V. Viswanathan & Jayadev Sreedha, "Polymer Science", Latest ed.

Paper Code: ETCS 108 | ***L*** | ***T*** | ***C***
Paper: Introduction to Programming | **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.

UNIT - I

Introduction to Programming: Concept of algorithms, Flow Charts, Data Flow diagrams etc., Introduction to the Editing tools such as vi or MS-VC editors, Concepts of the finite storage, bits bytes, kilo, mega and gigabytes. Concepts of character representation, Number Systems & Binary Arithmetic. **[No. of Hrs. 8]**

UNIT - II

Programming using C: The emphasis should be more on programming techniques rather than the language itself. The C Programming language is being chosen mainly because of the availability of the compilers, books and other reference materials.

Example of some simple C program. Concept of variables, program statements and function calls from the library (Printf for example)

C data types, int, char, float etc., C expressions, arithmetic operation, relational and logic operations, C assignment statements, extension of assignment of the operations. C primitive input output using getchar and putchar, exposure to the scanf and printf functions, C Statements, conditional executing using if, else. Optionally switch and break statements may be mentioned.

[No. of Hrs. 8]

UNIT - III

Iterations and Subprograms: Concept of loops, example of loops in C using for, while and do-while. Optionally continue may be mentioned.

One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations.

Concept of Sub-programming, functions Example of functions. Argument passing mainly for the simple variables. **[No. of Hrs. 8]**

UNIT - IV

Pointers and Strings: Pointers, relationship between arrays and pointers Argument passing using pointers Array of pointers. Passing arrays as arguments.

Strings and C string library.

Structure and Unions. Defining C structures, passing strings as arguments Programming examples. **[No. of Hrs. 8]**

TEXT BOOKS:

1. Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.

REFERENCE BOOKS:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.

Paper Code: ETME 110	**L**	**T**	**C**
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.

UNIT - I

Force system: Free body diagram, Eqilibrium equations and applications.

Friction: Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, friction lock, friction of flat pivot and collared thrust bearings, Belt drive- derivation of equation.

$$T_1/T_2 = e^{\mu\theta}$$ and its application

[No. of Hrs. 8]

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.

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. **[No. of Hrs. 8]**

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.

[No. of Hrs. 8]

UNIT - IV

Kinematics of Rigid Bodies: Concept of rigid body, type of rigid body motion, absolute motion, introduction to relative velocity, relative acceleration (Corioli's component excluded) and instantaneous center of velocity, Velocity and acceleration 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.

[No. of Hrs. 8]

TEXT BOOKS:

1. A.K.Tayal, "Engg Mechanics", Umesh Publications
2. Sadhu Singh, "Engg Mechanics", Khanna Publishers

REFERENCE BOOKS:

1. Irving H. Shames, "Engg Mechanics", PHI publications
2. U.C.Jindal, "Engg Mechanics", Galgotia Publications
3. Beer & Johnston, "Engg Mechanics", TMH
4. Subramanyam, "Engg Mechanics"

Paper Code: ETEC-112	**L**	**T**	**C**
Paper: ELECTRICAL SCIENCE	**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.

UNIT - I

Circuit Analysis

Ohm's Law, KCL, KVL Mesh and Nodal Analysis, Circuit parameters, energy storage aspects, Superposition, Thevenin's, Norton's, Reciprocity, Maximum Power Transfer Theorem, Millman's Theorem, Star-Delta Transformation. Application of theorem to the Analysis of dc circuits. **[No. of Hrs. 8]**

UNIT - II

A.C.Circuits

R-L, R-C, R-L-C circuits (series and parallel), Time Constant, Phasor representation, Response of R-L, R-C and R-L-C circuit to soinusoidal input Resonance-series and parallel R-L-C Circuits, Q-factor, Bandwidth. **[No. of Hrs. 7]**

UNIT - III

Measuring Instruments

Principles, Construction and application of moving coil, moving iron, dynamometer type, induction type instruments, extension of range of ammeter, voltmeter (shunt and multiplier), Two-wattmeter method, for the measurement of power, Cathol-ray Oscilloscope and Applications. **[No. of Hrs. 7]**

UNIT - IV

Transformers

Construction and Working principles and phaser diagrams of Single-phase Transformer, Emf equation, Equivalent circuit, Regulation and efficiency, and Auto transformer.

Rotating Machines

Construction and working principles of dc motor and generator and its characteristics Applications of DC machines

Construction and working principles of 3-φ-Induction motor, Torque-speed characteristics, and Industrial applications. **[No. of Hrs. 10]**

TEXT BOOKS:

1. P.C. Sen "Principles of Electric Machines and Power Electronics", Wiley Eastern 2003.
2. Vincent DEL TORO "Electrical Engineering Fundamental's Prentice Hall India", Ed 2002.

Paper Code: ETEL-114	**L**	**T**	**C**
Paper: Communication Skills – 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.

UNIT – I

Basic Concepts in Communication: Communication as sharing; context of communication; the speaker/writer and the listener/reader; medium of communication; barriers to communication; accuracy, brevity, clarity and appropriateness in communication.

[No. of Hrs: 05]

UNIT - II

Writing Skills: Types of writings (Expository, Descriptive, Analytic, Argumentative, Narrative etc) and their main features. Resumes and CV's and Cover letters. Memos and Notices. Basics of Formal Reports. **[No. of Hrs: 08]**

UNIT - III

Verbal, Non-Verbal and Listening Skills: Elementary Phonetics (Speech Mechanism, The Description of Speech Sounds, The Phoneme, the syllable; Prosodic Features, Word Accent, Features of Connected Speech); Paralanguage and Body language; and Classroom Presentations, Hearing and Listening; Essentials of Good Listening: Achieving ability to comprehend material delivered at relatively fast speed. **[No. of Hrs: 08]**

UNIT - IV

Group Discussion: Use of persuasive strategies including some rhetorical devices for emphasizing (for instance; being polite and firm; handling questions and taking in criticism of self; turn-taking strategies and effective intervention; use of body language).

[No. of Hrs: 09]

TEXT BOOKS:

1. R. K. Bansal, and J. B. Harrison, "Spoken English For India: A Manual of Speech and Phonetics", Hyderabad: Orient Longman, 1983.
2. Lewis, Hedwig. "Body Language: A Guide For Professionals. New Delhi: Response Books", A division of Sage Publication, 2000
3. Sides, H. Charles, "How to Write & Present Technical Information", Cambridge: CUP, 1999.
4. Forsyth, Sandy & Lesley Hutchison, "Practical Composition", Edinburgh Oliver & Boyd, 1981

Paper Code: ETPH-152	**L**	**P**	**C**
Paper: Applied Physics Lab – II	**0**	**2**	**1**

List of Experiments

1. To determine the value of e/m of electron by J.J. Thomson method.
2. To determine unknown resistance of a wire by Carey Foster's Bridge.
3. To determine the internal resistance of Leclanche cell using potentiometer.
4. To study the charging and discharging of a capacitor and to find out the time constant.
5. To find the thermal conductivity of a poor conductor by Lee's disk method.
6. To study the thermo emf using thermocouple and resistance using Pt. Resistance thermometer.
7. To determine the velocity of ultrasound waves using an ultrasonic spectrometer in a given liquid (Kerosene Oil)
8. To measure the frequency of a sine-wave voltage obtain from signal generator and to obtain lissajous pattern on the CRO screen by feeding two sine wave voltage from two signal generator.
9. To determine the temp. coefficient of resistance of platinum by Callender & Griffith's Bridge.
10. To study Hall effect.
11. To determine plank's constant.

Note:
Atleast 8 experiments must be carried out.
Proper error – analysis must be carried out with all the experiments.

Paper Code: ETCH – 154	**L**	**P**	**C**
Paper: Applied Chemistry Lab – II	**0**	**2**	**1**

List of Experiments

1. Determine the heat of hydration of $CuSO_4.5H_2O/FeSO_4.7H_2O$.
2. Determine the heat of neutralization of strong Acid (say H_2SO_4/HCl) with strong base (NaOH).
3. Determine the heat of neutralization of Weak Acid with strong base.
4. Determine the molecular weight of a substance by Rast Method.
5. Determine the reaction rate constant for 1^{st} order reaction.
6. Determine the surface tension of a liquid using drop weight method.
7. To determine the viscosity of the given liquid (density to be determined).
8. Preparation of a Polymer.
9. To determine the cell constant of a conductivity cell.
10. Titration of strong acid/strong base conduct metrically.

TEXT BOOKS:

1. B.D. Khosla, A. Gulati & V.C. Garg, "Practical Physical Chemistry", Latest ed
2. S.K. Bhasin and Sudha Rani, "Laboratory Manual on Engineering Chemistry", Latest ed.

Paper Code: ETCS 156 **L P C**
Paper: C Programming Lab. **0 2 1**

List of Experiments

1. Write a program to produce ASCII equivalent of given number
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user
   - ❖ (ax+b)/(ax-b)
   - ❖ 2.5 log x-cos 30+ | x^2-y^2|+sqrt (2xy)
   - ❖ (x^5+10x^4+8x^3+4x+2
4. Write a program to find sum of a geometric series
5. Write a program to cipher a string
6. Write a program to check whether a given string follows English capitalization rules
7. Write a program to find sum of the following series
   1+ ½ + 1/3 +_____+1/20
8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.
9. Write a recursive program for tower of Hanoi problem
10. The fibonacci sequence of numbers is 1,1,2,3,5,8……. Based on the recurrence relation
    F(n)=F(n-1)+F(n-2)for n>2
    Write a recursive program to print the first m Fibonacci number
11. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
    a) Addition of two matrices
    b) Subtraction of two matrices
    c) Finding upper and lower triangular matrices
    d) Trace of a matrix
    e) Transpose of a matrix
    f) Check of matrix symmetry
    g) Product of two matrices.
12. Write a program that takes two operands and one operator from the user perform the operation and then print the answer
13. Write a program to print the following outputs:

```
1                                   1
2   2                             2   2
3   3   3                       3   3   3
4   4   4   4                 4   4   4   4
5   5   5   5   5           5   5   5   5   5
```

14. Write functions to add, subtract, multiply and divide two complex numbers (x+iy) and (a+ib) Also write the main program.
15. Write a menu driven program for searching an sorting with following options:-
    a) Searching (1) Linear searching (2) Binary searching
    b) Sorting (1) Insersection sort (2) Selection sorting
16. Write a program to copy one file to other, use command line arguments.
17. Write a program to mask some bit of a number (using bit operations)
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.

Paper Code: ETME 158	**L**	**P**	**C**
Paper: Engineering Mechanics Lab	**0**	**3**	**2**

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, η 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.

Paper Code: ETEC 160	**L**	**P**	**C**
Paper: Electrical Science Lab	**0**	**2**	**1**

List of Experiments

1. Verification of Thevenin's theorem
2. Verification of Superposition theorem
3. Phasor Diagram and Power factor of LCR circuit.
4. Measurement of Power and Power factor in single phase Load using three ammeters/voltmeters.
5. Calibration of Energy Meter/Wattmeter/Voltmeter/Ammeter
6. Two wattmeter method of measuring power in three phase circuit (resistive load only)
7. Load test on Single Phase Transformer, Regulation and Efficiency of Transformer
8. Short Circuit/Open Circuit tests on Single Phase transformer
9. Measure the armature and field resistance of a D.C. Machine
10. Connection and starting of a Three Phase Induction Motor using direct on line or Star Delta Starter.
11. Starting and Speed Control of a D.C. shunt motor
12. Resonance

Paper Code:ETMA - 201 **L T C**

Paper: Numerical Analysis & Programming **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.

UNIT - I

Numerical Techniques: The solution of linear and non-linear equations: Direct Iteration method, Regula-Falsi method, Newton – Raphson method. Solution of system of simultaneous equations by Gauss elimination, Gauss-Jacobi and Gauss-Seidal methods.

Finite differences: Forward, backward and Central differences. **[No. of Hrs.: 11]**

UNIT II:

Interpolation and Numerical Calculus: Newton's interpolation for equi-spaced values. Divided differences and interpolation formula in terms of divided differences. Stirling's central difference interpolation formula, Lagrange's interpolation formula for unequi-spaced values. Numerical Differentiation. Numerical Integration: Newton-Cote's quadrature formula, Trapezoidal rule, Simpson's one-third rule and Simpson's three-eighth rule. **[No. of Hrs.: 11]**

UNIT III:

Numerical solution of ordinary differential equations: Picard's method, Euler's method, modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method. **[No. of Hrs.: 11]**

UNIT IV:

Computer Programming: Writing programmes in C++ for solving numerical problems. For example, Programme for solving algebraic and transcendental equations by Newton-Rapson Method, solving simultaneous equations by Gauss-Seidal method. Programme for Interpolation by Lagrange's method. Programme for estimating the value an integral by Simpson's rule. Programme for solving differential equation by Runge-Kutta method, etc. **[No. of Hrs.: 11]**

Text Books:

1. V.P. Mishra; "Text Book of Engineering Mathematics", Galgotia Publications, Delhi.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications, Delhi.
3. V.P. Jaggi and A.B. Mathur, "Advanced Engineer Mathematics", Khanna Publications, Delhi.

Reference Books:

1. S.S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall of India Pvt. Ltd., New Delhi.
2. M.K. Jain, S.R.K Iyengar, R.K. Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International Publishers, New Delhi.

Paper Code:ETME - 203	**L**	**T**	**C**
Paper: Electronics	**3**	**1**	**4**

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

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

UNIT - I

Semiconductor Diodes: Introduction to Junction Diode, Rectifiers (Half wave & Full wave), Filters, Voltage Regulation and Voltage Multiplier. Types of Diodes (Zener, Photo, LED), Liquid Crystal Display (LCD), Introduction to Silicon Controlled Rectifier (SCR), DIAC, TRIAC.

Bipolar Junction Transistor: BJT Characteristics, CB, CE & CC Configuration, Load Line (DC & AC), Leakage Current, Saturation, Active & Cut off mode of operation of Transistor, Biasing methods. **[No. of Hrs.: 11]**

UNIT - II

Small Signal Amplifier: CB, CE, CC, Amplifier, Hybrid Model Analysis of Common Emitter Amplifier, RC Coupled Amplifier, Mid-Band Model, gain and Impedance, Comparison of Different Configurations, Darlington Amplifier.

Large Signal Amplifier: Introduction to Class A, Class B, Class C Amplifier, Class B Push Pull Amplifier.

Oscillator: Concept of Negative & Positive feedback, Introduction to LC Oscillators **[No. of Hrs.: 11]**.

UNIT - III

Field Effect Transistor: Introduction, Classification, FET Characteristics, Depletion & Enhancement MOSFET.

Operational Amplifier: Op-Amp Model, Concept of Ideal Op-Amp, Concept of Virtual Ground, Inverting & Non-Inverting Amplifier, Differential Amplifier, Adder & Sub tractor, V – I & I – V Converter, Integrator, Differentiator, Comparators. **[No. of Hrs.: 11]**

UNIT - IV

Digital Circuits: Binary operation, Boolean Algebra, Different Types of Codes (BCD, Gray, Excess-3, ASCII) DeMorgan's Law, Karnaugh Map, Different Types of Gates, Half Adder, Full Adder, Encoders, Decoders, Multiplexers, DeMultiplexers, Flipflops, Counters, Shift Registers, Introduction to RAMs and ROMs. **[No. of Hrs.: 11]**

Text Books:

1. Millman & Halkias, "Electronic Devices & Circuits", Tata Mcgraw Hill
2. R.L. Boylestos & L. Nashesky, "Electronic Devices & Circuits", Pearson Education
3. S. Salivahenan, N. Suresh Kr. & A. Vollavaraj, "Electronic Devices & Circuit", Tata McGraw Hill.

Reference Books:

1. R.P. Jain, "Modern Digital Electronics", Tata Mcgraw Hill
2. Malvino & Leach, "Digital Principle And Applications", Tata Mcgraw Hill

Paper Code: ETME 205	**L**	**T**	**C**
Paper: Thermal Science	**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.

UNIT - I

Basic concepts: Introduction to the Basic definitions of Engineering Thermodynamics. Thermodynamic systems : Closed, open and isolated systems. Microscopic and Macroscopic view. Intensive and Extensive properties. Zeroth law of Thermodynamics. Phase, State, Process, Cycle. Point functions and Path functions. Equation of state. Work and Heat.

First Law of Thermodynamics: Internal energy - a property arising from the First Law of Thermodynamics . Reversible Non flow processes p-v diagrams. Concept of Flow work, Enthalpy. Analysis of unsteady flow and steady flow processes and their applications. Throttling process. **[No. of Hrs.: 11]**

UNIT - II

Second Law of Thermodynamics: Limitations of First law and necessity of Second Law of Thermodynamics. Claussius and Kelvin Planck statements. Reversible and Irreversible processes. Carnot cycle, Reversed Carnot cycle. Clausius inequality. Entropy - a property arising from the Second law of Thermodynamics. Expressions for change in entropy during various processes and representations on t-s diagrams.

Availability and Irreversibility : High grade and low grade energy. Available and unavailable energy. Dead state. Loss of available energy due to Heat transfer through a Finite temperature difference. Availability. Reversible work and Irreversibility. Availability in non flow systems and steady flow systems. Second law efficiency. **[No. of Hrs.: 11]**

UNIT - III

Thermodynamic Property Relations: Helmholtz and Gibbs function. Mathematical conditions for Exact differentials (Properties). Maxwell Relations. Clapeyron Equation.

Properties of a Pure Substance: Phase equilibrium of a Pure substance on t-v diagram. Normal boiling point of a Pure substance. Saturation states. Compressed liquid. p-v & p-t diagram of a pure substance. Saturated steam, Dry and saturated steam, Superheated steam. Use of Steam tables and Mollier diagram. Different processes of vapour on p-v and t-s diagrams. Measurement of Dryness fraction. **[No. of Hrs.: 11]**

UNIT - IV:

Gas Power Cycles: Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycle and Brayton cycle.

Vapour Power Cycles : Carnot cycle. Simple Rankine cycle. Effect of various parameters on the efficiency of Rankine cycle. Reheat and Regenerative cycles. **[No. of Hrs.: 11]**

Text Books:

1. P.K. Nag, "Engineering Thermodynamics", Tata McGraw Hill

Reference Books:

1. Sonntag/Vanhylene, "Fundamentals of Thermodynamics", Wiley
2. Rahul Gupta, "Engineering Thermodynamics", Asian Books P. Ltd.
3. Gordon Rosers, "Yon Mahew; Engineering Termodynamics", Addison Wesley
4. Y.V.C. Rao, "Engineering Thermodynamics", Khanna Publications.
5. E. Gutra, "Basic Thermodynamics", Narosa Publications.

6. M.L. Mathur, “Mehta F.S. Thermal Engineering”, Jain Brothers
7. R.K. Rajput, “Thermal Engineering”, Laxmi Publications
8. Onkar Singh, “Applied Thermodynamics”, New Age Publications.
9. Dhomkundwar Kothandaraman, “A Course in Thermal Engineering”, Dhanpat Rai Publications
10. S.K. Kulshretha, “Engineering Thermodynamics”, Vikas Publications.

Paper Code: ETME 207 **L T C**

Paper: Mechanics of Solids **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.

UNIT - I

Simple Stresses & strains: Tensile, Compressive, shear and volumetric stresses and Strains, stress strain diagram, complementary shear stress, lateral strain and Poisson's ratio.

Compound bars and Temperature stresses: Stresses in compound bars carrying axial loads and subjected to temperature stresses.

Complex stresses and strains: Principle stress and strain due to combination of stresses, Mohr's circle theories of Failures. **[No. of Hrs.: 11]**

UNIT - II

Simple bending: Shear force and bending moment diagrams of cantilevers, beams under concentrated, uniformly varying loads with and without overhangs.

Stresses in beams and cantilevers under bending, beam of uniform strength, flitched beams, bending due to eccentric loads.

Slope and defection of cantilevers and beams under concentrated and uniformly distributed loads. **[No. of Hrs.: 11]**

UNIT - III

Columns: Combined direct and bending stresses in columns, Euler's and Rankine Gordon equations.

Torsion: Stresses and strains in pure torsion of solid circular shafts and hollow circular shafts. Power transmitted by shafts; combined bending and torsion. **[No. of Hrs.: 11]**

UNIT - IV

Springs: Close-coiled, open coiled springs under torque and moment.

Cylinders: Thin and thick cylinders, Lame's Theorem, compound cylinders, spherical vessels.

[No. of Hrs.: 11]

Text Books:

1. Jindal U.C., "Strength of Materials", Galgotia Publication, New Delhi, 1998.
2. Ryder G.H., "Strength of Materials", Macmillan, Delhi, 2003.
3. R.K. Bansal, "Strength of Materials", Laxmi Publication, New Delhi, 2001.

Reference Books:

1. Sadhu Singh, "Strength of Materials", Khanna Publishers, New Delhi, 2000.
2. Timoshenko S.P., "Elements of Strength of Materials", East-West affiliated, New Delhi, 2000.
3. Hibbler R.C., "Mechanics of Materials", Prentice Hall, New Delhi, 1994.
4. Popov Eger P., "Engg. Mechanics of solids", Prentice Hall, New Delhi, 1998.
5. Fenner, Roger.T, "Mechanics of Solids", U.K. B.C. Publication, New Delhi, 1990.
6. Sri Nath L.S. et.al., "Strength of Materials", McMillan, New Delhi,2001

Paper Code: ETME 209 **L T C**
Paper: Production Technology **4 0 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.

UNIT - I

Moulding: Cores, Core Prints, Core boxes, Pattern design, Pattern layout and construction, testing of moulding sand. moulding and core making machines, use of chaplets, CO_2 - Process, fluid sand process, shell moulding, cold curing process, hot-box method, high pressure and flask less moulding, Design of metal moulds, Die Design for die Casting. **[No. of Hrs.: 11]**

UNIT - II

Casting: Directional principles, Solidification, types of gating systems, Pouring time and temperature. Design criteria of pouring basin, screw, runner, gate and riser, gating ratio, chill and its uses. Selection of melting furnaces, Crucible furnaces, Electric furnaces, Induction furnace, Control of melt and Cupola charge calculations. Foundry mechanization and lay out. Casting defects, Causes and remedies. **[No. of Hrs.: 11]**

UNIT - III

Welding: Principle, classification, advantages, limitations and applications, Tungsten Inert Gas welding, Metal Inert Gas welding, Electro - slag welding, Electro - Gas Welding, Explosive Welding, Ultrasonic Welding, Electron Bean Welding, Laser Beam Welding, Friction Welding, Cold Welding, Thermit Welding, Codification of Electrodes, Welding Defects-causes and remedies. **[No. of Hrs.: 11]**

UNIT - IV

Metal Forming: Introduction to Metal Forming, Hot Forming and Cold Forming, Description of Forging, Wire Drawing, Tube Drawing, Deep Drawing, Rolling Bending, Extrusion Blanking, Piercing.

Powder Metallurgy: Definition, advantages, limitations and applications, Powder metallurgy processes and operations, metal powders, their characteristics and manufacture.

[No. of Hrs.: 11]

Text Books:

1. Rao P.N., "Manufacturing Technology",Vol.1, Tata McGraw Hill, 2003.
2. Sharma P.C., "A Text Book of Production Engineering", Vol.1, S. Chand Publication, New Delhi, 2001.

Reference Books:

1. Jain P.L., "Principles of Foundry Technology", Tata McGraw Hill, New Delhi, 1998.
2. Ramana Rao T.V., "Metal Casting Principles & Practices", New Age INT, New Delhi, 2003.
3. Heine & Rosenthal, "Principle of Metal Casting", Tata McGraw Hills, New Delhi, 2003.
4. Little Richard L, "Welding & Welding Technology", Tata McGraw Hill, New Delhi, 2003.
5. Raghuwanshi B.S., "Workshop Technology ",Vol.1, Dhanpat Rai Publication, N.Delhi, 2003.
6. Hazra Chaudhari, "Elements of Workshop Technology", Media Promoter Publication, New Delhi, 1998.
7. Jain, R.K., "Production Technology", Khanna Publishers, 2001.
8. HMT Bangalore, "Production Technology", Tata McGraw Hill, 1980.
9. Lindberg R.A., "Processes & Materials of Manufacture", Prentice Hall Publication, 1998.
10. R.B. Gupta, "Production Technology", Satya Prakashan, 2000.

Paper Code:ETME:211	**L**	**T**	**C**
Paper: Mechanics of Fluids	**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.

UNIT - I

Fluid Properties and Fluid Statics: Newtonian and Non-Newtonian Fluids; Kinematic and dynamic Viscosity; Incompressible and compressible fluids, compressibility.

Forces on plane surfaces, forces on curved surfaces, buoyant forces, stability of floating bodies, metacentre and metacentric height.

Kinematics of Fluid Motion: Steady and unsteady flow; uniform and non-uniform flow; Laminar and turbulent flow; streamline, path line and streak line; continuity equation, irrotational and rotational flow, velocity potential and stream function, vortex flow, vortex lines, vortex tubes, free and forced vortex. **[No. of Hrs.: 11]**

UNIT - II

Dynamics of Fluid Flow: Eulers equation of motion and its integration to yield Bernoulli's equation, graPrentice Hall Indiacal representation of Bernoulli's equation and its practical applications – Pitot tube, Venturi meter; steady flow momentum equation, force exerted by jet on plane surface and force exerted on a pipe bend. **[No. of Hrs.: 11]**

UNIT - III

Dimensional Analysis and Principles of Similarity: Buckingham Π Theorem and its applications, Geometric, Kinematics and Dynamic similarity; Dimensionless numbers-Reynolds, Froude, Euler, Mach, Weber Number and their significance.

Boundary Layer Flow: Laminar and turbulent boundary Layer and laminar sublayer.

Boundary Layer thickness, displacement, momentum and energy thickness.

Laminar Flow : Reynold's experiment, critical velocity, steady laminar flow through a circular tube, flow between parallel plates, measurement of viscosity. **[No. of Hrs.: 11]**

UNIT - IV

Turbulent Flow: Shear stress in turbulent flow. Hydrodynamically smooth & rough boundaries. Velocity distribution for turbulent flow in smooth and rough pipes.

Analysis of Pipe Flow: Energy losses, minor losses in pipe lines, concept of equivalent length, flow between two reservoirs, multiple pipe systems – in series and parallel, siphon.

Flow Measurements: Measurement of flow using Venturi meter, orifice meter, Pitot tube, Flow nozzle, Measurement of flow in open channels – rectangular, triangular, trapezoidal weir, Cipoeletti weir. **[No. of Hrs.: 11]**

Text Books:

1. R.K. Basal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications(P) Ltd.,2002.
2. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S.K. Kataria & Sons,2000.

Reference Books:

1. I.H. Shames, "Mechanics of Fluids", Tata McGraw Hill
2. V.L. Streeter and E.B. Wylie, "Fluid Mechanics", Tata McGraw Hill

Practicals:

ETME – 251	**Electronics**	**P**	**C**
	Based on Course work ETME – 203	2	1
ETME – 253	**Mechanics of Solids/Fluid Mechanics**	**P**	**C**
	Based on Course work ETME – 207	**2**	**1**
ETME – 255	**Mechanical Engineering Drawing**	**P**	**C**
		2	**1**

Free-Hand Sketching & Scale Drawing
Free-hand exercises for drawing three views from various models:

Drawing of Two/Three views of:
Cotter joint
Knuckle Joint
Rivets & riveted joints
Types of screw threads and their representation.
Screws/Bolts and nuts
Rigid Couplings
Flexible Coupling
Stepped Pulley
Simple Bush bearing
Plummer block
Ball & Roller bearing
Engine parts
Connecting Rod
Piston

ETME - 257	**Programming-I (Numerical Analysis)**	**P**	**C**
	Based on Course work ETMA– 201	2	1

Paper Code:ETME - 202	**L**	**T**	**C**
Paper: Kinematics & Dynamics Of 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.

UNIT - I

General concepts, Velocity and Acceleration Analysis: Introduction of Simple mechanism, Different types of Kinematics pair, Grublers rule for degree of freedom, Grashof's Criterion for mobility determination Inversions of 3R-P, 2R-2P chains, Kinematic analysis of planar mechanism by graPrentice Hall Indiacal and vectorial analysis. Computer Implementation of Kinematic analysis using C++. **[No. of Hrs.: 11]**

UNIT - II

Cams: Classification, Cams with uniform acceleration and retardation, SHM, Cylcloidal motion, oscillating followers.

Vibrations: Vibration analysis of SDOF systems, natural, damped forced vibrations, based-excited vibrations, transmissibility ratio. **[No. of Hrs.: 11]**

UNIT - III

Gears: Geometry of tooth profiles, Law of gearing, involute profile, interference, helical, spiral and worm gears, simple, compound gear trains. Epicyclic gear trains – Analysis by tabular and relative velocity method, fixing torque.

Dynamic Analysis: Slider-crank mechanism, turning moment computations**[No. of Hrs.: 11]**

UNIT - IV

Balancing: Static and Dynamic balancing, balancing of revolving and reciprocating masses, single and multi-cylinder engines.

Gyroscopes: Gyroscopic law, effect of gyroscopic couple on automobiles, ships, aircrafts.

[No. of Hrs.: 11]

Text Books:

1. S.S. Rattan, "Theory of Machines", Tata McGraw Hill, 2000
2. Dr. V.P. Singh, "Theory of Machines", Dhanpat Rai & Co.(P)Ltd.,2001

Reference Books:

1. Jagdish Lal, "Theory of Mechanism & Machines", Metropolitan Education,2000
2. Thomas Beven, "The Theory of Machines", CBS Publishers, 2000
3. P.L. Ballaney, "Theory of Machines & Mechanism", Khanna Publishers, 23rd Edition, 2003.
4. Malhotra & Gupta, "The Theory of Machine", Satya Prakashan, 1999.

Paper Code: ETME –204 **L T C**
Paper: Heat Transfer **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.

UNIT - I

Conduction: One dimensional steady state conduction. Simple convection. Overall heat transfer coefficient. Simple cases of Heat Transfer through, homogenous and composite plane walls, cylinders and spheres with constant and variable thermal conductivity. Critical thickness of insulation. Heat transfer from Fins of uniform cross section.

Convection: Concept of Hydrodynamic and Thermal boundary layers. Application of Dimensional analysis to Free and Forced convection. Important Dimensions- less numbers.

[No. of Hrs.: 11]

UNIT - II

Heat transfer during Change of Phase: Film condensation and Drop wise condensation. Flow regimes. Heat transfer coefficient for Film Condensation. Boiling: Classification. Boiling regimes. Heat transfer correlations in boiling.

Heat exchangers: Types of Heat exchangers. LMTD and NTU methods exchangers Design. Simple calculations.

Radiation: Kirchoffs law. Planck's distribution law. Wein's displacement law. Stenfan-Boltzmann's relation. Configuration factor. Radiant heat interchange between black and grey surfaces. Solar Radiation, Radiation shielding. **[No. of Hrs.: 11]**

UNIT - III

Air Compressors: Classification. Single stage Reciprocating compressor, Isothermal efficiency, Adiabatic efficiency. Clearance volume, Volumetric efficiency. Actual indicated diagram. Multistage compression with intercooling. Rotary Compressors: Roots Blower, Rotary vane compressor. Centrifugal and Axial flow compressor.

Gas Turbines: Gas Power Cycles–Thermal refinements. Performance of Gas turbines, Combined cycle. Principles of Jet Propulsion. Turbojet and Turbo-prop engines, Rocket engines.

[No. of Hrs.: 11]

UNIT - IV

Steam Nozzles: Application of Nozzles. Types of Nozzles. Expansion of steam through a Nozzle. Effect of friction. Critical pressure ratio. Areas at Throat & Exit for maximum discharge conditions. Performance at Off- design conditions.

Steam Turbines: Classification. Impulse and Reaction Turbines. Compounding of steam turbines. Velocity diagrams. Conditions for maximum efficiency. Governing of steam turbines. Losses in steam turbines. Reheat Factor. **[No. of Hrs.: 11]**

Text Books:

1. R. Yadav, "Steam Turbines", Asia Publications.
2. D.S. Kumar; "Heat & Mass Transfers", S.K. Kataria & Sons.
3. M.L. Mathur, F.S. Mehta, "Thermal Engineering", Jain Publication
4. R.K. Rajput, "Thermal Engineering", Laxmi Publication

Reference Books:

1. J.P. Holman; "Heat Transfers" McGraw Hill, USA
2. Mills; "Heat Transfers", C.B.S Publications.
3. Kearton; "Steam Turbine", C.B.S Publications
4. Arora DomkundwaR, "A Course in heat & Mass Transfer", Dhanpat Rai & Co.
5. Onkar Singh, "Applied thermodynamics", New Age Publications
6. Dhomkundwar, "A course in Thermal Engg.", Dhanpat Rai Publications
7. P.L. Ballaney, "Thermal Engg." Dhanpat Rai Publications
8. Cohen Rojers, "Gas Turbine Theory", Pearson's Education.

Paper Code: ETME - 206 **L T C**

Paper: Manufacturing Machines **4 0 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.

UNIT - I

Introduction: Classification of machine tools based on application and production rate: General purpose, Single purpose and Special purpose machines, Classification based on-types of machine tools and the processes, Generating and forming.

Elements of metal cutting processes: Elements of tool geometry, cutting tool materials and applications.

Lathe: Various types of lathe: Centre lathe, facing lathe, gap-bed lathe, capstan and turret lathe, CNC lathe, major difference between CNC lathe and conventional lathe. Major sub-assemblies of a lathe: Bed, headstock, tail stock, carriage consisting of saddle, cross-slide, compound slide, tool post and apron. Work holding devices: self centering three jaw chuck, independent four jaw chuck, collets, face plates, dog carriers, centers and mandrels. **[No. of Hrs.: 11]**

UNIT - II

Lathe contd... Driving mechanisms, apron mechanism, thread cutting mechanism and calculations, features of half-nut engagement – disengagement, indexing dial mechanism. Operations on lathe: taper turning, related calculations, thread cutting, facing, under-cutting, drilling, boring, parting-off, knurling, chamfering.

Reciprocating Type Machine Tools: Shaper, Planer and Slotter: Constructional features, basic machines and kinematics and related calculations **[No. of Hrs.: 11]**

UNIT III:

Drilling Machines: Constructional features of bench drilling machine, radial drilling machine, multi-spindle drilling machine, feed mechanism, work holding devices, Tool – holding devices. Different drilling operations: Drilling, reaming, counter boring and countersinking etc., estimation of drilling time.

Milling Machines: Types of general purpose milling machines: horizontal, vertical and universal. Types of milling cutters and their applications, different milling operations, work-holding devices: vice, clamps, chucks, dividing head and its use, simple, compound and differential indexing. Indexing calculations and machining time calculations. Introduction to machining centers **[No. of Hrs.: 11]**

UNIT IV:

Grinding Machines: Different types of grinding machines: cylindrical, surface and centre-less grinding machines, basic constructional features and mechanisms, specifications, different grinding operations, honing, lapping and super-finishing processes.

Gear Manufacturing Machines: Gear forming, gear generation, gear shaping and gear hobbing **[No. of Hrs.: 11]**

Text Books:

1. P.N. Rao, "Manufacturing Technology: Metal Cutting & Machine Tools", Tata McGraw Hill, Delhi, 2004.
2. B.S. Raghuwanshi, "Workshop Technology", Vol.2, Dhanpat Rai & Sons, 2003.
3. Hazra Chandhari S.K., "Elements of Workshop Technology", Vol.2, Media Promoters, 2003.

Reference Books:

1. P.C. Sharma, "A Text Book of Production. Engineering", S. Chand, New Delhi, 2004.
2. Bawa H.S., "Workshop Technology", Vol.2, Tata McGraw Hill, 2004.
3. Juneja & Shekhon, "Fundamental of Metal Cutting", New Age Publications
4. S.F. Krar Stevan F. and Check A.F., "Technology of M/C Tools", McGraw Hill Book Co., 1986.
5. Kibbe Richard et al, "M/c Tool practices", Prentice Hall India, 2003.
6. Bangalore HMT, "Production Technology", Tata McGraw Hill, 1980.
7. R.K. Jain, "Production Technology", Khanna Publishers
8. Gerling Heinrich, "All about Machine Tools", New Age Publication, 2003.

Paper Code: ETME-208	**L**	**T**	**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.

UNIT – I

D.C. Machines: D.C. Machines, constructional features, Principles of operation, DC generator analysis, DC motor analysis, Motor-speed-torque characteristic, speed control, applications of DC motors, starters and controllers of DC motors. **[No. of Hrs.: 11]**

UNIT – II

A.C. Machines: Three phase induction motors, revolving magnetic field theory, induction motor as a transformers, equivalent circuit, computation of performance, starting, auto start, speed control. **[No. of Hrs.: 11]**

UNIT – III

The Three Phase Synchronous Machine: Synchronous generator / motor phasor diagrams, equivalent circuits, computation of synchronous machine performance, synchronous condense. **[No. of Hrs.: 11]**

UNIT – IV

Single phase induction motors, double revolving field theory, different types of single – phase induction motors, characteristics and typical applications. Fractional KW motors, stepper motors, hysteresis motor, Servo motors AC series motor and Universal motors. **[No. of Hrs.: 11]**

Text Books:

1. Hughes Edward, "Electrical Technology", Addison Wesley Longma Ltd.
2. Nagrath IJ and Kothari, "DP. Electrical M/C", Tata McGraw Hill.

Reference Books:

1. Kosow L.L., "Electrical Machines & Transforms", Prentice Hall India.
2. Fitzerald Kingsley, "Kusko, Dumas", Electrical Machines, Tata McGraw Hill.
3. M.G. Say, "AC Machines", Pitman & Sons.
4. P.S. Bimbhna, "Electrical Machinery", Khanna Publication.

Paper Code:ETME: 210	**L**	**T**	**C**
Paper: Operations Research	**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.

UNIT - I

Linear Programming: Formulation of LP Problem. GraPrentice Hall Indiacal and Simplex method for maximization and minimization LP Problems. Duality in Simplex Problems, Sensitivity Analysis. **[No. of Hrs.: 10]**

UNIT - II

Transportation Models: Stepping stone method & MODI method for optimality check, North West Corner Method, Least-cost Method and Vogel's Approximation Method (VAM) for solving balanced and unbalanced transportation problems. Problems of degeneracy and maximization.

Assignment Models: Assignment model for maximization & minimization problems. Traveling Salesman Problems, Industrial Problems. **[No. of Hrs.: 11]**

UNIT - III

Queuing Theory: Basic structure, Terminology, Classification, Birth and Death Process. Queuing Models upto 2 service stations.

Sequencing Theory: Processing of n-jobs through m-machines with each job having same processing order. Processing of two jobs through m-machines with each job having different processing order. **[No. of Hrs.: 11]**

UNIT - IV

Network Models: Introduction to PERT and CPM. Fundamental concept of Network models and construction of network diagrams. Activity time estimates. Critical path and project time duration. Probability of completing the project on or before specified time. Concept of Float and slack.

Games Theory: Two person zero-sum games. Minimax and Maximin principle. Arithmetic, Algebraic, Matrix Algebra method. Solution by Dominance, Subgame, GraPrentice Hall Indiacal and Linear programming method. **[No. of Hrs.: 12]**

Text Books:

1. N.D. Vohra, "Operations Research", Tata McGraw Hill, 2004.
2. J.K. Sharma, "Operation Research", Macmillan India Ltd. 2005.
3. H.A. Taha, "Operations Research", Prentice-Hall India, 6th Edition, 2004.

Reference Books:

1. Richard Bronson, Govindasami Naadimuthu, "Operations Research", Tata McGraw Hill, 2004
2. A.P. Verma, "Quantitative Techniques", Asian Books Pvt. Ltd., 2004
3. A.P. Verma, "Operations Research", S.K. Kataria & Sons, 2004.

Paper Code ETME-212 **L T C**
Paper: LAN & Networking **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.

UNIT - I

Introduction to computer networks, reference models: OSI model, TCP / IP model, Evolution of Internet. **[No. of Hrs.: 10]**

UNIT - II

Fundamentals of MAC layer, Data Link layer, Transmission media: Guided and Unguided, Twisted pair cable (STP & UTP), coaxial cable, fiber optic cable, radio waves, infrared, microwaves links. **[No. of Hrs.: 10]**

UNIT - III

LAN technologies: Traditional Ethernet (Concept of CSMA / CD), Fast Ethernet, Giga bit Ethernet IEEE 802.4 (Token bus), IEEE 802.5 (Token ring), IEEE 802.11 (Wireless LAN), Working of repeater, hub, bridge and switch. Network layer concepts and routing algorithms, IPV6 and IPV4, subnetting and subnet masking, working of routers in LAN. Concept of Virtual LAN

[No. of Hrs.: 12]

UNIT - IV

Introduction to encryption and compression of data, network security issues, working of dial up connection, role of internet service provider (ISP) and working of ISDN and broadband internet connection etc, Application layer protocol: DNS, HTTP, FTP, telnet. **[No. of Hrs.: 12]**

Text Books:

1. B.A Forouzan., "Data Communication and Networking", Tata McGraw Hill, 4th edition 2001
2. A.S. Tanenbaum, "Computer Networks", Prentice Hall India, 3rd edition, 2002.
3. Gerd E. Keiser, "Local Area Networks", Tata McGraw Hill, 3rd edition, 2001.

Reference Books:

1. W.Stallings, "Computer Communications networks", Prentice Hall India, 5th edition, 2001.
2. Micheal, A. Miller, " Data and network communications", Vikas Publications, 2001
3. William, A. Shay, "Understanding Data Communication And Networks", Vikas Publications, 2001
4. D. V Comer, "Internetworking with TCP/IP" Vol. 1. 3rd Edition, Prentice Hall India, 2001.

Practicals:

ETME-252	**Kinematics & Dynamics of Machines Lab.**	**P**	**C**
	Based on course work ETME 202	2	1
ETME -254	**Machine Shop Lab.**	**P**	**C**
	Based on Course Work ETME – 206	3	2
ETME – 256	**Electrical Machines Lab.**	**P**	**C**
	Based on Course work ETME – 208	2	1
ETME - 258	**Programming –II (Operation Research)**	**P**	**C**
	Based on Course work ETMA - 210	2	1
ETME - 260	**LAN & Networking Lab.**	**P**	**C**
	Based on Course work ETME - 212	2	1

Paper Code: ETME 301	**L**	**T**	**C**
Paper: Microprocessor & Applications	**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.

UNIT - I

Introduction To Microprocessors And Microcontrollers: Introduction to Microprocessors and Microcontrollers, Number Systems and Binary arithmetic, Microprocessor Architecture (8085 and 8086) and Microcomputer Systems, memory map and addressing, memory classification, review of logic device for interfacing, Memory Interfacing, Overview of 8085 Instruction Set, stacks and Interrupts. **[No. of Hrs.: 11]**

UNIT - II

The 8051 Architecture:8051 Microcontroller hardware, oscillator and clock, Prog. Counter and Data Pointer, Registers and Program Status word, Internal Memory RAM, Stack and Stack Pointer, Special Function Registers, Internal ROM. Input / Output Pins, Ports and Circuits, External Memory, Counters and Timers, Serial Data Input and Output, Interrupts.

[No. of Hrs.: 11]

UNIT - III

Assembly Language & Programming The 8051: Assembly Language programming, Programming the 8051, Moving Data, Logical Operations, Arithmetic Operations, Branching Operations, Interrupts. **[No. of Hrs.: 10]**

UNIT - IV

Microcontroller 8051 design: Microcontroller specification and Design, External Memory and Memory space decoding, Memory – mapped I/O, Memory Access times, Timing Subroutines, Lookup Tables for 8051, Serial Data Transmission.

Interfacing Peripheral Devices To 8051 And Applications: Interfacing A/D Converters and D/A Converters, 8255, 8259. Application to interfacing Scanned Displays, Matrix Keyboard, Memory Design, Data Acquisition System Design. **[No. of Hrs.: 12]**

Text Books:

1. K.J. Ayala, "The 8051 Microcontroller, Architecture, Programming & Applications", Thomsom Delmer Learning.
2. RS Gaonkar, "Microprocessors Architecture, Programming and Applications", Penram International.

Reference Books:

1. M.A. Mazidi. & J.G Mazidi, "The 8051 Microcontroller & Embedded Systems", Pearson Education.
2. B.Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai and Sons.

Paper Code: ETME 303 **L T C**

Paper: Machine Design-I **4 0 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.

UNIT - I

Introduction: Principles of mechanical design, systematic design process, aesthetic and ergonomic considerations in design, use of standards in design.

Manufacturing consideration in design, casting, machining, forging

Dynamic and fluctuating stresses, fatigue failure and endurance limit, stress concentration, causes and remedies in design

Factor of safety

Tolerances and types of fits

Selection of materials **[No. of Hrs.: 11]**

UNIT - II

Design of Elements: Cotter and knuckle joints; screwed fastenings, bolted and riveted joints under direct and eccentric loads, initial tightening loads in bolts.

Welded joints, strength of welded joints, eccentrically loaded joints, welded joints subjected to bending moment and torsion. **[No. of Hrs.: 11]**

UNIT - III

Shafts, keys and couplings –design of rigid and pin bushed flexible couplings.

Levers design

Pipes, cylinder and design of pipe joints **[No. of Hrs.: 11]**

UNIT - IV

Translation screws : force analysis and design of various types of power screws

Springs, uses and design of close coiled helical springs shot pining of springs.

Classification of Gears, spur gears. **[No. of Hrs.: 11]**

Text Books:

1. Maleeve Hartman and O.P.Grover, “Machine Design”, CBS Publication & Publishers
2. V.B. Bhandari, “Machine Design”, Tata McGraw Hill
3. P.C. Sharma and D.K Aggarwal., “Machine Design”, S.K. Kataria & Sons.

Reference Book:

1. Mahadevan, “Design Data Book”, CBS Publishers & Distributors
2. I.E. Shigley & C.R. Mischke, "Mechanical Engineering Design”, Tata McGraw Hill Co.Inc.

Paper Code: ETME – 305	**L**	**T**	**C**
Paper: Material Science & Metallurgy	**4**	**0**	**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.

UNIT - I

Structure of metal: Crystal structure, miller indices, lattices, imperfections, elementary treatment of point and line defects and their relation to mechanical properties.

Deformation: Slip, twinning, effect of cold and hot working on mechanical properties, principles of recovery, re-crystallization and gain growth. **[No. of Hrs.: 11]**

UNIT - II

Creep: Basic consideration in the selection of material for high and low temperature service, creep curve, effect of material variables on creep properties, brittle failure at low temperature.

Solidification: Phases in metal system, lever rule, solidification of metal and alloys, solid solution, eutectic, eutectoid and inter-metallic compounds, Iron carbon equilibrium diagram, TTT-diagram. **[No. of Hrs.: 11]**

UNIT - III

Heat Treatment: Principles and purpose of heat treatment of plain carbon steels, annealing, normalizing, hardening, tempering, isothermal treatment, case hardening – carburizing, nitriding etc, precipitating hardening of aluminum alloys.

Materials: Plain: Carbon steels, effect of alloying elements, properties, uses, springs, and wear resisting steels, IS standards codes for steels. **[No. of Hrs.: 11]**

UNIT - IV

Corrosion:Types of corrosion, Galvanic cell, rusting of Iron, Methods of protection from corrosion.

Fiber Reinforced Composites: General characteristics, Applications, Introduction to Fibers – glass, carbon, Kevlar 49 fibers. Matrix – Polymeric, Metallic, Ceramic Matrix, Coupling agents and fillers. **[No. of Hrs.: 11]**

Text Books:

1. V. Raghavan, "Material Science & Engineering", Prentice Hall India Ltd., 2001.
2. S.K. Hazra Chaudhuri, "Material Science & Processes", Indian Book Publishers, Calcutta, 1983.
3. R.B. Gupta, "Material Science Processes", Satya Prakashan, New Delhi, 2000.

Reference Books:

1. Degarmo E. Paul et.al, "Materials & Processes in Manufacture", Prentice Hall India, New Delhi, 2001.
2. Raymond A Higgim., "Engineering Metallurgy Part 1", Prentice Hall India, New Delhi, 1998.
3. L. Krishna Reddi, "Principles of Engineering Metallurgy", New Age Publication, New Delhi, 2001.
4. Buduisky et al, "Engineering Materials & Properties", Prentice Hall India, New Delhi, 2004.
5. Peter Haasten, "Physical Metallurgy", Cambridge Univ. Press, 1996.

Paper Code:ETME: 307	**L**	**T**	**C**
Paper: Measurements 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.

UNIT - I

Basic concepts: Block diagram of measuring instrument, transducers, Signal conditioning unit, indicating unit, static characteristics i.e accuracy, precision, sensitivity, resolution, linearity, errors and sources of error.

Measurement of Pressure: Classification of Pressure measuring devices, elastic transducers for pressure measurement and secondary transducers used, High pressure measurement and Low pressure measurement.

Control Systems: Fundamentals: open and closed loop control, amplification, actuator, Block diagrams. Analog System, Transient response of first and second order System. Viscously Damped systems with (i) unit step displacement, (ii) step velocity, (iii) harmonic type input.

[No. of Hrs.: 11]

UNIT - II

Measurement of flow: Methods of flow measurement, obstruction meters electromagnetic flow meter, hot wire anemometer, ultrasonic flow meter.

Measurement of Temperature: Thermometers, Thermocouples, thermistors, resistance thermometer and pyrometers.

Proportional, integral and derivative control action. **[No. of Hrs.: 11]**

UNIT - III

Strain gauges and strain Measurement: Electric resistance strain gauges, foil gauges, semiconductor strain gauges. Temperature problems, circuitry for strain gauges. Application of strain gauges for torsion measurement.

Concept of stability, Nyquist criterion, gain and phase margin. **[No. of Hrs.: 10]**

UNIT - IV

Displacement and Rotational Speed Measurement:

Resistance potentiometer, Use of strain gauges, Variable inductance, capacitive & piezoelectric gauge for measurement, Eddy current drag cup, AC/DC techogenerators, Inductive, photoelectric and stroboscopic methods.

Bode Plot, Root Locus. Design of compensator. **[No. of Hrs.: 12]**

Text Books:

1. A.K. Tayal, "Instrumentation and Mechanical Measurement", Galgotia Publications Pvt. Ltd., 2003.
2. D. Patnabis, "Principles of Industrial Instrumentation", Tata McGraw Hill, 1998.
3. Nagrath and Gopal, "Control System Engineering", New Age Publication
4. B.C. Kuo, "Automatic Systems", Prentice Hall India

Reference Books:

1. T.G. Beckwith, R.D. Maragoni and J.H Lienhard, "Mechanical Measurements", Addison-Wesley, 1999.
2. E.O. Deoblin, "Measurement Systems, Application and Design", McGraw Hill Pub. Co., 1999.
3. K.Ogata, "Modern Control Engineering", Pearson Education
4. Hasan Sayeed, "Automatic Control System", S.K. Kataria & Sons Publications

Paper Code: ETCS-309	**L**	**T**	**C**
Paper: Database Management System	**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.

UNIT I:

Introduction : Concept and goals of DBMS, Database Languages, Database Users, Database Abstraction.

DBMS models: Basic Concepts of ER Model, Relationship sets, Keys, Mapping, Design of ER Model

Hierarchical model: Concepts, Data definition, Data manipulation and implementation.

[No. of Hrs.: 11]

UNIT II:

Relational Model: Relational database, Relational Algebra, Relational Calculus

Network Model: Network Data Model, DBTG Set Constructs, and Implementation.

Relational Database Design and Query Language : SQL, QUEL, QBE, **[No. of Hrs.: 11]**

UNIT III:

Normalization using Functional Dependency, Multivalued dependency and Join dependency.

Concurrency Control: Lock Based Protocols, Time Stamped Based Protocols, Deadlock Handling **[No. of Hrs.: 11]**

UNIT IV:

Crash Recovery: New Applications: Distributed Database, Objective Oriented Database, Multimedia Database, Data Mining, Digital Libraries. **[No. of Hrs.: 11]**

Text Books:

1. B.C. Desai, "Database Management", Tata McGraw Hill Publication Ltd.
2. Elmasery Navathe, "Fundamentals of Database Management", Pearson Education, 3rd edition.
3. T.J. Date, "Database Management", Pearson Education, 7th edtion.
4. Raghuram Singh, "Database Management", McGraw Hill International, 2nd edition.

Reference Books:

1. Korth, "Database Management", Tata McGraw Hill, 4th edition.
2. Alexis Leon, "Database Management", Vikas Publication.

Practical Papers:

ETCS - 351	**Microprocessors & Applications Lab.**	**P**	**C**
	Based on Course work ETME - 301	2	1
ETME - 353	**Machine Design-I Lab**	**P**	**C**
	Design of (i) Cotter Joint (ii) Knuckle Joint (iii) Pipe Joint (iv) Screw Jack/Toggle Screw Jack (v) Rigid and Flexible Coupling (vi) Spur Gear Train	4	2
ETME - 355	**Measurements & Control`**	**P**	**C**
	Based on Course work ETME - 307	2	1
ETME - 357	**Programming – III (MATLAB)**	**P**	**C**
	Based on Course work ETCS – 309	2	1
ETCS - 359	**DBMS Lab.**	**P**	**C**
		2	1
ETME – 361	**#^In-House Training after IV Semester**	**P**	**C**
		-	1

NUES

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

Paper Code:ETME - 302	**L**	**T**	**C**
Paper: Management Of Manufacturing Systems	**4**	**0**	**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.

UNIT I:

Introduction: Production functions

Plant Organization: Organization principles of organization, Organization structure-line and staff organization.

Plant Location, Layout: Process layout product layout and combination – methods of layout, economics of layout; group technology. **[No. of Hrs.: 11]**

UNIT II:

Production Planning & Control: Types of products, demand, demand forecasting, marketing strategies, scheduling and control of scheduling production control.

Method Study: Definition and concepts, method study procedures, symbols, advantages, Flow process charts, Motion study, micro motion, SIMO charts, Systems Concepts, Classification analysis techniques.

Work Measurement: Definition, objectives & techniques, Time study equipment, performance rating, allowances, standard time, work sampling, PMTS. **[No. of Hrs.: 11]**

UNIT III:

Industrial Maintenance: Types, organization for maintenance department, Breakdown and preventive maintenance.

Inventory control and replacement analysis: Introduction replacement policy and method adopted, EOQ. **[No. of Hrs.: 11]**

UNIT IV:

Management Concepts: Development of management principles, scientific management, human relation aspects.

Production Cost Concepts: Introduction, cost of production, cost center and unit, classification and analysis of cost, break Even Analysis. **[No. of Hrs.: 11]**

Text Books:

1. S.K. Sharma, "Industrial Engg. & Operation Management", S.K. Kataria & Sons.
2. Dr. Ravi Shankar, "Industrial Engg. & Management", Galgotia Publications
3. M. Mahajan, "Industrial Engg. & Production Management", Dhanpat Rai & Co.

Reference Book:

1. Joseph S. Martinich, "Production & Operation Management", John Wiley & Sons.

Paper Code: ETME 304 **L T C**

Paper: Machine Design-II **4 0 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.

UNIT I:

Design of Elements:-

Mechanical Drives: Selection of transmission, helical, bevel and worm gears, belt and chain drives. **[No. of Hrs.: 11]**

UNIT II:

Friction Clutches & Brakes: Common friction materials, shoe, band, cone and disc brakes their characteristics and design, friction clutches. **[No. of Hrs.: 11]**

UNIT III:

Bearings and Lubrication: Types of sliding bearing, materials, type of lubrication, design of sliding bearing, selection and application of rolling bearing, seals. **[No. of Hrs.: 11]**

UNIT IV:

Hoisting Elements; Wire ropes, hooks, pulley

Engine parts: Piston, connecting rod crank shaft **[No. of Hrs.: 11]**

Text Books:

1. Maleeve Hartman and O.P. Grover, "Machine Design", CBS Publication & Publishers.
2. V.B Bhandari, "Machine Design", Tata McGraw Hill.
3. P.C. Sharma and D.K Aggarwal., "Machine Design", S.K. Kataria & Sons.

Reference Book:

1. Mahadevan, "Design Data Book", CBS Publication & Publishers

Paper Code:ETME - 306 **L T C**
Paper: Metrology **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.

UNIT - I

Principles of measurement: Definition of Metrology, difference between precision and accuracy. Sources of errors: Controllable and Random Errors, Effects of Environment and Temperature, Effects of support, alignment errors, application of Least Square principles, errors in measurement of a quality which is function of other variables.

Length Standards: Line standards, end standards and wavelength standards, transfer from line standards to end standards. Numerical based on line standards. Slip gauges – its use and care, methods of building different heights using different sets of slip gauges.

Limits, fits and tolerances: Various definitions, IS919-1963, different types of fits and methods to provide these fits. Numerical to calculate the limits, fits and tolerances as per IS 919-1963. ISO system of limits and fits; Gauges and its types, limit gauges – plug and ring gauges. Gauge Design – Taylor's Principle, wear allowance on gauges. Different methods of giving tolerances on gauges, Numericals. **[No. of Hrs.: 11]**

UNIT - II

Comparators: Mechanical Comparators: Johanson Mikrokator and Signma Mechanical Comparator. Mechanical - optical comparator. Principles of Electrical and electronic comparators. Pneumatic comparators – advantages, systems of Penumatic gauging:- Flow type and back pressure type, Principle of working of back pressure gauges, different type of sensitivities and overall magnification, Solex Penumatic gauges and differential comparators. Numericals based on pneumatic comparators.

Angular Measurement: Sine Bar – different types of sine bars, use of sine bars in conjuction with slip gauges, precautions and calibration of sine bars. Use of angle gauges, spirit level, errors in use of sine bars. Numericals. Principle and working of Micro-optic autocollimator. Circular Division: dividing head and circular tables, circular division by precision Polygons. Caliper Principle, Calibration of polygons. Numerical based on circular division.

[No. of Hrs.: 11]

UNIT - III

Straightness and flatness: Definition of Straightness and Flatness error. Numericals based on determination of straightness error of straight edge with the help of spirit level and auto collimator. Numericals based on determination of flatness error of a surface plate with the help of spirit level or auto collimator.

Screw Thread Measurement :Errors in threads, Measurement of elements of screw threads – major dia, minor dia, pitch, flank angle and effective diameter (Two and three wire methods). Effect of errors in pitch and flank angles and its mathematical derivation. Numericals.

Gear Measurement: Measurement of tooth thickness – Gear tooth vernier caliper, Constant chord method, base tangent method and derivation of mathematical formulae for each method. Test plug method for checking pitch diameter and tooth spacing. Measurement of Gear Pitch, Parkinson Gear Tester, Numericals. **[No. of Hrs.: 11]**

UNIT - IV

Machine Tool Alignment: Machine tool tests and alignment tests on lathe. Alignment tests on milling machine. Alignment tests on a radial drilling machine.

Interferometry: Principle of measurement, Interferometry applied to flatness testing, surface contour tests, optical flats, testing of parallelism of a surface with the help of optical flat. Quantitative estimate of error in parallelism, Flatness Interferometer NPL-Gauge length interferometer for checking the error in slip gauges. Numericals based on Interferometry.

Surface texture: Introduction, different types of irregularities, standard measures for assessment and measurement of surface finish. **[No. of Hrs.: 11]**

Text Books:

1. R.K. Jain, "Engineering Metrology", Khanna Publishers, Delhi
2. I.C. Gupta, "Engineering Metrology", Dhanpat Rai Publications, Delhi

Reference Books:

1. F.W. Galyer & C.R. Shotbolt, "Metrology for Engineers", ELBS edition.

Paper Code:ETME: 308	**L**	**T**	**C**
Paper: Fluid 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.

UNIT - I

Introduction: Euler's equations for turbomachines; impulse and reaction forces due to fluid systems on stationery and moving system of vanes; jet propulsion. **[No. of Hrs.: 10]**

UNIT - II

Water Turbines: Classification; Pelton, Francis, Propeller and Kaplan turbines; velocity triangles; efficiency, draft tubes, governing.

Performance of Fluid Machines: Similarity laws applied to roto-dynamic machines; specific speed, unit quantities, Characteristic curves; use of models; cavitation and attendant problems in turbo-machines; selection of turbines hydroelectric plants **[No. of Hrs.: 12]**

UNIT - III

Pumps: Centrifugual pumps, velocity triangles; efficiency, turbine pumps; axial and mixed flow pumps.

Hydraulic Power Transmission: Transmission of hydraulic power through pipe lines; water hammer; precautions against water hammer in turbine and pump installations; hydraulic ram.

[No. of Hrs.: 11]

UNIT - IV

Power Hydraulics: Positive pumps; gear, vane, screw, variable delivery pumps, valves; flow control, pressure control, direction control, solenoid operated valve, hydraulic circuits, (meter-in, meter-out, bleed-off), fluid coupling and torque converter.

Pneumatic Power: Basic principles, comparison of pneumatic and hydraulic Systems.

[No. of Hrs.: 11]

Text Books:

1. Dr. R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd., 2002.

Reference Books:

1. Dr. D.S. Kumar, "Fluid Mechanics & Fluid Power Engineering", S.K. Kataria & Sons,2001
2. D.R. Malhotra & N.K. Malhotra, "The Fluid Mech. & Hydraulics", Satya Prakashan, 2001
3. V.P. Gupta, Alam Singh, Manish Gupta, "Fluid Mechanics, Fluid Mechanics & Hydraulics", CBS Publishers; 1999.

Paper Code:ETME -310 **L T C**
Paper: Metal Cutting & Tool 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.

UNIT - I

Introduction: Definition of feed, depth of cut and cutting speed. Concept of specific cutting energy in metal cutting and Numerical based on calculation of machining time on lathe, drilling machine, shaper, milling machine and grinding machines considering specific cutting energy of materials.

Theory of Metal Cutting: Orthogonal and oblique cutting, types of chips, Factors affecting the chip formation, Cutting forces in orthogonal cutting and their measurement, Merchant circle and derivation of relationships between the cutting forces, chip thickness ratio, shear angle, stress and strain in the chip, work done and power required in metal cutting, plowing forces and the 'size-effect', apparent mean shear strength of work material. **[No. of Hrs.: 11]**

UNIT - II

Ernst Merchant Theory:- its assumptions and modifications. Relationship between cutting velocity, shear velocity and chip flow velocity. Mechanism of friction at chip-tool interface. Numericals based on metal-cutting.

Heat generation in Metal cutting: Heat generation and temperature distribution in metal cutting. Calculation of temperature in primary and secondary deformation zones and their measuring methods. **[No. of Hrs.: 11]**

UNIT - III

Machinability: Machinability and its criteria, forms of tool-wear in metal cutting, tool-life and its criteria, effect of different cutting parameters on tool-life. Economics of machining and numericals. Cutting fluids, their physical action and applications.

Grinding: Specifications of grinding wheel, Mechanics of grinding, effect of grinding conditions and type of grinding on wheel behaviour, equivalent diameter of grinding wheel.

[No. of Hrs.: 11]

UNIT - IV

Cutting Tool Design: General considerations, single point tool geometry. Principles of different cutting tool materials and their important characteristics. Geometry of a drill. Basic principles of design of a single point and multiple point tools i.e broaches and twist drill.

Jigs & Fixtures: Important considerations in jigs and fixture design. Main principles of designing of jigs & fixtures, elements of Jigs and fixtures. Different devices and methods of locations. Different types of clamps used in jigs & fixtures. **[No. of Hrs.: 11]**

Text Books:

1. Dr. P.C. Pandey & C.K. Singh, "Production Engg. Sciences", Standard Publisher. Distributors.
2. Dr. B.J. Ranganath, "Metal Cutting & Tool Design" Vikas Publishing House Pvt. Ltd.

Reference Books:

1. Geoffrey Boothroyd, "Fundamentals of Metal Machining & Machine Tools", Tata McGraw Hill Kogakusha Ltd.
2. P.N. Rao, "Manufacturing Technology", Tata McGraw Hill Publication Ltd.

Practicals:

ETME- 352	**Machine Design – II** .	**P**	**C**
	(i) Automotive Transmission	4	2
	(ii) Brakes		
	(iii) Clutches		
	(iv) Connecting rod of I.C. Engine		
	(v) Mechanical Hoist		
	(vi) Hydraulic Riveter		
	(vii) Passenger Lift		
ETME -354	**Metrology Lab.**	**P**	**C**
	Based on Course Work ETME 306	2	1
ETME – 356	**Fluid Systems**	**P**	**C**
	Based on Course work ETME – 308	2	1
ETME – 358	**Metal Cutting & Tool Design**	**P**	**C**
	Based on Course work ETME – 310	2	1
ETME – 360	**Programming –IV (Pro-E - I)**	**P**	**C**
		2	1

Text Books:

Programming –IV (Pro-E I)

1. Prof. Sham Tickoo, **"**Pro/Engineer Wild fire for Engineers & Designers Release 2.0**"**, WILEY- dreamtech India Pvt. Ltd., 2005.

Paper Code:ETME - 401 **L T C**

Paper: Computer Aided Manufacturing **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.

UNIT - I

Introduction: Overview of automation in industry. Type of production: continuous, mass, batch and job shop and automation achievements therein. Product cycle and CAD/CAM influence CAD/CAM on product cycle. Automation strategies, mathematical model for employing and justifying CAD/CAM in different areas of operation.

Programmed Automation and Numerical Control: program controlled machine tools, punched card and punched tape machine tools. Numerical control and its basics. Axis designation. NC motion control systems: point-to-point, straight-cut and continuous path control systems. Applications of NC in metal-cutting and non-metal cutting areas. **[No. of Hrs.: 11]**

UNIT - II

Computer numerical control: Block diagrams of CNC operations. Nomenclature, types and features of CNC machine tools. Elements of CNC machines and systems. Machine control unit. Position control and its significance. Engineering analysis of NC positioning systems. Open loop and closed loop systems. Precision in NC positioning systems: control resolution, accuracy and repeatability. Actuators: DC servomotor, ac servomotor, stepper motor. Transducers and feedback elements: resolvers, inductosyns optical grating and encoders. **[No. of Hrs.: 11]**

UNIT - III

Part programming : Process planning and flow chart for part programming. Tooling systems, tool nomenclature and tool geometries of modern indexable carbide tools. Tool presetting & Modular Tooling. Selection of tools based on machining capacity, accuracy and surface finish. Elements of programming for turning and milling. Composition of a part program. Preparatory codes G, Miscellaneous functions M. Interpolation, Tool compensations, cycles for simplifying programming. Part programming for typical components on turning machines and machining centres.

Computer aided programming: APT Part Programming. Introduction to computer aided programming through Pro-E. **[No. of Hrs.: 11]**

UNIT - IV

Modern CNC machines : CNC lathes. Turning centres. Machining centres. . Automatic pallet changers. Automatic tool changers. Direct numerical control and applications. CNC machine design features. Supporting structures. Guide ways. Ball screw-and-nut mechanisms. Machine spindles. Concept of rigidity and relation with accuracy.

Computer aided Inspection: Coordinate measuring machines and their applications. Introduction to machine vision and applications. **[No. of Hrs.: 11]**

Text Books:

1. Mikell P. Groover, "Automation, Production Systems and Computer-Integrated Manufacturing", 2nd Edition, Pentice Hall, 2001.
2. S.K. Sinha, "CNC Programming", Galgotia Publications 2003.
3. "HMT Mechatronics", Tata McGraw Hill, 2001.

Reference Books:

1. Mikell P. Groover, Emory W.Zimmers, "CAD/CAM", Pearson Education, 2001.
2. P.N. Rao, "CAD/CAM Principles and Applications", Tata McGraw Hill, 2003.

Paper Code: ETME - 403 **L T C**
Paper: Mechatronics **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.

UNIT - I

Introduction: Overview: Mechanical Actuation System – Kinematic Chains, Cam, Gear, Train Ratchet Mechanism, Belt, Bearing.

Hydraulic And Pneumatic Actuation Systems: Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems. **[No. of Hrs.: 11]**

UNIT - II

Electrical Actuation Systems: Switching Devices, Mechanical Switches – SPST, SPDT, DPDT, Debouncing keypads; Relays, Solid State Switches, Diodes, Thyristors, Transistors, Solenoid, Types Devices: Solenoid Operated Hydraulic and Pneumatic Vlaves, Electro-Pneumatic Sequencing Problems. Control of DC Motors, Permanent Magnet DC Motors, Control of DC Motors, Bush less Permanent Magnet DC Motors, AC Motors, Stepper Motors, Stepper Motor Controls, Servo Motors.

Interfacing controllers: Interfacing, Buffers, Darlington Pair, I/O Ports, Interface Requirements, Handshaking, Serial and Parallel Port Interfacing, Peripheral Interface, Adapters.

Digital logic: 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. Introduction to Microcontroller – Intel 8051, Selecting a Microcontroller.

Sensors and 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 Mechantronic System as – Temperature Switch Circuit, Float Systems. **[No. of Hrs.: 12]**

UNIT - III

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, Analog to Digital Conversion, Digital To Analog Conversion, Sample and Hold Amplifiers, Multiplexers, Time Division Multiplexing, Data Acquisition, Digital Signal Processing, Pulse Modulation.

System models: Mechanical System Models Applications like – Machine on a floor, Car Wheel Moving along a road etc. Model Development of an Electrical Systems, Fluid System, and Thermal Systems: Rotational – Translation Systems, DC Motors, Speed Control and Hydraulic – Mechanical Systems. **[No. of Hrs.: 11]**

UNIT - IV

Programmable logic controllers (plc):PLC Structure, Input / Output Processing, Programming, Language (Ladder Diagram), Logic Functions, Latching, Sequencing, Timers, Internal Relays and

Counters, Shift Registers, Master and Jump Controls, Jumps, Data Movement, Code Conversion, Ladder Circuits.

Case studies: Auto-Focus Camera, Printer, Domestic Washing Machine, Optical Mark Reader, Bar Code Reader and Pick and Place robot Arm. **[No. of Hrs.: 11]**

Text Book:

1. W. Bolton, "Mechatronics", Pearson Education Ltd., 2003.

Reference Books:

1. Mohammad Ali Mazidi Janice Gillispier Mazidi, "The 8051 Microcontroller", Pearson Education Inc.,2004.
2. Gary Dunning, "Introduction to Programmable Logic Controllers", Thomson Asia P. Ltd., Singapore, 1998.
3. Gopal K. Dubey, "Fundamentals of Electrical Drives", Narosa Publishing House, 2001.
4. Charles H. Roth, "Jr. Fundamentals of Logic Design", Jaico Publishing House, 2001.
5. "HMT Mechatronics", Tata McGraw Hill Publishing Co. Ltd., 2001.
6. Devdas Shetty, Richard A. Kolk "Mechatronics System Design", Thomson Asia Pvt. Ltd., Singapore, 2001.
7. A.K. Tayal, "Instrumentation & Mechanical Measurements", Galgotia Publication Pvt.Ltd., 2003.
8. D. Rana Durgaiah, "Fluid Mechanics & Machinery", New Age Int. Publishers, 2004.
9. Nitaigour Premchand Mahalik, "Mechatronics Principles, Concepts & Application", Tata McGraw Hill Publishing Co.Ltd., 2003.
10. Mikell P. Groover, "Automation, Production Systems and Computer-Integrated Manufacturing", 2nd Edition, Prentice Hall, 2001.

Paper Code: ETME 405 **L T C**
Paper: Refrigeration & Air Conditioning **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.

UNIT - I

Air Refrigeration : Brief History of Refrigeration. Refrigerating Machine-Second Law of Thermodynamics---Interpretation. Carnot Cycle, Reversed Carnot Cycle, Heat Engine, Refrigerating Machine, Heat Pump, COP. Unit of Refrigeration. Bell Coleman Cycle, Dense Air System, Reversed Brayton Cycle, Air Refrigeration Cycle for Aircraft. Ram Compression. Comparison of various cooling systems for aircraft.

Vapour Compression Refrigeration System : Simple Saturated Cycle. T-s, P-h, h-s, P-v diagrams. COP. Dry and Wet Compression. Effect of operating parameters. Effect of under-cooling and superheating. Liquid-Suction Heat Exchanger. Actual vapour compression cycle. Details of various types of Compressors, Condensers, Expansion devices and Evaporators. Matching of Components. **[No. of Hrs.: 11]**

UNIT - II

Refrigerants : ASHRAE Nomenclature. Eco Friendly Refrigerants, Thermodynamic Requirements of a Good Refrigerant. Introduction to Azeotropic & Non Azeotropic Refrigerant Mixtures (NARM)

Compound Vapour Compression System : Concepts of (i) Liquid Flash cooler,
(ii) Flash Inter cooler. Optimum Interstage Pressure.

Multiple Evaporators and Compressors : Use of Individual Expansion valves, Back pressure valves and multiple expansion valves.

Miscellaneous: Vapour Absorption System : Thermal refinements, Practical vapour absorption system Electrolux Refrigerator. **[No. of Hrs.: 11]**

UNIT III:

Steam Jet Refrigeration : System components and analysis.

Cascade Refrigeration : Limitations of vapour compression system for low temperature refrigeration. Cascade staging. Dry ice.

Controls : Sensing and Actuating Elements H.P/L.P cut out, Thermostat, Solenoid valve, Humidistat, Anemometer etc.

Psychrometry : Brief History of Air Conditioning. Working substance in Air Conditioning. Dalton's Law of Partial Pressures. Psychometric Properties and Psychometric Chart. Psychometric Processes , Concept of Room Sensible Heat Factor, Grand Sensible Heat Factor, Apparatus Dew point, Effective Sensible Heat Factor. High Latent Heat Load applications, Summer & Winter Air Conditioning **[No. of Hrs.: 11]**

UNIT - IV

Comfort Air Conditioning: Factors influencing Human comfort. Concept of Effective Temperature. Factors governing optimum effective temperature.

Heat Load Estimation : Inside and Outside design conditions. Solar heat gain through glass and structures. Occupancy load, Lighting load and miscellaneous loads. Infiltration and Ventilation. Summery of Heat Loads.

Duct Design : Transmission and distribution of air flow. Types of supply air outlets, Mechanism of flow of air through outlets. Pressure drop and friction loss in ducts. Rectangular equivalents of circular ducts. Method of Duct design. **[No. of Hrs.: 11]**

Text Books:

1. P L Ballany; "Refrigeration & Air Conditioning", Khanna Publisher.
2. C.P. Arora, "Refrigeration & Air Conditioning", Tata McGraw Hill

Reference Books:

1. Domkundewar & Arora, "A Course in Refrigeration & Air conditioning", Dhanpat Rai & Co.
2. Marsh & Olivo, "Principles of Refrigeration", C.B.S Publications.
3. Paul Lang, "Principles of Air Conditioning", C.B.S Publications

Paper Code: ETME 407 **L T C**

Paper: Solar Energy **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.

UNIT - I

Selected topics in Heat Transfer: Heat transfer modes, properties and radiation characteristics of opaque and partially transparent media. **[No. of Hrs.: 11]**

UNIT - II

Solar Radiation: Origin, nature and availability of solar radiation, measurements of solar radiation data and its estimation, effects of receiving surface orientation and motion.

[No. of Hrs.: 11]

UNIT - III

Components, process and system modes: Design consideration and performance of flat plate and focussing collectors; energy storage components, water storage, packed bed and phase-change energy storage; mathematical models of various solar systems and components.

[No. of Hrs.: 11]

UNIT - IV

Application: Solar water heating, solar air heaters, solar space heating and cooling, solar pumps, solar thermal power, solar furnaces and solar distillation. **[No. of Hrs.: 11]**

Text Books:

1. H.P. Garg and J. Prakash, "Solar Energy fundamental and Applications", Tata McGraw Hill Pulishing Co. Ltd.
2. Magal, "Solar Power Engineering", Tata McGraw Hill Publishing Co. Ltd.

Paper Code:ETME: 409	**L**	**T**	**C**
Paper: Personnel Management	**4**	**0**	**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.

UNIT I

Nature, Scope, Objective and Growth of Personnel Programme personnel department and its Functions; Profile of a Good Personnel Manager; Formulation of personnel policy manpower planning.

Recruitment and Selection – Traditional and Scientific approach; Job Change-Promotion, Transfer and Separation; Training and Development-Counselling and Succession Planning; Performance Appraisal and Merit Rating; Wage and Salary. **[No. of Hrs.: 11]**

UNIT II

Administration –equitable wage structure; wage disparities and differentials-job evaluation; Motivation in actual practice; Motivation Research; Communication Channel; Media and Forms of Communication; Barriers; How to issue Instructions; Industrial Relations – Meaning and Cope-Role of Employers, Machinery; Welfare Activities; Employee Benefits and Service-Statutory and Non-Statutory. **[No. of Hrs.: 12]**

UNIT III

Concept, Objectives, Manpower Data Bank, Supply forecast reconciling demand & supply, budgeting and control, audit and improvement, acquisition and redeployment, reporting, performance evaluation & appraisal, training, compensation, Counseling policies, Safety & Health, Carrier development, Test and interviews. **[No. of Hrs.: 12]**

UNIT IV

Applications & Case Studies. **[No. of Hrs.: 09]**

Text Books:

1. Morappa & Saiya Ram, "Personnel Management", Tata McGraw Hill, 1998
2. T.N. Chhabra, "Human Resource Management", Dhanpat Rai & Sons, 4th Edition, 2004.

Reference Books:

1. S.P. Robbins, "Human Resource Management", Prentice Hall India
2. C.B. Memoria, "Personnel Management", Himayala Publishing House.

Paper Code:ETME: 411	**L**	**T**	**C**
Paper: Metal Forming	**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.

UNIT - I

Introduction: Metal forming, Review of tensile test, strain hardening, plastic yield criteria, Flow of metals, classification of processes and their characteristic. Friction and lubrication in forming processes. **[No. of Hrs.: 11]**

UNIT - II

Mechanics of forming processes, spring back, effect of various parameters
Strip and disc forming – Mechanics, pressure distribution, total force
Drawing, drawing force, power, maximum allowable reduction
Extrusion, force required in extrusion, maximum reduction **[No. of Hrs.: 11]**

UNIT - III

Deep drawing, stress distribution effect of friction, blank to folding force
Rolling, roll pressure, roll separating force, driving torque and power, roll pass design
Bending : Work load **[No. of Hrs.: 11]**

UNIT - IV

Presses
Introduction to dies and wear

High Energy Rate Forming : Introduction, Principle of operation, Advantages, Limitations, uses & applications of Explosive Forming, Electro Hydraulic Forming, Magnetic Pulse Forming.
[No. of Hrs.: 11]

Text Books:-

1. Ghosh & Mallick, "Manufacturing Science", East West Affiliated.
2. P.C. Sharma, "Production Engineering", S.Chand & Co., 2002

Reference Books:

1. G.R. Nagpal, "Metal Forming Processes", Khanna Publishers 2000.
2. K.P. Sinha, S.C. Prasad, "Theory of Metal Forming & Metal Cutting", Dhanpat Rai Publications, 1995.

Paper Code:ETME - 413	**L**	**T**	**C**
Paper: Automotive Engineering	**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.

UNIT - I

Power Plant: Selection of power plant for automotive vehicle, requirements of vehicle. Characteristics of various power plants (Petrol engines, Diesel engines, CNG LPG engine, Gas Turbines); constructional details of C.I. and S.I. engines, crank shafts, connecting rods, pistons, piston pins, piston rings, valves mechanisms, manifolds, air cleaners, mufflers, radiators and oil filters.

Vehicular Performance : Load, air and grade resistance; matching of engine output and demand power, performance requirements of various vehicles like Passenger cars, heavy duty trucks etc. performance characteristics of internal combustion engines, drive effectiveness relationship for 2 wheel and 4 wheel drive vehicles. **[No. of Hrs.: 11]**

UNIT II

Transmission Systems : Transmission requirements, general arrangement of clutch, gear box and rear axle transmission, general arrangement of rear engines and vehicles with live axles. General arrangement of Dead axle and axle-less transmission, De-Dion drive, arrangement of front engine and front wheel drives, four wheel drive transmission.

Clutches: Principle of friction clutch, single and multiplate clutches, centrifugal clutch. Friction materials. Bonding materials. Fluid fly wheel clutch. **[No. of Hrs.: 11]**

UNIT III

Transmission : Description and working of manually operated gearboxes like sliding mesh, constant mesh, synchromesh. Hydraulic torque converter and its construction working and performance. Semi-automatic transmission (Wilson Gear Box). Analysis of differentials, live axles, construction and working. Requirement of overdrive.

Steering System : Steering geometry, Ackermann steering, Center point steering, Power steering. **[No. of Hrs.: 11]**

UNIT IV

Suspension : Independent suspension; Perpendicular arm type, Parallel arm type. Dead axle suspension. Live axle suspension, air suspension, shock absorbers.

Wheels, Tyres and Brakes : Wheel and tyre requirements, tyre dynamics, mechanical and hydraulic brakes, shoe arrangements and analysis, disc brakes, braking effectiveness relationship for 4 wheel drive. **[No. of Hrs.: 11]**

Text Books:

1. Kirpal Singh, "Automobile Engg.", Vol.I & II, Standard Publishers, 2004
2. N.K. Giri, "Automotive Mechanics", Khanna Publishers
3. Narang G.B.S., "Automobile Engg.", Khanna Publishers
4. Srinivasan, "Automotive Engines", Tata McGraw Hill
5. K.K. Jain & R.B. Asthana, "Automobile Engineering", Tata McGraw Hill

Reference:

1. Joseph Haitner, "Automotive Mechanics", C.B.S. Publications

Paper Code: ETME 415	**L**	**T**	**C**
Paper: Manufacturing Information 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.

UNIT - I

Introduction to Data Processing and Informational Systems, Fundamentals of Information Technology.

Data Bank Concepts, CAD/CAM databases, Data-Bank-Information storage and retrieval, Data life cycle, Desirable characteristics of data processing system, Level of decision making and Information requirements, Data Dictionaries in Manufacturing, Integrated Information System, Object Oriented Models. **[No. of Hrs.: 11]**

UNIT II:

Structured Query Language, Implementation of an Information System.

Distributed Databases, Information processing systems, Use of computer networks, Elements of Computer Communication Networks, Elements of Automated Manufacturing Systems.

[No. of Hrs.: 11]

UNIT III:

Networks in Manufacturing, Local Area Networks-Architectures and Protocols, Manufacturing Message Specification, Manufacturing Automation Protocol, Network and Protocol Implementation. **[No. of Hrs.: 11]**

UNIT IV:

LAN design and performance, Sensor level network, Machine level network, Cell level network, Network performance Evaluation.

Multimedia information systems, management of Multimedia database. **[No. of Hrs.: 11]**

Text Books:

1. Elmasri Navathe, "Fundamentals of Database Systems", Pearson Education Asia, 2001.

Paper Code: ETME 417 **L T C**

Paper: Computer Aided 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.

UNIT - I

Introduction to CAD: CAD tools and their definition, Role of CAD in typical product cycle, Industrial look at CAD

CAD Hardware: Types of Systems, CAD Systems Evaluation Criteria, Input Devices, Output Devices

CAD Software: GraPrentice Hall Indiacs Standards, Basic Definitions – Data Structure, Database, DBMS, Database Coordinate System, Working Coordinate System, Screen Coordinate System, Modes of GraPrentice Hall Indiacs Operations, User Interface, Software Modules – OS Module, GraPrentice Hall Indiacs Module, Applications Module, Programming Module, Communications Module, Modelling and Viewing

Mapping of Geometric Models: Translation, Rotational, General, Changes of Coordinate System **[No. of Hrs.: 11]**

UNIT II

Three Dimensional Transformations: Point representations, Transformation Matrices, Scaling, Translation, Rotation, Reflection

Projections: OrthograPrentice Hall Indiac, Isometric, Perspective, Point at Infinity & Vanishing Point

Curves: Representation of Space Curves, Cubic Spline, Normalized Cubic Splines, Bezier Curves, B-spline Curves

Surface Generation: Plane Surfaces, Ruled Surfaces, Surface of Revolution, Sweep Surface, Bezier Surface, Cubic Surface Patch, B-Spline Surface, Composite Surface**[No. of Hrs.: 11]**

UNIT III

Solid Modeling: Set Theory, Boolean Operations, B-rep Modeling, CSG, Sweep Representations, Spatial Occupancy Enumeration

Computer Animation: Animation Types, Animation Techniques, Simulation

Geometric Property Formulation: Curve Length, Surface Area, Volume Calculation, Mass Calculation, Centroid Calculation **[No. of Hrs.: 11]**

UNIT IV

CAD/CAM Data Exchange: Introduction, IGES, PDS

Finite Element Methods: General Method for FEM, Finite Element Analysis**[No. of Hrs.: 11]**

Text Books:

1. Ibrahim Zeid, "CAD/CAM Theory and Practice", Tata McGraw-Hill Publishing Company Limited, 6th Edition 1998.
2. David F. Rogers and J. Alan Adams, "Mathematical Elements for Computer GraPrentice Hall Indiacs", Tata McGraw-Hill, 2nd Edition 2002.

Reference Book:

1. Ibrahim Zeid, "Mastering CAD/CAM", Tata McGraw-Hill Publishing Company Limited,

Paper Code: ETME 419	**L**	**T**	**C**
Paper: Project	**-**	**-**	**4**

Students may select a project related to any of the subjects of the current semester.

Practicals:

ETME-451	**Computer Aided Manufacturing Lab.**	**P**	**C**
	Based on Course work ETME - 401	2	1
ETME-453	**Mechatronics Lab.**	**P**	**C**
	Based on Course work ETME – 403	2	1
ETME-455	**Elective I and II**	**P**	**C**
	Based on course work of these Electives	2	1
ETME 457	**Programming – V (Pro-E-II)**	**P**	**C**
		2	1
ETME 459	***Minor Project**	**P**	**C**
		8	**4**

*Students may choose a project based on any subject of Mechanical & Automation Engineering. The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

ETME-461	**#^Practical Training after VI Semester**	**P**	**C**
		0	1

#NUES

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

Paper Code:ETME - 402 **L T C**

Paper: Quality Control & Quality Assurance **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.

UNIT - I

Introduction: Definition and Need of quality, Aspects of quality, Quality characteristic, Quality specification, Quality function, Economics of quality. Inspection, Its objectives and types, Inspection versus Quality Control, Statistical Quality Control, its Tools, Advantages, limitations and Applications.

Probability & Statistics: Definition, Laws, Probability Distributions (Normal Binomial, Poisson, Exponential) & related problems. Measures of Central tendency & Dispersion, Concept of Variation, Variable and attribute data, Frequency distribution. **[No. of Hrs.: 11]**

UNIT - II

Control Charts: Concept of variability, Assignable & chance causes, Concept of specifications and tolerances, Definition and objectives of control charts, Control charts for variables and attributes & related problems, Variable charts vs attribute charts, Patterns on control charts, Type–I & Type-II Errors, Process capability and its methods of determination.

[No. of Hrs.: 11]

UNIT - III

Acceptance Sampling: Definition, Advantages over 100% inspection, Methods of taking samples, Operating characteristics curve & its characteristics. Single, Double and Multiple, Sequential Sampling Plan & Related problems.

Quality Assurance: Need, Principles, Essentials and Advantages of Quality Assurance System, Quality Manual, Field complaints, Quality Audit & its types, Quality Assurance Methods, Quality Control vs Quality Assurance. **[No. of Hrs.: 11]**

UNIT - IV

Quality systems: Description of ISO:9000 series of standards, ISO:9001–2000 Systems. Description of TQM, Concept of Quality Circles, JIT System, Taguchi's Concept of Quality, Zero Defect Concept, 6σ Concept.

Reliability: Definitions of Reliability Failure, Elements of reliability. Quality vs reliability, System Reliability & related problems. Causes of failures, Constant Failure rate, MTBF, Bath Tub Curve. **[No. of Hrs.: 11]**

Text Books:

1. EL Grant & RS Leavenworth, "Statistical Quality Control",McGraw Hill & Co.
2. M. Mahajan, "Statistical Quality Control", Dhanpat Rai & Co.
3. O.P. Khanna, "Statistical Quality Control", Dhanpat Rai & Co.
4. R.C. Gupta, "Statistical Quality Control", Khanna Pulishers

Reference Books:

1. Amitav Mitra, "Fundamentals of Quality Control", Pearson Education
2. Feigenbaum, "Total Quality Control", McGraw Hill & Co.
3. Suresh Dalela, "Quality Systems", Standard Publishers & Distributors
4. Montgomery DC, "Introduction to Statistical Quality Control", John Wiley & Sons Inc.
5. Stephan B. Vardeman, J Marcus Jobe, "Statistical QA Methods for Engineers", John Wiley & Sons Inc.
6. Taylor J.R., "Quality Control systems", McGraw Hill Int. Education
7. K.C. Arora, "Total Quality Management", S.K. Kataria & Sons.

Paper Code: ETME - 404 **L T C**

Paper: Robotics **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.

UNIT - I

Fundamentals of robot technology : Robot anatomy. Work volume. Drive systems. Control systems and dynamic performance. Accuracy and repeatability. Sensors in robotics. Robot reference frames and coordinates and robot kinematics. Path control. **[No. of Hrs.: 10]**

UNIT - II

Robot kinematics. Matrix representation. Homogeneous transformations. Forward and inverse kinematics.

Robot dynamics. Differential motions of a frame. Jacobian, static force analysis.

[No. of Hrs.: 10]

UNIT - III

Configuration of a robot controller. End effectors. Mechanical and other types of grippers. Tools as end effectors. Robot and effector interface. Gripper selection and design. Introduction to robot languages. **[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. GraPrentice Hall Indiacal simulation of robotic work cells.

Typical applications of robots in material transfer, machine loading/unloading; processing operations; assembly and inspection. **[No. of Hrs.: 12]**

Text Books:

1. Saeed B. Niku, "Introduction to Robotics analysis, Systems & Applications", Pearson Education Singapore P. Ltd., 2002.
2. S.R. Deb, "Robotic Technology and Flexible Automation", Tata McGraw Hill Publishing Co. Ltd., 2003.
3. R.K. Mittal, I.J. Nagrath, "Robotics & Control", Tata McGraw & Hills, 2005.

Reference Books:

1. Robert J. Schilling, "Fundamentals of Robotics, analysis & Control", Prentice Hall of India P.Ltd., 2002.
2. John J.Craig; "Introduction to Robotics Mechanics & Control", Pearson Education, 2004.
3. Allison Druin & James Hendler; "Robots Exploring New Technologies for learning for kids", Morgan Kaufmann Publishers, 2000.

Paper Code: ETME - 406 **L T C**

Paper: Optimization Techniques **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.

UNIT - I

Introduction: Historical development, engineering applications, statement of problem-objective function, constraints, classification, techniques.

Classification: Single variable optimization, multivariable optimization with equality and inequality constraints. **[No. of Hrs.: 11]**

UNIT - II

Linear Programming: GraPrentice Hall Indiacal method, simplex method, simplex algorithm, Duality, Transportation problem, Sensitivity or Postoptimality Analysis **[No. of Hrs.: 10]**

UNIT - III

Non-linear Programming: One dimensional minimization methods, unrestricted search, golden search method, interpolation methods. **[No. of Hrs.: 10]**

UNIT - IV

Non-Linear Programming: Unconstrained optimization technique-direct search method, univariate method, Hooke and Jeeves Method, Powell's Method, Steepest Descent (Cauchy) Method, Conjugate Gradient (Fletcher-Reeves) Method, Constrained optimization method-penalty function method, Introduction to Genetic Algorithms. **[No. of Hrs.: 13]**

Text Book:

1. Singiresu S.Rao, "Engg. Optimization Theory & Practice", 3rd Edition., New Age Int., 2001

Reference Book:

1. Ashok D Belegundu, & Tiopathik Chandupatta, "Optimization Concept & Application", Pearson Education, Singapore, 2003.
2 Deb Kalyanmoy, "Optimization for Engg. Design, Algorithm & Examples", Prentice Hall, 2000.

Paper Code: ETME - 408 **L T C**
Paper: Advanced Methods Of Manufacturing **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.

UNIT - I

Non-Conventional Machining Methods : Classification of non-traditional machining methods, their comparative study.

Electric Discharge Machining : Principle and applications, mechanism of metal removal, basic EDM circuits, evaluation of metal removal, calculation of metal removal rate and optimization of MRR, selection of tool material and dielectrics.

LASER Beam Machining : Introduction, Production of LASER, machining applications of LASER, analysis and related calculations. **[No. of Hrs.: 11]**

UNIT - II

Abrasive Jet Machining : Principle and classification of ECM, determination and evaluation of MRR, Electrochemistry of ECM, selection of electrolytes and analysis of ECM, Electro Chemical Grinding, principle and process parameters.

Ultrasonic Machining : Principle, applications and process parameters, purpose of slurry slection, magnetostiction, analysis of process parameters.

Plasma Arc Machining : Principles and applications.

Electron Beam Machining : Principle, advantages and limitations. **[No. of Hrs.: 11]**

UNIT - III

System of Manufacturing : Components of manufacturing systems, Classifications of manufacturing system, Batch manufacturing and its analysis, mass manufacturing and its analysis, mass manufacturing and its analysis, Line balancing.

Cellular Manufacturing System : Introduction, advantages and applications, analysis of CMS (ROC algorithm) **[No. of Hrs.: 11]**

UNIT - IV

Flexible Manufacturing system : FMS components, applications and benefits, FMS planning and implementation, quantitative analysis of FMS.

Computer Integrated Manufacturing : Basic concept and benefits, application of CIM, Computer aided Process Planning (CAPP)., Concurrent engineering and advanced manufacturing planning, Lean manufacturing, Agile manufacturing, comparison of lean and agile manufacturing. **[No. of Hrs.: 11]**

Text Books:

1. P.C. Pandey & H.S. Shan, "Modern Machining Process", Tata McGraw Hills, 2001
2. Mr. Kell P. Groover, "Automation Production System and Computer Integrated Manufacturing", Pearson Education Asia, 2001.

Reference Books:

1. Amitabh Gosh and A.K. Mallik, "Manufacturing Science", Affiliated East-West Press Pvt. Ltd., 1985.
2. P.C. Sharma, "A Text Book of Prod. Engg.", Vol. 1, S.Chand & Co., 2002.
3. S.R. Deb, "Robotics Technology and Flexible Automatic", Tata McGraw Hill, 2000.

Paper Code: ETME - 410 **L T C**

Paper: Mechanical Vibration **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.

UNIT - I

Systems with single degree of freedom-undamped free Vibrations, Energy method and Rayleigh's method, damped free vibrations with viscous damping, forced vibrations with har monic excitation. Base excitation. **[No. of Hrs.: 11]**

UNIT - II

vibration isolation, Equivalent viscous damping, structural damping. Vibration measuring instruments. Whirling of rotating shafts with damping. **[No. of Hrs.: 11]**

UNIT - III

Systems with two degrees of freedom-undamped free vibrations, normal modes, steady state undamped and damped forced vibrations. **[No. of Hrs.: 11]**

UNIT - IV

Influence co-efficient and generalized co-ordinates, Principal co-ordinates and orthogonality Principles. **[No. of Hrs.: 11]**

Text Book:

1. W.T Thomson, "Theory of vibration" Prentice Hall of India Pvt. Ltd.
2. J.S. Rao and K. Gupta," Vibration Engg.", New Age Publications.

Reference Book:

1. D.J. Ewins, "Modal Analysis", Kulwer Publications.

Paper Code: ETME – 412 **L T C**

Paper: IC Engines, Emissions And Pollution 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.

UNIT - I

I.C. Engines: Working of Two stroke and Four stroke SI and CI Engines. Valve Timings. Actual indicated diagrams. Combustion calculations. Carburetion and Fuel Injection. Supercharging. Lubrication and cooling methods. Governing methods. Engines performance & Testing.

Combustion in S.I. and C.I. Engines: Normal & Abnormal Combustion. Pre-ignition. Detonation. Knocking. Comparison of knocking in S.I. and C.I. Engines. Rating of Fuels.

[No. of Hrs.: 11]

UNIT - II

Engine Fuels: Types of Hydrocarbon, Gasoline, Diesel specifications, Alternate Fuels – Properties of CNG, LPG, Alcohol, Bio- Fuel as vehicular Fuels.

Emission and Air Pollution: Automotive emissions and their role in air pollution, photochemical smog, Chemistry of smog formation. Combustion in homogeneous mixtures, emission formation, Incomplete combustion. Formation of Hydrocarbons (HC), carbon monoxide and oxides of nitrogen. Aldehyle. Emissions of unregulated toxic pollutants such as benzene; 13butadiene etc. Influence of engine design and operating parameters on S.I. engine exhaust emissions.

Hydrocarbon Evaporation Emissions: Various sources and method of their control, canisters for controlling evaporative emission control system for S.I. engines, blow-by control closed PCV system, reduction of exhaust emissions, various methods. Fules system design.

[No. of Hrs.: 11]

UNIT - III

Exhaust Treatment devices: Air injection into exhaust system. Thermal reactors, Catalytic converters- construction, efficiency, effect of equivalence ratio, additives on efficiency of 3-Way converter.; Advances in Converter design, plasma Catalyst

Stratified charged engines. Gasoline Direct injection, Various Methods for stratification;, Honda CVCC engine.

Diesel engine emissions: Source of emissions during combustion, effect of Air injector timing on performance and formation. D.I and I.D.I. engines emissions. Diesel smoke, PM and RSPM emission.

Methods of reducing emission, Exhaust gas re-circulation, smoke emission from diesel engines, Particulate Traps, Continuous Regeneration Traps (CRT). Methods for control of NO_x

[No. of Hrs.: 11]

UNIT - IV

Emission from CNG and LPG Engines.

Emission Instruments: Non – dispersive infrared analyzer. Gas chromatography. Flame Ionisation Detector. Chemiluminescent analyzer.

Emission Standards: Ambient Air Quality Standards, Mass emission standards, Air pollution cost benefit analysis. **[No. of Hrs.: 11]**

Text Books:

1. R.P. Sharma and M.L. Mathur, "Internal Combustion Engine", Dhanpat Rai Publications
2. V. Ganeshan, "Internal Combustion Engine", Tata McGraw Hill

Reference Books:

1. Angli M Course., "Automotive Engines", CBS Publications
2. Harper, "Fuel Systems Emission Control", CBS Publications

Paper Code: ETME 414 **L T C**

Paper: Gear Technology **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.

UNIT I:

Types of gears, Geometric and Kinetics characteristics, Undercutting and interference-correction, Non-Circular gears.

Design of tools to make gear teeth

Kinds and cases of gear failures **[No. of Hrs.: 11]**

UNIT II:

Special Design Problems; Center distance problem, profile modification, problem Combined bending and Torsion of pinions with large length to diameter ratio, high speed gearing.

[No. of Hrs.: 11]

UNIT III:

Geneva Mechanisms (Analysis & Synthesis)

Gear Trains (Analysis & Synthesis) **[No. of Hrs.: 11]**

UNIT IV:

Some example of optimal kinematics system Design; Gear Set design Design of sub-system consisting of Geneva wheel and elliptical gears for reduction of maximum acceleration of the wheel. **[No. of Hrs.: 11]**

Text Books:

1. D.W. Dudley, "Practical Gear Design", Tata McGraw Hill Co.Inc.
2. S.S. Rattan, "Theory of Machines", Tata McGraw Hill, 2000

Reference Book:

1. AGMA (American Gear Manufacturing Association) Standards

Paper Code:ETME - 416	**L**	**T**	**C**
Paper: Financial Management	**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.

UNIT - I

Aims and objectives of Financial Management Financial Analysis and Planning, Valuation of Securities, Cost-volume, profit Analysis, Operating and Financial Leverage. **[No. of Hrs.: 11]**

UNIT - II

Investment and capital Structure Decision, Methods of Capital Budgeting Cost of Different sources of Raising capital Weighted Average cost of capital, Optimum Capital Structure, Inventory, Accounts payable, Effect of Inflation on working capital Management, Instruments of Long-Term Finance, Internal financing and Dividend Policy. **[No. of Hrs.: 12]**

UNIT - III

Finance Function as Business; Approach to Financial Planning; Analysis of financial statements; Limitations of Financial statements; Rational Analysis; Flow of Funds Analysis; Sources of Long and Short Term Finance; Management of Components of Current Assets-Inventory Management; Accounts Receivable; cash; bills payable, Financial policies like working capital policy, Credit policy, Cash policy, Determinants; Basic Features of Indian Money and Capital markets; Financial Structure of Indian Companies and Liberalization & Globalization policy.

[No. of Hrs.: 12]

UNIT - IV

Applications and Case Studies **[No. of Hrs.: 09]**

Text Books:

1. Khan & Jain, "Financial Management", Tata McGraw Hall
2. I.M. Pandey, "Financial Management", Prentice Hall India

Reference Book:

1. R.P. Rastogi, "Financial Management", Galgotia Publications

Paper Code : ETME – 418	**L**	**T**	**C**
Paper: Reliability & Maintenance Engineering	**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.

UNIT I:.

Fundamentals Of Reliability & Maintenance: Reliability, Reliability Improvement, Redundancy, Element Redundancy. Unit Redundancy, Standby Redundancy, Reliability cost – trade off.

Maintenance, Scope of Responsibilities, Types of maintenance, Maintenance planning & control, Maintainability & Availability , Failure modes and the Bath Tub Curve. **[No. of Hrs.: 11]**

UNIT II:

Failure Data Analysis, Hazard Models & System Reliability: Failure Data, Mean Failure rate, Mean time to failure (MTTF), Mean time between failures (MTBF), GraPrentice Hall Indiacal plots, MTTF in terms of failure density, Reliability in terms of hazard rate and failure density. Constant Hazard model, Linearly Increasing Hazard and the Weibull Model. Instantaneous repair system, Mean time to repair (MTTR), Reliability and Availability function. Series configuration, Parallel configuration, Mixed configuration, A r – out – of – n – structure, mean time to failure of system, Fault tree construction, Calculation of reliability from Fault tree.

[No. of Hrs.: 11]

UNIT 3.

Systematic Maintenance: Codification & Cataloguing, History cards, Instruction manual and operating manuals, Job planning, Job manuals & Job scheduling, Job cards and Job procedures, Maintenance organization, Centralized & Decentralized organization, Captive maintenance, Replacement models, Spare part management. **[No. of Hrs.: 11]**

UNIT 4.

Condition Monitoring Techniques & Modern Concepts: Leakage monitoring, Lubricant monitoring techniques, Ferrography, Spectroscopy, Cracks monitoring, Thickness monitoring, corrosion monitoring, Thermography.

Terrotechnology, Failure mode effect analysis, Failure mode effect & critically analysis, Total productive maintenance, Computer managed maintenance system, Case studies.

[No. of Hrs.: 11]

Text Books :

1. L.S.Srinath, "Reliability Engineering", Affiliated East-West Press Ltd., 1985
2. S.K. Srivastava, "Industrial Maintenance Management", S. Chand & Co. Ltd., 1998.

Reference Books :

1. E. Balaguruswamy, "Reliability Engineering", Tata McGraw Hill Publishing Co., 1984.
2. Charles E. Ebling, "Reliability & Maintainability Engg.", Tata McGraw Hill Publishing Co., 1997.

Paper Code: ETME - 420 **L T C**

Paper: Power Plant Practice **3 1 4**

INSTRUCTIONS TO PAPER SETTERS:	**MAXIMUM MARKS: 75**
1.	Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2.	Apart from 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.

UNIT - I

Steam Generator Plant: Fuel handling systems, Indian coals, combustion of coal in furnaces; fluidized bed combustion; High pressure heavy duty boilers, Super critical and once through boilers influence of operating conditions on layout of evaporator, superheater, reheater and economizer; dust collectors; ash disposal, fans and draft systems. **[No. of Hrs.: 11]**

UNIT - II

Turbine Plane: Layout of turbine plant room, corrosion in condensers and boilers, feed water treatment; feed heating and de aeration system; cooling water systems and cooling towers.

[No. of Hrs.: 11]

UNIT - III

Other Power Plant: General layout of I.C. Engines and turbine power plants, types, gas turbine plants, fields of application, Nuclear power plants, power reactors and nuclear steam turbines; handling of nuclear waste and safety measures, peak load power generation methods.

[No. of Hrs.: 11]

UNIT - IV

Control: Important instruments on steam generator and turbine; drum water level control, combustion control and super heat temperature control; testing of power plants and heat balance.

Economics: Planning for power generation in India, super thermal power plants, estimation of cost of power generation; choice of plant site. **[No. of Hrs.: 11]**

Text Books:

1. Arora & Domkundwar, "A course in Power Plant Engineering", Dhanpat Rai & Sons

Reference Books:

1. Black Veatch, "Power Plant Engineering", CBS Publisher

Paper Code:ETME - 422	**L**	**T**	**C**
Paper: Finite Element Methods	**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.

UNIT - I

Introduction: Continuum and Discrete System

Finite Element Modeling: Local and Natural coordinates: 2-D and axi-symmetric elements and shape functions, continuity and convergence. **[No. of Hrs.: 11]**

UNIT - II

Higher Order Element: ISO-parametric elements, Numerical Integration **[No. of Hrs.: 11]**

UNIT - III

Finite Element Formulation: Potential Energy and weighted residual methods of formulation. Assembly of global stiffness metric and load vector, Imposition of boundary conditions.

[No. of Hrs.: 11]

UNIT - IV

Computer Implementation and Application of FEM: Method of solution of simultaneous equations. Computer implementation of the method. Application of FEM to Heat Transfer and Stress analyses problems. **[No. of Hrs.: 11]**

Text Books:

1. Larry J. Segerlind, "Applied Finite-Element Analysis", John Wiley and Sons.
2. Kenneth H. Huebner, "Finite Element Method for Engineers", John Wiley and Sons

Reference Books:

1. O.C. ZienKiewicz, "The Finite Element Method", Tata McGraw Hill
2. S.S. Rao, "Finite Element Method In Engineering", Pergaman Press

Practicals:

ETME - 452	**Quality Control & Quality Assurance**	**P**	**C**
	Based on course work ETME 402	2	1
ETME – 454	**Robotics**	**P**	**C**
	Based on course work ETME 404	2	1
ETME - 456	**Practical based on course work on Electives**	**P**	**C**
		2	1
ETME - 458	***Major Project**	**P**	**C**
		12	6

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