SCHEME OF EXAMINATION

&

DETAILED SYLLABUS

for

BACHELOR OF TECHNOLOGY
(Mechanical & Automation Engineering)

GURU GOBIND SINGH
INDRAPRASTHA UNIVERSITY
KASHMERE GATE, DELHI
### First Semester Examination

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Paper</th>
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<tbody>
<tr>
<td>ETMA 101</td>
<td>Applied Mathematics – I</td>
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<td>Communication Skills – I</td>
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<td>Impact of Science &amp; Technology on Society</td>
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### Practical/Viva Voce

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<td>Applied Chemistry Lab. – I</td>
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<td>Introduction to Auto CAD Office Automation and Web Design</td>
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<td>Workshop Practice</td>
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<td>Engineering Graphics Lab.</td>
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**Total** | **14** | **17** | **26**

ETEL-113* is NUES
# BACHELOR OF TECHNOLOGY

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

## SECOND SEMESTER EXAMINATION

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<td>Applied Chemistry – II</td>
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### THEORY PAPERS

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<td>ETCH 154</td>
<td>Applied Chemistry Lab. – II</td>
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**TOTAL** 15 18 28
## BACHELOR OF TECHNOLOGY
(Mechanical & Automation Engineering)

### THIRD SEMESTER EXAMINATION

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<td>ETME 203</td>
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<td>Thermal Science</td>
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<td>ETME 207</td>
<td>Mechanics of Solids</td>
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<td>ETME 209</td>
<td>Production Technology</td>
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<td>ETME 211</td>
<td>Mechanics of Fluids</td>
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### PRACTICAL/VIVA VOCE

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<td>ETME 253</td>
<td>Mech. of Solids / Fluid Mech. Lab.</td>
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<td>ETME 255</td>
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BACHELOR OF TECHNOLOGY  
(Mechanical & Automation Engineering)  

FOURTH SEMESTER EXAMINATION  

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<td>ETME 204</td>
<td>Heat Transfer</td>
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<td>Manufacturing Machines</td>
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<td>Electrical Machines</td>
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<td>ETME 212</td>
<td>LAN &amp; Networking</td>
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**PRACTICAL/VIVA VOCE**  

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**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.
# BACHELOR OF TECHNOLOGY  
(Mechanical & Automation Engineering)  

FIFTH SEMESTER EXAMINATION

<table>
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<td>Microprocessors &amp; Applications</td>
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<td>ETME 303</td>
<td>Machine Design- I</td>
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<td>ETME 305</td>
<td>Material Science &amp; Metallurgy</td>
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<td>ETME 307</td>
<td>Measurements &amp; Controls</td>
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<td>ETCS 309</td>
<td>Database Management Systems</td>
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<td>Measurements &amp; Controls Lab</td>
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# TOTAL 17 15 27

^Practical training was conducted after fourth semester. However, Viva-Voce for evaluation of Practical Training will be conducted in this semester.
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<td>Metrology</td>
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<td>Fluid Systems</td>
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**NOTE:** 4-6 weeks training will be held after sixth semester. However, Viva-Voce will be conducted in the seventh semester.
BACHELOR OF TECHNOLOGY  
(Mechanical & Automation Engineering)  

SEVENTH SEMESTER EXAMINATION  

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PRACTICAL/VIVA VOCE  

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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.
BACHELOR OF TECHNOLOGY  
(Mechanical & Automation Engineering)  

EIGHTH SEMESTER EXAMINATION

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<td>Reliability &amp; Maintenance Management</td>
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PRACTICAL/VIVA VOCE

<table>
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<td>ETME 456</td>
<td>Practical based on Electives</td>
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<td>ETME 458</td>
<td>*Major Project</td>
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*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.
UNIT I


UNIT II


\[ \tan \theta, \sin \theta, \cos \theta, \tan \frac{\theta}{2}, \sin \frac{\theta}{2}, \cos \frac{\theta}{2} \]

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

UNIT III


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 – Cauchy and Legendre forms. [No. of Hrs. 10]

TEXT BOOKS:

REFERENCE BOOKS:
3. “Advanced Engineering Mathematics”, Dr. A. B. Mathur, V. P. Jaggi (Khanna publications)
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 Birefringence, Interference from parallel thin films, wedge shaped films, Newton rings, Michelson interferometer.

**Diffraction**: Fresnel Diffraction, Diffraction at a straight edge, Fraunhofer 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


**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. Subrahmanyan and Brij Lal, “Optics”

**REFERENCE BOOKS**:
3. A. Beiser, “Concepts of Modern Physics”
UNIT - I


[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.
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, Nox, HC, Sox 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

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
INSTRUCTIONS TO PAPER SETTERS:

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.

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.

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.

UNIT – IV
Sheet Metal Work:
Common processes, tools and equipments; metals used for sheets, standard specification for sheets, spinning, bending, embossing and coining.

TEXT BOOKS:
2. 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
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.

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.

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.

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

TEXT BOOKS:

REFERENCE BOOKS:
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

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

[No. of Hrs: 10]

TEXT BOOKS:
1. Maison, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980
*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.
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.
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.


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

TEXT BOOKS:


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.
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.
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:**

**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
UNIT - I
CALCULUS OF SEVERAL VARIABLES:
Partial differentiation, ordinary derivatives of first and second order in terms of partial derivatives, 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:

[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:

[No. of Hrs. 10]

TEXT BOOKS:

REFERENCE BOOKS:
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.

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)

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.

UNIT - IV
X-Rays: production and properties, Crystalline and Anorphous solids (Brief) Bragg’s Law, Applications.
Ultrasonics: Introduction, Production of Ultrasonics (Magentostricction and piezoelectric methods), engineering applications.

TEXT BOOKS:
1. A. BEISER, “Concept of Modern Physics”
2. Rajam, “Atomic Physics”
3. Greiner, “Quantum Physics”
4. Griffith, “Introduction to Electrodynamics”

REFERENCE BOOKS:
4. Schiff, “Quantum Mechanics”
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
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$_2$SO$_4$ – 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:
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:**


**REFERENCE BOOKS:**

UNIT - I

**Force system:** Free body diagram, Equilibrium 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.

\[ \frac{T_1}{T_2} = e^{\mu \theta} \] 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 (Coriolis’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:**

**REFERENCE BOOKS:**
1. Irving H. Shames, “Engg Mechanics”, PHI publications
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 sinusoidal 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


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:

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:
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.
List of Experiments

1. Determine the heat of hydration of CuSO$_4$.5H$_2$O/FeSO$_4$.7H$_2$O.

2. Determine the heat of neutralization of strong Acid (say H$_2$SO$_4$/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:
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
   \[1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{20}\]
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
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3  3  3  3  3
4  4  4  4  4  4  4  4
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```
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 and sorting with following options:-
    a) Searching (1) Linear searching (2) Binary searching
    b) Sorting (1) Insertion 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 records contains information of managers and workers of a company. Print all the data of managers and workers in separate files.
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, \( \eta \) 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.
List of Experiments

1. Verification of Thevenin’s theorem
2. Verification of Superposition theorem
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
UNIT - I

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

UNIT II:

UNIT III:

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:

Reference Books:
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.


[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:**

**Reference Books:**
UNIT - I


[No. of Hrs.: 11]

UNIT - II


[No. of Hrs.: 11]

UNIT - III


[No. of Hrs.: 11]

UNIT - IV:

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


[No. of Hrs.: 11]

Text Books:

Reference Books:
3. Gordon Rosers, “Yon Mahew; Engineering Thermodynamics”, Addison Wesley
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 deflection 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:

Reference Books:
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, CO₂ 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

UNIT - IV

Powder Metallurgy: Definition, advantages, limitations and applications, Powder metallurgy processes and operations, metal powders, their characteristics and manufacture. [No. of Hrs.: 11]

Text Books:

Reference Books:
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, graphPrentice 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
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.

Text Books:

Reference Books:
### Practicals:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>P</th>
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<tbody>
<tr>
<td>ETME – 251</td>
<td>Electronics</td>
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<td>Based on Course work ETME – 203</td>
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<td>ETME – 253</td>
<td>Mechanics of Solids/Fluid Mechanics</td>
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<td>Based on Course work ETME – 207</td>
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<td>ETME – 255</td>
<td>Mechanical Engineering Drawing</td>
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<td>Free-Hand Sketching &amp; Scale Drawing</td>
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<td>Free-hand exercises for drawing three views from</td>
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<td>various models:</td>
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<td>Drawing of Two/Three views of:</td>
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<td></td>
<td>Cotter joint</td>
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<td>Knuckle Joint</td>
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<td>Rivets &amp; riveted joints</td>
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<td>Types of screw threads and their representation.</td>
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<td>Screws/Bolts and nuts</td>
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<td>Rigid Couplings</td>
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<td>Flexible Coupling</td>
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<td>Stepped Pulley</td>
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<td>Simple Bush bearing</td>
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<td>Plummer block</td>
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<td>Ball &amp; Roller bearing</td>
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<td>Engine parts</td>
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<td>Connecting Rod</td>
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<td>Piston</td>
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<td>ETME - 257</td>
<td>Programming-I (Numerical Analysis)</td>
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<td>Based on Course work ETMA– 201</td>
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INSTRUCTIONS TO PAPER SETTERS:

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

[No. of Hrs.: 11]

UNIT - II
Cams: Classification, Cams with uniform acceleration and retardation, SHM, Cycloidal 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:

Reference Books:
UNIT - I

[No. of Hrs.: 11]

UNIT - II

[No. of Hrs.: 11]

UNIT - III

[No. of Hrs.: 11]

UNIT - IV

[No. of Hrs.: 11]

Text Books:

Reference Books:
1. J.P. Holman; “Heat Transfers” McGraw Hill, USA

43 w.e.f. session 2004-2005
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.

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

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

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

Text Books:

Reference Books:
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:

Reference Books:
UNIT - I

UNIT - II

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.

Text Books:

Reference Books:
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:

Reference Books:


Practicals:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Theory</th>
<th>Practicals</th>
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<tbody>
<tr>
<td>ETME-252</td>
<td>Kinematics &amp; Dynamics of Machines Lab.</td>
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<tr>
<td>ETME -254</td>
<td>Machine Shop Lab.</td>
<td>P</td>
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<tr>
<td>ETME – 256</td>
<td>Electrical Machines Lab.</td>
<td>P</td>
<td>C</td>
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<td>ETME - 258</td>
<td>Programming –II (Operation Research)</td>
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<td>ETME - 260</td>
<td>LAN &amp; Networking Lab.</td>
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<td>Based on Course work ETME - 212</td>
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</tbody>
</table>
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

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:

Reference Books:
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:

Reference Book:
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
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.

Text Books:

Reference Books:
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.

[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:

Reference Books:
3. K.Ogata, “Modern Control Engineering”, Pearson Education
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:
[No. of Hrs.: 11]

Text Books:

Reference Books:
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

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

Reference Book:
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:

Reference Book:
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.

UNIT - II

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.

UNIT - IV
**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:**

**Reference Books:**
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: Centrifugal 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:

Reference Books:
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


[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.


[No. of Hrs.: 11]

Text Books:
2. Dr. B.J. Ranganath, “Metal Cutting & Tool Design” Vikas Publishing House Pvt. Ltd.

Reference Books:
### Practicals:

<table>
<thead>
<tr>
<th>Course Code</th>
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<td>(i) Automotive Transmission</td>
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<td>(ii) Brakes</td>
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<td>(iii) Clutches</td>
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<td>(iv) Connecting rod of I.C. Engine</td>
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<td>(v) Mechanical Hoist</td>
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<td>(vi) Hydraulic Riveter</td>
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<td>(vii) Passenger Lift</td>
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<td>ETME-360</td>
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### Text Books:

**Programming –IV (Pro-E I)**

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.


UNIT - II

UNIT - III

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

UNIT - IV

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

Text Books:

Reference Books:
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

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


UNIT - III


UNIT - IV

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:

Reference Books:
UNIT - I


UNIT - II


UNIT III:

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


UNIT - IV


Text Books:

Reference Books:
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

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:
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:

Reference Books:
UNIT - I

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


Text Books:-

Reference Books:
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.


[No. of Hrs.: 11]

UNIT III


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:

Reference:
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:

UNIT IV:

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

Text Books:
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


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:

Reference Book:
Students may select a project related to any of the subjects of the current semester.
## Practicals:

<table>
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<td>Computer Aided Manufacturing Lab.</td>
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<td>ETME-453</td>
<td>Mechatronics Lab.</td>
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<td>ETME-455</td>
<td>Elective I and II</td>
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<td>Programming – V (Pro-E-II)</td>
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<td>ETME 459</td>
<td>*Minor Project</td>
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*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.

<table>
<thead>
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<th>Course Code</th>
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^Practical training was conducted after sixth semester. However, Viva-Voce for evaluation of Practical Training will be conducted in this semester.
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.


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.


UNIT - IV


Text Books:
4. R.C. Gupta, “Statistical Quality Control”, Khanna Publisher
5. Reference Books:
UNIT - I

UNIT - II


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

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

Text Books:

Reference Books:
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

Text Book:

Reference Book:
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 selection, magnetostiction, analysis of process parameters.
Plasma Arc Machining: Principles and applications.
Electron Beam Machining: Principle, advantages and limitations.\[No. of Hrs.: 11\]

UNIT - III
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:

Reference Books:
UNIT - I

[No. of Hrs.: 11]

UNIT - II

[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:

Reference Book:
UNIT - I


[No. of Hrs.: 11]

UNIT - II


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


[No. of Hrs.: 11]

UNIT - IV

Emission from CNG and LPG Engines.


Emission Standards: Ambient Air Quality Standards, Mass emission standards, Air pollution cost benefit analysis.

[No. of Hrs.: 11]

Text Books:

Reference Books:
1. Angli M Course., “Automotive Engines”, CBS Publications
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:

Reference Book:
1. AGMA (American Gear Manufacturing Association) Standards
UNIT - I

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:
2. I.M. Pandey, “Financial Management”, Prentice Hall India

Reference Book:
UNIT I:
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 :

Reference Books :
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:

Reference Books:
1. Black Veatch, “Power Plant Engineering”, CBS Publisher
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

UNIT - IV

Text Books:

Reference Books:
Practicals:

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<td>ETME – 454</td>
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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.