# NETAJI SUBHAS UNIVERSITY


**SYLLABUS AND SCHEME OF EXAMINATION**
**FOR**

# DIPLOMA

# MECHANICAL ENGINEERING

(Effective from academic session: 2021-22)

# STATE BOARD OF TECHNICAL EDUCATION, JHARKHAND

## First Year

| Subject Code | SEMESTER 1 | Subject Code | SEMESTER 2 |
|---|---|---|---|
| DIP101 | Basic Physics | DIP201 | Communication Skills-II |
| DIP102 | Basic Chemistry | DIP202 | Engg. Mathematics-I |
| DIP103 | Basic Mathematics | DIP203 | Applied Science |
| DIP104 | Communication Skill-I | DIP204 | Engg. Mechanics |
| DIP105 | Engg. Graphics | DIP205 | Engg. Drawing |
| DIP106 | Computer Fundamentals | DIP206 | Basic Workshop Practice |
| DIP107L | COMPUTER LAB | DIP207L | ED LAB |
| DIP108L | PHY LAB | DIP208L | CHEM LAB |

| SEMESTER - 1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| THEORY | | PERIOD | | | Evaluation Scheme | | | Credit | Hours |
| CODE | NAME OF THE PAPER | LECTURES | TUTORIALS | PRACTICALS | IA | ESE | SUB-TOTAL | | |
| DIP101 | Basic Physics | 3 | 1 | 0 | 30 | 70 | 100 | 4 | 4 |
| DIP102 | Basic Chemistry | 3 | 1 | 0 | 30 | 70 | 100 | 4 | 4 |
| DIP103 | Basic Mathematics | 3 | 1 | 0 | 30 | 70 | 100 | 4 | 4 |
| DIP104 | Communication Skill-I | 3 | 0 | 1 | 30 | 70 | 100 | 4 | 4 |
| DIP105 | Engg. Graphics | 3 | 1 | 0 | 30 | 70 | 100 | 4 | 4 |
| DIP106 | Computer Fundamentals | 3 | 0 | 1 | 30 | 70 | 100 | 4 | 4 |
| DIP107L | COMPUTER LAB | 0 | 0 | 2 | 15 | 35 | 50 | 2 | 2 |
| DIP108L | PHY LAB | 0 | 0 | 2 | 15 | 35 | 50 | 2 | 2 |
| | | | | | | | Total Credits: | 28 | |

## Basic Physics (DIP101)

| Contents (Theory) | | Hrs/week |
|---|---|---|
| Unit -1<br>UNITS AND MEASUREMENTS | **1.1**Need of Measurement in engineering and science, unit of a Physical quantity, requirements of standard unit, systems of units-CGS, MKS and SI, classification of physical quantities- Fundamental and Derived with their units.<br>**1.2**Accuracy, Precision of instruments, Errors in measurement, Estimation of errors - Absolute error, Relative error and percentage error, significant figures. (Simple Problems).<br>**1.3**Basic Measuring instruments - Vernier Caliper, Micrometer screwgauge, inner & outer caliper thermometer,spherometer, ammeter, voltmeter with their least count, range, accuracy and precision.<br>Standard reference surfaces used in engineering measurements- surface plate, angle plate, V- block, Engineer's square. | 05 |
| Unit -2<br>GENERAL PROPERTIES OF MATTER | **2.1 Elasticity :** Deforming force, Restoring force, Elastic and plasticbody, Stress and strain with their types, Hooke's law, Stress strain diagram, Young's modulus, Bulk modulus, Modulus of rigidity and relation between them( no derivation), (simple problems).<br>(Simple problems). Stress strain diagrams of H.T. Steel, Cast iron, Aluminum and Concrete, Ultimate and breaking stress, Factor of safety. | 05 |

| | | |
|---|---|---|
| | **2.2 Surface Tension:** Forces—cohesive and adhesive, angle of contact, shape of liquid surface in a capillary tube, capillary action with examples, relation between surface tension, capillary rise and radius of capillary (no derivation), (simple problem), effect of impurity and temperature on surface tension.<br>**2.3 Viscosity :** Velocity gradient, Newton's law of viscosity, coefficient of viscosity, streamline and turbulent flow, critical velocity, Reynold's number, (simple problems), Stokes law and terminal velocity (no derivation), buoyant (up thrust) force, effect of temperature & adulteration on viscosity of liquid. | **03**<br><br>**03** |
| **Unit – 3**<br>**HEAT** | **3.1Transmission of heat and expansion of solids:** Three modes of transmission of heat - conduction, convection and radiation, good and bad conductor of heat with examples, law of thermal conductivity, coefficient of thermal conductivity (simple problems), expansion of solids-linear, aerial and cubical and relation between them.<br>**3.2Gas laws and specific heats of gases:** Boyle's law, Charles's law, Gay Lussac's law, absolute temperature, Kelvin scale of temperature, general gas equation(no derivation) (simple problems), molar or universal gas constant, universal gas equation, standard or normal temperature and pressure (N.T.P.), specific heat of gases, relation between two specific heat (simple problems), thermodynamic variables, first law of thermodynamics (statement & equation only), isothermal, isobaric, isochoric & adiabatic processes (difference among these processes and equations of state) (simple problems). | **03**<br><br>**04** |
| **Unit – 4**<br>**LIGHT** | **4.1Properties of light:** Reflection and refraction, Snell's law, physical significance of refractive index (simple problems), Total internal reflection, dispersion, diffraction and polarization of light (only introduction).<br>**4.2 Wave theory of light & Interference:** Newton's corpuscles theory of light, Huygens's wave theory, wave front, Types of wave front-spherical, cylindrical and plane Huygens's principle of propagation of wave front, Principle of superposition of waves,<br>Interference of light, constructive and destructive interference, Young's experiment. Analytical treatment of interference, conditions for stationary interference pattern.<br>**4.3 Laser:** Light amplification by stimulated emission of radiation, properties of laser, spontaneous and stimulated emission, population inversion, pumping methods, He-Ne laser- construction & working, recording and reconstructing of hologram by using He-Ne laser. | **03**<br><br>**04**<br><br>**04** |
| **Unit – 5**<br>**MODERN PHYSICS** | **5.1 Photo electricity :** Plank's hypothesis, properties of photons, photo electric effect, laws and characteristics of photoelectric effect, Einstein's photoelectric equation,(simple problems), construction and working of photoelectric cell, applications of photoelectric cell.<br>**5.2 X-rays: Production** of X-rays, types of X-ray spectra-continuous and characteristics, X-ray wavelength (simple problems), properties of X-rays, applications of X-rays-engineering, medicine and scientific research work. | **03**<br><br>**03** |
| | **Total** | **40** |

**Text Books**

| | Titles of the Book | Name of Authors. | Name of the Publisher |
|---|---|---|---|
| (i) | Physics –I | V. Rajendran | Tata McGraw- Hill raw- Hill publication, New Delhi |
| (ii) | Applied Physics | Arthur Beiser. | Tata McGraw- Hill raw- Hill publication, New Delhi |
| (iii) | Engineering. Physics | R.K. Gaur & S.L. Gupta. | Dhanpat Rai Publication, New Delhi. |
| (iv) | Physics | Resnick and Halliday | - |
| (v) | Concept of Physics Part-I&II | H. C. Verma | - |
| (vi) | Basic Physics | Roshan Kr. Sinha | Foundation Publishing House |

# Basic Chemistry (DIP102)

| Contents (Theory) | | Hrs/week |
|---|---|---|
| **Unit -1** | **Atomic Structure** : Definition of Atom, Fundamental Particles of Atom – their Mass, Charge, Location, Definition of Atomic no, Atomic Mass no., Isotopes & Isobars, & their distinction with suitable examples, Bohr's Theory, Definition, Shape & Distinction between Orbits & Orbitals, Hund's Rule, Filling Up of the Orbitals by Aufbau's Principles (till Atomic no. 30), Pauli's exclusion principle, Valency – Definition, types (Electrovalency &Covalency), Distinction, Octet Rule, Duplet Rule, Formation of Electrovalent & Covalent Compounds e.g. Nacl, $CaCl_2$, MgO, $AlCl_3$, $CO_2$, $H_2O$, $Cl_2$, $NH_3$, $C_2H_4$, $N_2$, $C_2H_2$. | **06** |
| **Unit -2** | **Electrochemistry :** Definition Ionisation & Electrolytic Dissociation, Arrhenius Theory of Ionisation, Significance of the Terms Involved in Electrolysis. Such as Conductors, Insulators or Dielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes, Current Density, Temperature, Mechanism of Electrolysis – Primary & Secondary Reactions at Cathode & Anode, Electrochemical Series for Cations& Anions,<br>Electrolysis of $CuSO_4$ Solution by using Cu Electrode & Platinum Electrode, Electrolysis of NaOH solution & fused NaCl, Faraday's first & second law of Electrolysis &Numericals, Electrochemical Cells & Batteries, Definition,<br>Types (Primary & Secondary Cells), e.g. Construction, Working & Applications of Dry Cell / Laclanche Cell & Lead – Acid Storage Cell, Applications of Electrolysis such as Electroplating & Electro refining, Electrometallurgy & electrotyping Conductivity of Electrolyte – Ohms Law, Definition & Units of Specific Conductivity, Equivalent Conductivity, specific resistance. | **08** |

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| **Unit -3** | **Metals & Alloys Metals :** Occurrence of Metals, Definition Metallurgy, Mineral, Ore, Gangue, Flux & Slag, Mechanical Properties, Processing of Ore, Stages of Extraction of Metals from its Ores in Detail i.e. Concentration, Reduction, refining. Physical Properties & Applications of some commonly used metals such as Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Co, Ag, W.<br><br>**Alloys: Definition** of Alloy, Purposes of Making alloy Preparation Methods, Classification of Alloys such as Ferrous & Non Ferrous, examples.<br>Composition, Properties & Applications of Alnico, Duralumin, Dutch Metal, German Silver / Nickel Silver, Gun Metal, Monel metal, Wood's Metal, Babbitt Metal. | **08** |
| **Unit -4** | **Non Metallic Materials Plastics :** Definition of Plastic, Formation of Plastic by Addition & Condensation Polymerisation by giving e.g. of Polyethylene & Backelite plastic Respectively, Types of Plastic, Thermo softening& Thermosetting Plastic, with Definition, Distinction &e.g. Compounding of Plastics – Resins, Fillers, Plasticizers, Accelerators, Pigments, Engineering Applications of Plastic based on their Properties.<br>**Rubber:** Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanisation of Rubber with Chemical Reaction. Synthetic Rubber: Definition, & e.g., Distinction Between Natural & Synthetic Rubber.<br>**Thermal Insulating Materials: Definition**, Characteristics & Applications of Glass, Wool, Thermocole, Asbestos, Cork. | **08** |
| **Unit – 5** | **Environmental Effects (Awareness Level):** Introduction, Definition, Causes of Pollution, Types of Pollution, Such as Air & Water Pollution.<br>**Air Pollution :** Definition, Types of Air Pollutions their Sources & Effects, Such as Gases, Particulates, Deforestation, Radio Active Gases, Control of Air Pollution, Air Pollution Due to Internal Combustion Engine & Its Control Methods, Causes & Effects of Ozone Depletion & Green House Effects.<br>**Water Pollution :** Definition, Causes & Methods of Preventing Water Pollution, Types of Waste such as Domestic Waste, Industrial Waste, their Physical & Biological Characteristics, BOD, COD, Biomedical Waste & E–Waste, their Origin, Effects & Control Measures. Preventive Environmental Management (PEM) Activities. | **10** |
| | **Total** | **40** |

**Text Books:-**

| | Titles of the Book | Name of Authors. | Name of the Publisher |
|---|---|---|---|
| (i) | Engineering Chemistry | Jain & Jain | Dhanpat Rai and Sons |
| (ii) | Engineering Chemistry | S.S. Dara | S. Chand Publication |
| (iii) | Industrial Chemistry | B.K. Sharma | Goel Publication |
| (iv) | Environmental Chemistry & Pollution Control. | S.S. Dara | S. Chand Publication |

# Basic Mathematics (DIP103)

| Contents (Name of Topics) | | Hrs/week |
|---|---|---|
| **Unit -1** | **ALGEBRA** | |
| | **1.1 REVISION :**<br>1.1.1 Laws of Indices<br>1.1.2 Formula of factorization and expansion ( $(a^2-b^2)$, $(a+b)^2$ etc.)<br>1.1.3 Laws of logarithm with definition of Natural and Common logarithm. | **01** |
| | **1.2 PARTIAL FRACTION :**<br>1.21 Definition of polynomial fraction proper & improper fractions and definition of partial fractions.<br>1.2.2 To Resolve proper fraction into partial fraction with denominator containing non repeated linear factors, repeated linear factors and irreducible non repeated quadratic factors.<br>1.2.3 To resolve improper fraction into partial fraction. | **04** |
| | **1.3 DETERMINANT AND MATRICES :**<br>**Determinant**<br>1.3.1 Definition and expansion of determinants of order 2 and 3.<br>1.3.2 Cramer's rule to solve simultaneous equations in 2 and 3 unknowns.<br>**Matrices**<br>1.3.3 Definition of a matrix of order m x n types of matrices.<br>1.3.4 Algebra of matrices such as equality, addition, Subtraction, scalar multiplication and multiplication.<br>1.3.5 Transpose of a matrix.<br>1.3.6 Minor, cofactor of an element of a matrix, adjoint of matrix and inverse of matrix by adjoint method.<br>1.3.7 Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversion method. | **10** |
| | **1.4 BINOMIAL THEOREM :**<br>1.4.1 Definition of factorial notation, definition of permutation and combinations with formula.<br>1.4.2 Binomial theorem for positive index.<br>1.4.3 General term.<br>1.4.4 Binomial theorem for negative index.<br>1.4.5 Approximate value (only formula) | **03** |
| **Unit -2** | **TRIGONOMETRY.**<br>**2.1 REVISION :**<br>2.1.1 Measurement of an angle (degree and radian). Relation Between degree and radian.<br>2.1.2 Trigonometric ratios of $0^0$, $30^0$, $45^0$ etc.<br>2.1.3 Fundamental identities. | **02** |
| | **2.2 TRIGONOMETRIC RATIOS OF ALLIED, COMPOUND, MULTIPLE & SUBMULTIPLE ANGLES**<br>(Questions based on numerical computations, which can also be done by calculators, need not be asked particularly for allied angles). | **06** |
| | **2.3 FACTORIZATION AND DEFACTORIZATION FORMULAE :** | **02** |

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| | **2.4 INVERSE TRIGONOMETRIC RATIOS :**<br>2.4.1 Definition of inverse trigonometric ratios, Principal values of Inverse trigonometric ratios.<br>2.4.2 Relation between inverse trigonometric ratios. | **02** |
| | **2.5 PROPERTIES OF TRIANGLE**<br>2.5.1 Sine, Cosine, Projection and tangent rules (without proof)<br>2.5.2 Simple problems. | **02** |

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| **Unit -3** | **COORDINATE GEOMETRY**<br>**3.1 POINT AND DISTANCES :**<br>3.1.1 Distance formula, Section formula, midpoint, centriod of triangle.<br>3.1.2 Area of triangle and condition of collinearity. | **04** |
| | **3.2 STRAIGHT LINE :**<br>3.2.1 Slope and intercept of straight line.<br>3.2.2 Equation of straight line in slope point form, slope-intercept form, two-point form, two-intercept form, normal form. General equation of line.<br>3.2.3 Angle between two straight lines condition of parallel and perpendicular lines.<br>3.2.4 Intersection of two lines.<br>3.2.5 Length of perpendicular from a point on the line and perpendicular distance between parallel lines. | **04** |
| | **3.3 CIRCLE :**<br>3.3.1 Equation of circle in standard form, centre – radius form, diameter form, two – intercept form.<br>3.3.2 General equation of circle, its centre and radius. | **04** |
| **Unit-4** | **VECTORS**<br>4.1 Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication) 4.2 Dot (Scalar) product with properties.<br>4.3 Vector (Cross) product with properties. | **04** |
| | **4.4 Applications**<br>4.4.1 Work done and moment of force about a point & line | **02** |
| | **Total** | **50** |

## Text Books:-

| | Titles of the Book | Name of Authors. | Name of the Publisher |
|---|---|---|---|
| (i) | Mathematics for Polytechnic | S.P. Deshpande | Pune Vidyarthi Griha |
| (ii) | Trigonometry | S.L. Loncly | S. Chand Publication |
| (iii) | Higher Algebra | H.S. Hall & S.R. Knight | Metric edition, Book Palace, New Delhi |
| (iv) | College Algebra | Frc. G. Valles | Charotar Publication |
| (v) | Matrices | Aryes. | Schuam series, McGraw Hill |
| (vi) | Higher Engineering Mathematics | B.S. Grewal | Khanna Publications New Delhi |
| (vii) | Engineering Mathematics | S.S. Sastry | Prentice Hall of India |
| (viii) | Basic Mathematics | Sindhu Prasad | Foundation Publishing House |

# Communication Skill-I (DIP104)

| Contents : Theory | | Hrs/week |
|---|---|---|
| **Unit -1** | Introduction: Definition, Objectives, Stages of Communication, Essentials of Good/Effective Communication, Benefits of Good Communication, Gaps in Communication, Communication and Information Technology. Business Correspondence: Structure of a Letter, Inquiry Letter, Sales Letter, Order Letter, Complaints, Complaint Handling, Telemarketing. | 08 |
| **Unit -2** | Government Correspondence: Noting, Routine Letter, Demi-Official Letter Memorandum, Circular, Telegrams, Newsletter. Writing Skills: Report Writing, Scientific Paper Writing, Writing Small Paragraphs & Essays. | 08 |
| **Unit -3** | 2-3 classic short stories, 2-3 great short stories by Indian writers. Preparation for Job: Writing Applications for Jobs, Preparing Curriculum Vitae, Preparing for Interviews, Preparing for Group Discussions. | 08 |
| **Unit -4** | **Grammar:** Sentence Structure, Idiomatic Usage of Language, Tenses, Direct & Indirect Parts of Speech, Active & Passive Voice, Vocabulary. | 08 |
| **Unit -5** | **Preparation for Job:** Writing Applications for Jobs, Preparing Curriculum Vitae, Preparing for Interviews, Preparing for Group Discussions. | 08 |
| | **Total** | **40** |



## Text Books:


1. Organizations - Structures, Processes and Outcomes; Richard h Hall; Prentice Hall India.
2. English for the Secretary; Yvonne Hoban; Tata McGraw Hill.
3. Technical Communication: M. Raman & S. Sharma; Oxford University Press.
4. Business Communication Process and Product: M.E. Guffey; Thomson Learning.


## Reference Book:


1. Human Behavior at Work; John W Newstorm & Keith Davis; Tata McGraw Hill.
2. The Most Common Mistakes in English Usage; Thomas Elliot Berry, Tata McGraw Hill
3. Business Communication: R.K. Madhukar; Vikas Publication.

# Engg. Graphics (DIP105)

| Contents (Theory) | | Hrs/week |
|---|---|---|
| **Unit -1** | **Drawing Instruments and their uses :**<br>1.1 Letters and numbers (single stroke vertical)<br>1.2 Convention of lines and their applications.<br>1.3 Scale (reduced, enlarged & full size) plain scale and diagonal scale.<br>1.4 Sheet layout.<br>1.5 Introduction to CAD (Basic draw and modify Command).<br>1.6 Geometrical constructions. | **06** |
| **Unit -2** | **Engineering curves & Loci of Point:**<br>2.1 **To draw an ellipse by :**<br>2.1.1 Directrix and focus method<br>2.1.2 Arcs of circle method.<br>2.1.3 Concentric circles method.<br>2.2 **To draw a parabola by :**<br>2.2.1 Directrix and focus method<br>2.2.2 Rectangle method<br>2.3 **To draw a hyperbola by :**<br>2.3.1 Directrix and focus method<br>2.3.2 passing through given points with reference to asymptotes.<br>2.3.3 Transverse Axis and focus method.<br>2.4 **To draw involutes of circle & polygon (up to hexagon)**<br>2.5 : To draw a cycloid, 21 picycloids, hypocycloid To<br>2.6 draw Helix & spiral.<br>2.7 Loci of Points:<br>2.7.1 Loci of points with given conditions and examples related to simple mechanisms. | **12** |
| **Unit – 3** | **Orthographic projections :**<br>3.1 Introduction to Orthographic projections.<br>3.2 Conversion of pictorial view into Orthographic Views (First Angle Projection Method Only).<br>3.3 Dimensioning technique as per SP-46. | **06** |
| **Unit – 4** | **Isometric projection :**<br>4.1 Isometric scale.<br>4.2 Conversion of orthographic views into isometric View/projection (Simple objects)<br>4.3 Projection of Straight Lines and Planes. (First Angle Projection Method only). | **08** |
| **Unit – 5** | 5.1 Lines inclined to one reference plane only and limited to both ends in one quadrant.<br>5.2 Projection of simple planes of circular, square, rectangular, rhombus, pentagonal, and hexagonal, inclined to one reference plane and perpendicular to the other. | **08** |
| | **Total** | **40** |

**Text Books:-**

| | Titles of the Book | Name of Authors. | Name of the Publisher |
|---|---|---|---|
| (i) | Engineering Drawing | N.D. Bhatta | Charotar Publishing House |
| (ii) | Engineering Drawing & Graphics + Auto CAD | K. Venugopal | New Age Publication |
| (iii) | Engineering Drawing | R.K. Dhawan | S. Chand Co. |
| (iv) | Engineering Drawing | P.J. Shah | - |
| (v) | Engineering Graphics | K.R. Mohan | Dhanpat Rai and Publication Co. |
| (vi) | Engineering Graphics | Dharmendra Kumar | Foundation Publishing House |

# Computer Fundamentals (DIP106)

| Contents : Theory | | Hrs/week |
|---|---|---|
| **Unit -1** | Evolution of computer, Data and Information, Characteristics of computers, Various fields of application of computers, various fields of computer (Hardware, Software, Human ware and Firmware), Advantages and Limitations of computer,<br>Block diagram of computer, Function of different units of computer, Classification of computers Types of software (System and Application), Compiler and Interpreter, Generation of language (Machine Level, Assembly, High Level, 4GL). | 08 |
| **Unit -2** | Input and Output Devices, **Computer Memory:** & **Number System (Logic gates)**<br>Primary Memory (ROM and it's type – PROM, EPROM, EEPROM, RAM) Secondary memory- SASD, DASD Concept, Magnetic Disks – Floppy disks, Hard disks, Magnetic Tape, Optical disks – CD ROM and it's type (CD ROM, CD ROM-R, DVD, Flash Memory.<br>Introduction to Number System, Conversion of Number System, Signed and Unsigned Numbers, Binary Coding, Logic gates, Boolean algebra, Combination of Logic Gates. | 08 |
| **Unit -3** | **Operating System Concept:**<br>Introduction to operating system; Function of OS, Types of operating systems, Booting Procedure, Start-up sequence, Dos – History, Files and Directories, Internal and External Commands, Batch Files | 08 |
| **Unit -4** | **Editors and Word Processors 5**<br>Basic Concepts: MS-Word, Introduction to desktop publishing **Spreadsheets and Database packages:**<br>Purpose, usage, commands - MS-Excel Creation of files in MS-Access, MS – PowerPoint | 08 |
| **Unit -5** | Concept of Data Communication and Networking: Networking Concepts, Types of networking (LAN, MAN AND WAN), Communication Media, Mode of Transmission (Simplex, Half Duplex, Full Duplex), Analog and Digital Transmission. Synchronous and Asynchronous Transmission, Different Topologies | 08 |
| | **Total** | **40** |

**Text Books:**


1. Leon and Leon; Introduction to Information Technology, Leon Tech World.
2. Microsoft Office-2000 Complete- BPB Publication.
3. Sinha, Kr. Pradeep and Preeti Sinha; Foundations of Computing, BPB Publication.
4. Jain, V.K.; Computers and Beginners


| SEMESTER - 2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| THEORY | | PERIOD | | | Evaluation Scheme | | | Credit | Hours |
| CODE | NAME OF THE PAPER | LECTURES | TUTORIALS | PRACTICALS | IA | ESE | SUB-TOTAL | | |
| DIP201 | Communication Skills-II | 3 | 1 | 0 | 30 | 70 | 100 | 4 | 4 |
| DIP202 | Engg. Mathematics-I | 3 | 1 | 0 | 30 | 70 | 100 | 4 | 4 |
| DIP203 | Applied Science | 4 | 0 | 0 | 30 | 70 | 100 | 4 | 4 |
| DIP204 | Engg. Mechanics | 4 | 0 | 0 | 30 | 70 | 100 | 4 | 4 |
| DIP205 | Engg. Drawing | 2 | 0 | 2 | 30 | 70 | 100 | 4 | 4 |
| DIP206 | Basic Workshop Practice | 0 | 0 | 4 | 30 | 70 | 100 | 4 | 4 |
| DIP207L | ED LAB | 0 | 0 | 2 | 15 | 35 | 50 | 2 | 2 |
| DIP208L | CHEM LAB | 0 | 0 | 2 | 15 | 35 | 50 | 2 | 2 |
| | | | | | | | Total Credits: | 28 | |

## Communication Skills-II (DIP201)

| Contents Theory | | |
|---|---|---|
| | **Name of the Topic** | IIrs/Week |
| **Unit -1** | **Introduction to communication :**<br>1.1 Definition , Communication Cycle/Process,<br>1.2 The elements of communication: sender- message - channel- Receiver -Feedback & Context.<br>1.3 Definition of Communication Process.<br>1.4 Stages in the process : defining the context, knowing the audience, designing the message, encoding , selecting proper channels, transmitting, receiving, decoding and giving feedback. | **08** |
| **Unit -2** | **Types of communication :**<br>**2.1** Formal- Informal, Verbal- Nonverbal, Vertical- Horizontal- Diagonal. | **04** |
| **Unit - 3** | **Principals of effective communication :**<br>3.1 Definition of Effective Communication.<br>3.2 Communication Barriers & how to overcome them.<br>3.3 Developing effective messages: Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers & facilitating feedback. | **06** |

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| **Unit - 4** | **Non verbal- graphic communication:**<br>4.1 Noun- verbal codes: A- Kinesics , B- Proxemics , C - Haptics D-Vocalics , E- Physical appearance. F -Chronemics , G -Artifacts Aspects of Body Language Interpreting Visuals & illustrating with Visuals like Tables, Charts & graphs. | **06** |
| **Unit - 5** | **Formal written skills :**<br>5.1 Office Drafting: Circular, Notice , and Memo.<br>5.2 Job Application with resume.<br>5.3 Business correspondence: Enquiry, Order letter, Complaint letter, and Adjustment letter.<br>5.4 Report writing: Accident report, fall in production, Progress / Investigative.<br>5.5 Defining & describing objects & giving Instructions. | **06** |
| | **Total** | **30** |

## Text Books :-

| | Titles of the Book | Name of Authors. | Name of the Publisher |
|---|---|---|---|
| (i) | Developing Communication Skills | Krushna Mohan, Meera Banerji | Macmillan |
| (ii) | Communication Skills | Joyeeta Bhattacharya. | Reliable Series |
| (iii) | Every ones guide to effective writing | Jayakaran | Apple Publishing |
| (iv) | Communication Skills-II | Kajari Guha | Foundation Publishing House |
| (v) | Effectual Communication Skills | Bhupender Kour | S.K. Kataria & Sons. |
| (vi) | The Functional Aspects of Communication Skills | Dr. P. Prasad | S.K. Kataria & Sons. |
| (vii) | Communication Skills | Leena Sen | Prentice Hall of India Pvt.Ltd. |
| (viii) | Professional Communication | Dr. Raavee Tripathi | S.K. Kataria & Sons. |
| (ix) | Technical Communication for Engineers | Shalini Verma | Vikas Publishing Home Pvt. Ltd. |

# Engg. Mathematics-I (DIP202)

| Contents theory | | Hrs/week |
|---|---|---|
| **Unit -1** | **Function and Limit :**<br>**1.1 Function**<br>1.1.1 Definitions of variable, constant, intervals such as open, closed, semi-open etc.<br>1.1.2 Definition of Function, value of a function and types of functions, Simple Examples.<br>**1.2 Limits**<br>1.2.1 Definition of neighborhood, concept and definition limit.<br>1.2.2 Limits of algebraic, trigonometric, exponential and logarithmic functions with simple examples. | **03**<br>**06** |

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| **Unit -2** | **Derivatives :**<br>2.1 Definition of Derivatives, notations.<br>2.2 Derivatives of Standard Functions<br>2.3 Rules of Differentiation. (Without proof). Such as Derivatives of Sum or difference, scalar multiplication, Product and quotient.<br>2.4 Derivatives of composite function (Chain rule)<br>2.5 Derivatives of inverse and inverse trigonometric functions.<br>2.6 Derivatives of Implicit Function<br>2.7 Logarithmic differentiation<br>2.8 Derivatives of parametric Functions.<br>2.9 Derivatives of one function w.r.t another function<br>2.10 Second order Differentiation. | **12** |
| **Unit - 3** | **Statistics And Probability :**<br>**3.1 Statistics**<br>3.1.1 Measures of Central tendency (mean, median, mode) for ungrouped and grouped frequency distribution.<br>3.1.2 Graphical representation (Histogram and Ogive Curves) to find mode and median.<br>3.1.3 Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation. Comparison of two sets of observations.<br>**3.2 Probability**<br>3.2.1 Definition of random experiment, sample space, event, Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely).<br>3.2.2 Definition of Probability, addition and multiplication theorems of Probability | **08**<br><br>**04** |
| **Unit - 4** | **4.1 Applications Of Derivative**<br>4.1.1 Geometrical meaning of Derivative, Equation of tangent and Normal.<br>4.1.2 Rates and Motion<br>4.1.3 Maxima and minima<br>4.1.4 Radius of Curvature<br>**4.2 Complex number**<br>4.2.1 Definition of Complex number. Cartesian, polar, Exponential forms of Complex number.<br>4.2.2 Algebra of Complex number (Equality, addition, Subtraction, Multiplication and Division)<br>4.2.3 De-Moivre's theorem (without proof) and simple problems.<br>Euler's form of Circular functions, hyperbolic functions and relations between circular & hyperbolic functions | **05**<br><br>**04** |
| | **Total** | **42** |

**Text Books :-**

| | Tilles of the Book | Name of Authors. | Name of the Publisher |
|---|---|---|---|
| (i) | Mathematics for Polytechnic | S.P. Deshpande | Pune Vidyarthi Griha Prakashan Pune. |
| (ii) | Calculus single Variable | Robert T Smith | Tata McGraw Hill |
| (iii) | Advanced Engineering Mathematics | Dass H.K. | S. Chand Publication, New Delhi |
| (iv) | Fundamentals of Mathematical Statistics | S.C. Gupta and Kapoor | S. Chand Publication New Delhi |
| (v) | Higher Engineering Mathematics | B.S. Grewal | Khanna Publication, New Delhi |
| (vi) | Applied Mathematics | P.N. Wartikar | Pune Vidyarthi Griha Prakashan, Pune. |
| (vii) | Engineering Mathematics | Sindhu Prasad | Foundation Publishing House |

# Applied Science (DIP203)

| (A) PHYSICS Contents | | Hrs/week |
|---|---|---|
| **Unit-1** | **1. Kinematics**<br>**1.1 Rectilinear Motion**<br>Equations of Motions- $v = u+at$, $S = ut+1/2at^2$, $V^2 = u^2+2as$ (only equation), Distance traveled by particle in $n^{th}$ second, Velocity Time Diagrams-uniform velocity, uniform acceleration and uniform retardation, equations of motion for motion under gravity.<br>**1.2 Angular Motion**<br>Definition of angular displacement, angular velocity, angular acceleration, Relation between angular velocity and linear velocity, Three equations of circular motion (no derivation) angular distance traveled by particle in $n^{th}$ second (only equation), Definition of S.H.M. and S.H.M. as projection of uniform circular motion on any one diameter, Equation of S.H.M. and Graphical representation of displacement ,velocity, acceleration of particle in S.H.M. for S.H.M. starting from mean position and from extreme position. | **14** |
| **Unit-2** | **2. Kinetics**<br>**2.1** Definitions of momentum, impulse, impulsive force, Statements of Newton's laws of motion and with equations, Applications of laws of motion—Recoil of gun, Motion of two connected bodies by light inextensible string passing over smooth pulley, Motion of lift.<br>**2.2 Work, Power, Energy**<br>Definition of work, power and energy, equations for P.E. K.E., Work energy principle, Representation of work by using graph, Work done by a torque(no derivation). | |
| **Unit -3** | **3. Non -destructive testing of Materials.**<br>**3.1 T**esting methods of materials -Destructive and Nondestructive, Advantages and Limitations of N.D.T., Names of N.D.T. Methods used in industries, Factors on Which selection of N.D.T. dependents, Study of Principle, Set up, Procedure.<br>**3.2** Working, Advantages, limitations, Applications and Application code of following N.D.T. methods -Penetrant method, Magnetic particle method, Radiography, Ultrasonic, Thermography. | **05** |

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|---|---|---|
| **Unit -4** | **Acoustics and Indoor Lighting of Buildings**<br>**4.1 Acoustics**<br>Weber and Fetcher's law, limit of intensity and loudness, echo, Reverberation and reverberation time (Sabine's formula) ,Timbre (quality of sound), Pitch or Frequency of sound. Factors affecting Acoustical planning of auditorium-- echo, reverberation, creep, focusing, standing wave, coefficient of absorption, sound insulation, noise pollution and the different ways of controlling these factors.<br>**4.2 Indoor lighting**<br>Definition of luminous intensity, intensity of illumination with their SI units, Inverse square law and Photometric equation, Bunsen's photometer— ray diagram, working and applications, Need of indoor lighting, Indoor lighting schemes and Factors Affecting Indoor Lighting. | **05** |
| | **Total** | **24** |

**Text/Reference Books :-**

| | **Tilles of the Book** | **Name of Authors.** | **Name of the Publisher** |
|---|---|---|---|
| (i) | Physics –I | V. Rajendran | Tata McGraw - Hill |
| (ii) | Applied Physics | Arthur Beiser | Tata McGraw - Hill |
| (iii) | Engineering Physics | R.K. Gaurand and S.L. Gupta | Dhanpatrai |
| (iv) | Phyiscs | Resrie and Holliday | - |
| (v) | Concept of Physics Part-I, II | H.C. Verma | - |
| (vi) | Applied science | Roshan Kr. Sinha | Foundation Publishing House |

| **(B) CHEMISTRY** | **Hrs/ week** |
|---|---|
| **Contents :Theory** | |

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|---|---|---|
| **Unit -1** | **Electrochemistry**<br>Definition of Electrolyte & Conductor, Difference between Metallic & Electrolytic Conduction, Ionisation, Degree of Ionisation & Factors Affecting Degree of Ionisation, Conductivity of Electrolytes.<br><br>Definition of Electrochemical Cell, Battery, Charge, Discharge, Closed Circuit Voltage, Open Circuit Voltage, EMF, Internal Resistance, Separator, Classification of Batteries such as Primary, Secondary & Reserve with Examples.<br><br>Industrial Application of Electrolysis - Metallic or Protective Factors for Selection of Method of Coating, Process of Electroplating, Electrorefining, Electrometallurgy (Applications of Electroplating), Impregnated Coating or Cementation on Base Metal Steel - Coating Metal Zn (Sheradizing),Cr (Chomozing), Al (Colorizing), Applications, Advantages & Disadvantages. | **05** |
| **Unit -2** | **Non Metallic Engineering Materials**<br>(Plastic, Rubber, Insulators, Refractories, Composite Material, Ceramics)<br>1. **Engineering Plastic:** Special Characteristics & Engineering Applications of Polyamides or Nylons, Polycarbonates (Like Lexan, Merlan), Polyurethanes (Like Perlon - U), Silicons, Polyacetals, Teflon, Laminated Plastic, Thermocole, Reinforced Plastic.<br>2. **Ceramics:** Definition, Properties & Engineering Applications, Types - Structural Ceramics, Facing Material, Refractories, Fine Ceramics, Special Ceramics.<br>3. **Refractories:** Definition, Properties, Applications & Uses of Fire Clay, Bricks, Silica Bricks.<br>4. **Composite Materials:** Definition, Properties, Advantages, Applications & Examples. | **05** |

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|---|---|---|
| **Unit -3** | **Metals & lloys**<br>**Metals** - Metallurgy of Iron, Terms Involved in Metallurgy, Indian Resources of Fe, Imp Ores, Extraction, Smelting in Blast Furnace, Chemical Reactions in Blast Furnace, Products of Blast Furnace, their Composition, Application, Commercial Forms of Iron, (Pig Iron / Cast Iron, Wrought or Malleable Steel), their Composition, Properties & Applications, Types of Casting (Chilled Casting, Centrifugal Casting & Malleable Casting), Heat Treatment, Heat Treatment of Cast Iron & Steel.<br><br>**Alloys** - Definition, Types, Ferrous Alloys - Steel, Composition, Properties & Applications of Plain Carbon Steel (Low Carbon, Medium Carbon, High Carbon & Very Hard Steel) & Alloy Steels, (Heat Resisting, Shock Resisting, Magnetic, Stainless, Tool Steel & HSS), Effect of Various Alloying Elements (Cr, W, V, Ni, Mn, Mo, Si) etc. on Steel.<br><br>Non-Ferrous Alloys - Copper Alloy - Brass, Bronze, Nickel Silver or German Silver, their Composition, Properties & Applications, Aluminium Alloy - Duralumin, Bearing Alloy - Babbitt Metal, Solders - Soft Solder, Brazing Alloy, Tinamann's Solder, Nickel Alloy - Monel Metal, Low Melting Alloys - Woods Metal. | **08** |
| **Unit -4** | **Corrosion**<br>Definition, Types, Atmospheric or Chemical Corrosion, Mechanism, Factors Affecting Atmospheric, Corrosion & Immersed Corrosion or Electrochemical Corrosion, Mechanism, Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, Controlling the External Conditions & Application of Protective Coatings i.e. Galvanising, Tinning, Metal Spraying, Sherardizing, Electroplating, Metal Clodding, Cementation or Diffusion Method, their Definition, Procedure, Uses, Advantages & Disadvantages, Examples of Non Corrosive Materials, Protection of Corrosion by the Use of Organic Coating Like Paint, Lacquer, Enamels, Emulsion Paints, Special Paints, their Properties & Uses.<br><br>Special Paints - Heat Resistant, Cellulose Paint, Coaltar Paint, Antifouling Paint their constituents & applications. | **05** |
| **Unit -5** | **Lubricant**<br>Lubricant, Types, Lubrication Mechanism by Fluid Film, Baundary, Extreme Pressure, Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oilness, Volatility, Flash & Fire Point, Cloud & Pour Point, Chemical Characteristics such as Acid Value or Neutralization Number, Emulsification, Saponification Value, Selection of Lubricants for Various Types of Machineries. | **03** |
| | **Total** | **26** |

**Text Books :-**

| | **Tilles of the Book** | **Name of Authors.** | **Name of the Publisher** |
|---|---|---|---|
| (i) | Engineering Chemistry | Jain & Jain | Dhanpat Rai and Sons |
| (ii) | Engineering Chemistry | S.S. Dara | S. Chand Publication |
| (iii) | Industrial Chemistry | B.K. Sharma | Goel Publication |
| (iv) | Environmental Chemistry & Pollution Control | S.S. Dara | S. Chand Publication |
| (v) | Applied science | Sanjay Kumar, Rahul Kumar | Foundation Publishing House |

# Engg. Mechanics (DIP204)

| | Contents Theory | Hrs/week |
|---|---|---|
| **Unit -1** | **Force**<br>a. **Fundamentals: -** Definitions of mechanics, statics, dynamics. Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units, derived units, S.I. units.<br><br>b. **Force**: - Definition of a force, unit force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility.<br><br>c. **Resolution of a force:** Definition, Method of resolution, Types of component forces, Perpendicular components and Non-perpendicular components.<br><br>d. **Moment of a force: -** Definition, measurement of moment of a force, S. I. unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment and it's use, couple - definition, S.I. unit, measurement of a couple, properties of couple.<br><br>e. **Force system: -** Definition, classification of force system according to plane and line of action<br><br>f. **Composition of Forces**: - Definition, Resultant force, methods of composition of forces,<br><br>I - Analytical method:- (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of resolution),<br>II - Graphical method: - Introduction, space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent, non-concurrent and parallel force system by analytical and graphical method. | **14** |

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|---|---|---|
| **Unit -2** | **Equilibrium:**<br>2.1 Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram.<br>2.2 Lami's Theorem - statement and explanation, Application of Lami's theorem for solving various engineering problems.<br>2.3 Equilibrant - Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system.<br>2.4 Beams - Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, uniformly distributed load. Reactions of a simply supported and over hanging beam by analytical and graphical method. | **10** |
| **Unit - 3** | **Friction:**<br>3.1 Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coeff. Of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction.<br>3.2 Equilibrium of bodies on level plane -external force applied horizontal and inclined up anddown.<br>3.3 Equilibrium of bodies on inclined plane - external forces is applied parallel to the plane, horizontal and incline to inclined plane.<br>3.4 Ladder friction, Wedge andblock. | **08** |
| **Unit - 4** | **Centroid and Centre Of Gravity:**<br>4.1 **Centroid:** Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure.<br>4.2 **Center of gravity:** Definition, center of gravity. Of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids. | **08** |
| **Unit - 5** | **Simple Machines:**<br>5.1 Definitions of simple machine, compound machine , load , effort , mechanical advantage , velocity ratio , input on a machine ,output of a machine ,efficiency of a machine , expression for mechanical advantage , velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load.<br>5.2 Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self-locking machine. | **08** |
| | **Total** | **48** |

**Text Books :-**

| | Tilles of the Book | Name of Authors. | Name of the Publisher |
|---|---|---|---|
| (i) | Engineering Mechanics | Beer-Johnson | Tata McGraw Hill, Delhi |
| (ii) | Engineering Mechanics | Basu | Tata McGraw Hill, Delhi |
| (iii) | Vector Mechanics for Engineers Vol. - I & II | Joslph F. Shelley | Tata McGraw Hill, Delhi |
| (iv) | Engg. Mechanics | Ram Manohar Pandey | Foundation Publishing House |

## Engg. Drawing (DIP205)

| Contents (Theory) | | Hrs/week |
|---|---|---|
| **Unit -1** | **Sectional Views.**<br>1.1 Types of sections<br>1.2 Conversion of pictorial view into sectional orthographic views (First Angle Projection Method only) | **04** |
| **Unit -2** | **Missing Views.**<br>2.1 Draw missing view from the given Orthographic views - simple components (First Angle Projection Method only) | **04** |
| **Unit - 3** | **Isometric Projection**<br>3.1 Conversion of Orthographic Views into Isometric view/projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces). | **05** |
| **Unit - 4** | **Projections of Solids.**<br>4.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other. | **08** |
| **Unit - 5** | **Sections of Solids.**<br>5.1 Solids: -Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube.<br>5.2 Cone, Pyramid and Tetrahedron resting on their base on Horizontal Plane.<br>5.3 Prism, Cylinder: -a) Axis parallel to both the reference plane b) Resting on their base on HP.<br>5.4 Section plane inclined to one reference plane and perpendicular to other. | **05** |
| **Unit - 6** | **Developments of Surfaces.**<br>Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such as tray, funnel, Chimney, pipe bends etc. | **06** |
| **Unit - 7** | **Free Hand Sketches**<br>7.1 Free hand sketches of nuts, bolts, rivets, threads, split pin, foundation bolts, | **08** |
| | **Total** | **40** |

**Text Books :-**

| | Tilles of the Book | Name of Authors. | Name of the Publisher |
|---|---|---|---|
| (i) | Engineering Drawing | N.D. Bhatta | Charotkar Publishing House |
| (ii) | Engineering Drawing | R.K. Dhawan | S. Chand Co. |
| (iii) | Engineering Drawing | P.J. Shah | - |
| (iv) | Machine Drawing | N.D. Bhatta | Charotkar Publishing House |
| (v) | Engineering Drawing and Graphics + Auto CAD | K. Venugopal | New Age Publication |
| (vi) | Engineering Graphics | K.R. Mohan | Dhanpat Rai and Publication Co. |
| (vii) | Machine Drawing | R.K. Dhawan | S. Chand Co. |
| (viii) | Engineering Drawing | Dharmendra Kumar | Foundation Publishing House |

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2018

## APPLIED MATHEMATICS -I

| | Name of the Topic | Hours |
|---|---|---|
| UNIT-01 | Integration:<br>Definition of integration as anti-derivative. Integrationof standard function.Rulesofintegration(Integralsofsum,difference,scalarmultiplication).Methods ofIntegration.Integration bysubstitution<br>Integration of rationalfunctions.Integration by partialfractions.<br>Integration by trigonometrictransformation.Integration byparts.<br>DefiniteIntegration.Definition of definiteintegral.Propertiesofdefiniteintegralwithsimpleproblems. | 10 |
| | Applications of definiteintegrals.Areaunderthecurve.Areaboundedbytwocurves,Volume ofrevolution.Centreofgravityofarod,planelamina.MomentofInertiaofunifo rmrod,rectangularlamina, Theoremsofparallelandperpendicularaxes. | 08 |
| UNIT-02 | Differential Equation<br>Definition of differential equation, order and degree of differential equation.Formationofdifferentialequationforfunctioncontaining singleconstant.<br>Solutionofdifferentialequationsoffirstorderandfirstdegreesuchas variable separable type, reducible to Variable separable, Homogeneous, No homogeneous, Exact, Linear and Bernoulli equations.<br>Applications of Differentialequations.<br>Rectilinearmotion(motionunderconstantandvariable acceleration)<br>Simple HarmonicMotion. | 10 |
| UNIT-03 | Probability Distribution, Binomial distribution, Poisson's distribution.<br>Normaldistribution, Simpleexamplescorrespondingtoproductionprocess. | 08 |
| UNIT-04 | Numerical Methods<br>Solution of algebraicequations<br>Bisection method, Regula falsi method and Newton – Raphson method.<br>Solution of simultaneous equations containing 2 and 3 unknowns<br>Gauss elimination method. Iterative methods- Gauss Seidal and Jacobi's methods. | 06<br><br><br><br>06 |
| | Total | 48 |

| Text/Reference Books:- | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |

| | | |
|---|---|---|
| Mathematics for polytechnic | S. P. Deshpande | Pune Vidyarthi Griha Prakashan, Pune |
| Calculus: single variable | Robert T. Smith | Tata McGraw Hill |
| Advanced Mathematics for Engineers and Scientist | Murray R Spiegel | Schaum outline series McGraw Hill |

**MECHANICAL ENGINEERING DRAWING**
**(MECHANICAL ENGINEERING GROUP)**

| | Name of the Topic | Hours |
|---|---|---|
| UNIT-01 | Sections Of solid: Sections of pyramid, prism, Cubes, Tetrahedrons, cones and cylinders (No problems on axis inclinations, spheres and hollow solids). True shape of sections.<br>Orthographic views: conversion of pictorial views into orthographic projections of simple machine parts with or without section. (Bureau of Indian standards conventions are to be followed for the drawings) hidden line conventions. Precedence of lines. | 08 |
| UNIT-02 | Couplings<br>Split muff coupling, protect ted type flanged coupling, pin (bush) type flexible coupling, Oldham's coupling and universal coupling(Hooke's joint) | 08 |
| UNIT-03 | Key & Joints:<br>Parallel key, taper key, feather key, Gibhead key and wood ruff key<br>Riveted joint: single and double riveted lap joints, butt joints, with single/double cover straps (chain and zigzag, using snap head rivets. cotter joint(socket and spigot), knuckle joint (pin joint) for two rods. | 08 |
| UNIT-04 | Thread forms: thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and acme. Sellers thread, American Standard thread.<br>Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simply assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split nut pin for locking, counter sunk head screw, grub screw, Allen screw | 04 |
| UNIT-05 | Details to Assembly<br>Introduction- Couplings–Universalcouplings&Oldham'sCoupling Bearing–FootStepBearing&PedestalBearing, Lathe toolPost Machine vice & PipeVice, ScrewJack, Steam StopValve | 08 |
| UNIT-06 | Assembly to Details<br>Introduction– PedestalBearing, Lathe TailStock, DrillingJig, Piston & connectingrod, Gland and Stuffing boxAssembly, Valve–Notmorethaneightparts, Fast & loosepulley | 08 |
| | TOTAL | 48 |

| Text/ Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Machine Drawing | N.D.Bhatt | Charotar Publication, Anand |
| Codeofpracticeforgeneralengineering drawing. | IS Code SP 46 (1988) | Engineering Drawing Practice for School and colleges |

**MECHANICS OF SOLIDS**
**(MECHANICAL ENGINEERING GROUP)**

| | Name of the Topic | Hours |
|---|---|---|
| UNIT-01 | Mechanical Properties of Materials, Simple stresses & Strains<br>Types of loads, Simple stresses & strains viz. tensile, compressive, Shear,Crushing,Thermalstresses,Hoopstresses&corresponding strains, Volumetric Strain, Bulk modulus, Hook's law, Young's modulus, Modulus of Rigidity, stress-strain curves for ductile & brittle materials, Poisson'sratio.<br>Concept of stresses & strains in thin cylindrical & spherical shells subjected to internalpressure.<br>Concepts of Buckling – Rankine's & Euler's formulae for buckling loadforcolumns/shafts under compression, concepts of equivalent length for various endconditions.<br>ConceptsofDeflection&slopeofbeams–relationbetweenbending moment & slope. Deflection of simply supported beams and cantileverbeamssubjectedtopointload.(Noderivation)<br>(Problemsoncompressive&tensilestresses,Thermalstresses,butt&lap riveted joints, simple cases ofbuckling). | 10 |
| UNIT-02 | Strain Energy<br>Concept,derivation&useofexpressionfordeformationofaxially loadedmembersundergradual,sudden&impactload.<br>Strain energy due toself-weight. | 03 |
| UNIT-03 | Bending Moment & Shear Force<br>Shearforce,bendingmoment&relationbetweenthem.<br>Shear force & bendingmomentdiagrams for simply supported beam & cantilevers subjected to point loads & Uniformly distribution load, concept of Uniformly varying load & couples acting onbeam Location of point ofcontra flexure.<br>(Problems to be based on simply supported & cantilever beams with point load & UDL only) | 08 |
| UNIT-04 | Moment of Inertia<br>DefinitionofMomentofinertia,Momentofinertiaofdifferent laminae, radius ofgyration.<br>Parallel & perpendicular axistheorem.<br>Moment of inertia of rectangular, circular, semicircular. Triangular, HollowRectangular,symmetricalI-Section,<br>Channel section, Tee- section, angle section about centroidal axis.<br>Polar moment ofinertia. | 03 |
| UNIT-05 | Bending & Shear stresses<br>Theoryofsimplebending,equationofbending.<br>Assumptionsinthetheoryofbending,momentofresistance,section modulus & neutralaxis.<br>Shearstresses–conceptsofdirect&transverseshearstress. | 06 |

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|---|---|---|
| UNIT-06 | Combination of Bending & Direct stresses<br>Axialload,eccentricload,directstresses,bendingstresses maximum & minimumstresses.<br>Applicationoftheaboveconceptsformachinepartssuchasoffset links,C-clamp,Benchvice,Drillingmachineframe,stressesatbase ofashortcolumn,conditionfornotensionatextremefibers,total stressvariationdiagrams.(Simpleproblemsonaboveapplications) | 08 |
| UNIT-07 | Principal Planes & Principal Stresses<br>Definitionofprincipalplane&principalstresses.<br>Expressionfornormalandtangentialstress,maximumshearstress.<br>Stresses on inclinedplanes.<br>Positionofprincipalplanes&planesofmaximumshear.<br>GraphicalsolutionusingMohr'scircleofStresses. | 06 |
| UNIT- 08 | Torsion<br>Concept of Pure Torsion, Torsion equation for solid and hollow circularshafts.AssumptionsintheoryofpureTorsion.<br>Comparison between Solid and Hollow Shafts subjected to pure torsion(noproblemoncompositeandnonhomogeneousshaft) | 04 |
| | Total | 48 |

| Text /Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Strength of Material | AndrewPytelFedrinandL.Singer | Addison-Wesley An imprint of Addison Wesley Longman, Inc. Forth edition |
| Strength of Material | G.H.Ruder | ELBS with Macmillan third edition |
| Strength of Material | B.K.Sarkar | Tata McGraw hill New Delhi |
| A Text Book strength of Material | Dr. R. K.Bansal | Laxmi Publication New Delhi |
| Strength of Material | S Ramamrutham | Dhanpat Rai & Publication New Delhi |
| Strength of Material | R.S.Khurmi | S.Chand Company Ltd. Delhi |
| Materials Science | G.K.NarulaK.S.Narula | Tata McGraw hill New Delhi |
| Mechanics of Solids | Roshan Sinha, Pradeep Kumar | Foundation Publishing |

**MECHANICAL ENGINEERING MATERIALS**
**(MECHANICAL ENGINEERING GROUP)**

| | Name of the Topic | Hours |
|---|---|---|
| UNIT-1. | Engineering Materials and their Properties<br>Introduction, Classification and Application of Engineering materials, I.Sspecificationofmaterialslikeplaincarbonsteel,GreyCastiron,low alloy steels & bearingMaterials.<br>Properties ofmetals<br>Physical Properties–<br>Structure, Density, Melting point.<br>Mechanical Properties–<br>Strength, elasticity, ductility, malleability, plasticity, toughness, hardness, hardenability, brittleness, fatigue, thermal conductivity, electrical conductivity, thermal coefficient of linear expansion<br>Introduction to Corrosion, types of Corrosion, Corrosionresisting materials. | 06 |
| UNIT-2. | Ferrous Metals and Alloys<br>Characteristicsandapplicationofferrousmetals<br>PhaseequilibriumdiagramforIronandIronCarbide.<br>Flow diagram for production of Iron and Steel, Classification, composition and uses of cast iron, effect of sulphur, silicon and phosphorous.<br>Classification, composition and application of low carbon steel, medium carbonsteelandhighcarbonsteelwiththeirchemicalcomposition.<br>AlloySteels:-Lowalloysteel,highalloysteel,toolssteel&stainless steel.Effectofvariousalloyingelementssuchas–Chromium,nickel, manganese, molybdenum, tungsten,vanadium.<br>ToolSteels:-HighspeedSteels(HSS),Hot&coldWorkingdies,shear, punches etc., properties &applications.<br>Magneticmaterials:-Properties&Applicationsofcommonlyused magnetic materials (Permanent magnets and temporarymagnets).<br>SpecialCuttingToolMaterials–Diamond,Stelites&TungstenCarbide | 12 |
| UNIT-3. | Non Ferrous Metals and Alloys<br>Properties, applications & chemical compositions of Copper alloys (navalbrass,muntzmetal,Gunmetal&bronzes),Aluminiumalloys(Y- alloy & duralumin) & bearing materials like white metals, leaded bronzes & copper leadalloys.<br>Desired properties of bearingmaterials. | 06 |
| UNIT-4. | Heat Treatment of Steels<br>Introduction to Heat treatment processes such as Annealing, subcritical annealing, Normalizing, Hardening, Tempering (Austempering&Martempering)-<br>Principle,Advantages,limitationsandapplications.<br>SurfaceHardening-Methodsofsurfacehardening,i)casehardeningii) FlameHardening,iii)InductionHardening,iv)Nitriding,v)Carburizing<br>- Principle, advantages, limitations and applications | 08 |

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|---|---|---|
| UNIT-5. | Non Metallic Materials<br>Polymeric Materials – Introduction to Polymers- types, characteristics, properties and uses of Thermoplastics, Thermosetting Plastics & Rubbers.<br>Thermoplastic Plastics - characteristics and uses of ABS, Acrylics, Nylons andVinyls<br>Thermosetting Plastics - Characteristics and uses of polyesters, Epoxies, Melamines&Bakelites.<br>Rubbers–Neoprene,Butadiene,Buna&Silicons–Properties&applications.<br>Properties and applications of following Engineering Materials – Ceramics, Abrasive, AdhesiveandInsulating materialssuchasCork, Asbestos, Thermocole and GlassWool<br>Introduction to Composite Materials – Laminated &Fibre reinforced materials-Structure,Properties&Applications. | 08 |
| UNIT-6. | Powder Metallurgy & Nondestructive Testing<br>6.1Advantages,limitationsandapplicationsofPowderMetallurgyfor engineeringproducts.<br>Brief Description of Process of Powder Metallurgy – Powder making, blending,compacting,sintering,infiltration&impregnation.<br>ApplicationsofPowdermetallurgyfortungstencarbidetiptools& porousbearing.<br>Importance of Non-destructive testing, Difference between Destructive and Nondestructivetesting.<br>Nondestructivetestingmethods-Radiography(X-Ray&GammaRay), Ultrasonic crack detection, Dye penetrant test, Magnaflux test – Comparison &applications. | 08 |
| | Total | 48 |

| Text/Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| ATextBookofMaterialScienceand Metallurgy | O.P.Khanna | Dhanpat Rai and Sons [1999] |
| Material Science And Metallurgy | Dr.V.D. Kodgire | Everest Publishing House [1990] |
| Material Science and Engineering | R.K.Rajput | S.K.Katari and Sons [2002 reprint 2003] |
| Material Science and Processes | S.K.Hazra and Choudhari | Indian Book Distribution Co. [1982] |
| Engineering Materials Properties and Selection | Kenneth G. Budinskiand Micheal K. Budinski | Pearson Education, New Delhi |
| ASME Material Manuals | ASME | |
| Introduction to Physical metallurgy | Sidney H. Avner | Tata Mc Graw Hill edition (2nd) |
| Mechanical Engineering Materials | R.M. Pandey, Umesh Kumar | Foundation Publishing |

**ELECTRICAL ENGINEERING**
**(MECHANICAL ENGINEERING GROUP)**

| | Name of the Topic | Hours |
|---|---|---|
| UNIT-01 | Introduction to Electrical power supply system Generation, Transmission, Distribution & Utilization. AC supply & DC supply | 02 |
| UNIT-02 | AC Fundamentals: cycle, frequency, phase, period, max, average, r.m.s. value. Concept of current, voltage, power & energy in R, L, & C circuits | 03 |
| UNIT-03 | Threephasesupply:Star&Deltacircuit,Line&Phaserelationship,powerequation. | 03 |
| UNIT-04 | Measuring Instruments: Introduction to construction, operation and use of AC & DC ammeter, voltmeter, Electrodynamic Wattmeter, energy meter & digital multimeter, Clip on meter. | 04 |
| UNIT-05 | DC Motor: Construction and principle of operation. Speed torque characteristics. Types, specifications & ratings and applications. Types of insulation used. | 06 |
| UNIT-06 | A.C.Machines:Transformer:Constructionandprincipleofoperation.EMFequation and transformation ratio. Load test, efficiency and regulation. Specifications & rating. Autotransformer&3phasetransformerconceptonly.Applicationsoftransformers. | 06 |
| | AC motor: Construction and principle of operation of 3 phase induction motor. Speed torque characteristics, slip, speed control ( VFD), reversal of rotation,starters.Singlephasemotor,universalmotor,steppermotor&servomotor. Motorspecification&ratings.Applicationsofthesemotorsinvariousfields.Testing ofmotors. | 06 |
| | Alternator:Construction,principleofoperation&applications.Selfand separateexcitation. Synchronous Motor:- Construction, principle of operation, methods of starting & Applications | 03 |
| UNIT-07 | Utilisation of Electrical Energy | |
| | Industrial applications: Classification of drives, factors for selection of motor for different drives, Enclosures & Mountings | 02 |
| | Electric heating & welding: Working principle & types selection of system, specifications & rating | 02 |
| | Electrometallurgical & Electro Agro Systems: Concept & principle used in electroplating, Electrical machines used in electro-agro systems ( irrigation pumps) | 02 |
| UNIT-08 | Electricwiring&Illumination:SimpleElectricInstallationswith2sockets,2fans,2 lamps,fuses.Introductiontodifferentaccessorieslike MCCB, ELCB, wires & cables. Different types of lamps their specifications, | 04 |
| UNIT-09 | Electric safety, tariff & power conservation, necessity of Earthing, types safety tools, first aid measures, types of tariff, pf improvement only methods, energy conservation & audit, fire extinguishing methods adopted in electrical engineering. | 05 |
| | Total | 48 |

| Text/Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Electrical Technology | E. Hughes | ELBS |
| Electrical Technology | H. Cotton | Pitman |
| Electrical Technology Vol I To IV | B. L. Theraja | S. Chand |

| | | |
|---|---|---|
| Electrical Engineering | K.D. Joshi | Foundation Publishing |

**THEORY OF MACHINES & MECHANISMS**
**(MECHANICAL ENGINEERING GROUP)**

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-1 | Fundamentals and types of Mechanisms:<br>Kinematics of Machines: - Definition of Kinematics, Dynamics, Statics, Kinetics,Kinematiclink,KinematicPairanditstypes,constrainedmotion anditstypes,Kinematicchainanditstypes,Mechanism,inversion,machine andstructure.<br>Inversions of Kinematic Chain:Inversion of four bar chain, coupled wheels of Locomotive &Pentograph.InversionofSingleSliderCrankchain-RotaryI.C.Enginesmechanism,Whitworthquickreturnmechanism,CrankandSlotted lever quick returnmechanism.Ackerman's Steering gearmechanism. | 10 |
| Unit-2 | Velocity and Acceleration in Mechanism:<br>Concept of relative velocity and relative acceleration of a point on link, angularvelocityandangularacceleration,inter-relationbetweenlinearand angular velocity andacceleration.<br>Drawing of velocity and acceleration diagram of a given configuration, diagramsofsimplemechanisms.Determinationofvelocityandacceleration ofapointonlinkbyrelativevelocitymethod<br>Analytical method [no derivation] and Klein's construction to determine velocityandaccelerationofdifferentlinksinsingleslidercrankmechanism. | 08 |
| Unit-3 | Cams and Followers :<br>Concept,definitionandapplicationofCamsandFollowers.Classification of Cams andFollowers.Different follower motions and their displacement diagrams like uniform velocity,SHM,uniformaccelerationandRetardation.<br>Drawingofprofileofradialcamwithknife-edgeandrollerfollowerwithand without offset with reciprocating motion (graphical method). | 08 |
| Unit-4 | Power Transmission :<br>TypesofDrives–Belt,Chain,Rope,Geardrives&theircomparison.<br>BeltDrives-flatbelt,V–belt&itsapplications,materialforflatandV-belt,angle oflap,beltlength.Slipandcreep.Determinationofvelocityratio,ratiooftight sideandslacksidetension,centrifugaltensionandinitialtension,conditionfor maximumpowertransmission(Simplenumericals)<br>Chain Drives – Advantages & Disadvantages, Selection of Chain & Sprocket wheels, methods oflubrication.<br>Gear Drives – Spur gear terminology, types of gears and gear trains, their selection for different application, methodsoflubrication,Lawofgearing.<br>RopeDrives–Types,applications,advantages&limitationsofSteelropes. | 12 |

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|---|---|---|
| Unit-5 | Flywheel and Governors :<br>Flywheel-Concept,functionandapplicationofflywheelwiththehelpofturning moment diagram for single cylinder 4-Stroke I.C. Engine (no Numericals).<br>Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance.<br>Governors - Types, concept, function and application & Terminology of Governors.<br>Comparison between Flywheel andGovernor. | 06 |
| Unit-6 | Brakes, Dynamometers, Clutches &Bearings :<br>Function of brakes and dynamometer, types of brakes and Dynamometers, comparison between brakes anddynamometer.<br>Construction and working of i) shoe brake,ii) BandBrake, iii) Internal expanding shoe brake iv) DiscBrake.<br>ConceptofSelfLocking&Selfenergizingbrakes.<br>Numericalproblemstofindbrakingforceandbrakingtorqueforshoe&band brake.<br>Constructionandworkingofi)RopeBrakeDynamometer,ii) HydraulicDynamometer,iii)EddycurrentDynamometer.<br>Clutches-UniformpressureandUniformWeartheories.<br>FunctionofClutchanditsapplication,Constructionandworkingof Singleplateclutch,ii)Multiplateclutch,iii)CentrifugalClutchiv)Cone clutchv)Diaphragmclutch.(No numericalonsingleandMulti plate clutch).<br>Bearings – i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot.<br>Torque&powerlostinfriction(noderivation and numerical). | 07 |
| Unit-7. | Balancing &Vibrations :<br>Conceptofbalancing.Balancingofsinglerotatingmass.Graphicalmethodfor balancingofseveralmassesrevolvinginsameplane.<br>Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects andremedies. | 03 |
| | Total | 54 |

| Text/Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Theory of machines | Khurmi Gupta | Eurasia publishing House Pvt. Ltd. 2006 edition |
| Theory of Machine | S.S.Rattan | McGraw Hill companies II Edition |
| Theory of machines | P.L.Ballaney | Khanna Publication |
| Theory of machines | TimoShenko | Wiley Eastern |
| Theory of machines | Jagdishlal | Bombay Metro – Politan book ltd. |

**FUNDAMENTALS OF ELECTRONICS**
**(MECHANICAL ENGINEERING GROUP)**

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | Electronic Devices :<br>Introduction to electronic devices, their symbols, principle of working and testingprocedure–<br>Diode,Zenerdiode,Powerdiode,Varactordiode,Bipolar JunctionTransistor(BJT),FieldEffectTransistor(FET)-JFET&MOSFET,Uni-junction Transistor(UJT), power devices – DIAC,TRIAC, SCR, Photo devices-,<br>LDR,Photodiode,Phototransistor,LED&LEDdisplay(7segment),Liquid crystaldisplay(LCD),opto–coupler,thermister-NTC,PTCPowersupply. | 10 |
| Unit-02 | Circuit diagram and operation :<br>Half wave, full wave & bridge rectifier. Filters – L, C, L-C, π filter<br>Concept ofunregulatedpowersupply,regulatedpowersupply-lineregulation&load regulation. Principle of operation, block diagram and application of shunt regulatedpowersupply,seriesregulatedpowersupply,switchmodepower supply (SMPS), 3 pin IC regulated, IC 723 adjustable power supply.<br>Block diagram of UPS, Concept of online and off line UPS. Concept of constant currentlimitingandfoldbackcurrentlimiting,conceptofconstantvoltage source, constant currentsource. | 09 |
| Unit-03 | Transistor :<br>Transistor as a switch and amplifier, single stage transistor amplifier CB, CE and CC configuration and their applications, RC coupled and direct coupled amplifier, their frequency response and application.<br>Power amplifier- class A, class B, class C, class AB, their comparison on operating point, conduction cycle, efficiency, application.(No circuits expected)<br>Oscillator: Requirement of oscillator circuit, Barkhauson's criteria of oscillator,circuitdiagramanditsapplication-.Phaseshiftoscillator,Hartley oscillator,Colpittsoscillator,Crystaloscillator. | 09 |
| Unit-04 | OP Amp :<br>Blockdiagram,configurations and use of op amp as - Inverting, Non-inverting, Summing, Voltage to current converter, current to voltage converter,differentiator,Comparator,Wienbridgeoscillator,Schmitt's trigger, Instrument amplifier | 05 |
| Unit-05 | Digital Electronics :<br>Number system- Decimal, Binary, Hexadecimal, BCD, Decimal to binary conversion, , Decimal – Hexadecimal conversion.<br>Study of logic gates, Symbol, truth table and IC numbers - NOT, AND, OR, NAND, NOR, XOR, XNOR and NAND as universal gate.<br>FlipFlops–Blockdiagramofflipflop,RSflipflop,Dflipflop,Toggle,JKflip flop, Master Slave JK flip flop, Clocked flip flop – level triggered and edge triggered,Applicationofflipflop–<br>Frequencydivider,Ringcounter,Shift register.Sevensegmentdrivingcircuit,Encoder,Decoder,Multiplexer,De multiplier. | 09 |

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|---|---|---|
| Unit-06 | IC 555 :<br>Blockdiagram,MultivibratorcircuitdiagramandworkingforMonostable, BistableandAstableMultivibrator,AnalogtoDigitalConverters,Digitalto Analog converter.<br>Blockdiagramandworkingof–Weldingcontrolcircuits–sequentialtimer Temperature control circuits using SCR,FWR Speed control circuits Level controlcircuitusingvariablecapacitorandpotentiometer. | 06 |
| | Total | 48 |

| Text /Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Principles of Electronics | V.K. Mehta | S. Chand & Company Ltd. New Delhi |
| Electronic Principles | Paul Malvino | Tata McGraw Hill Publishers |
| Electronic Devices & Components' | A. Mottershead | Prentice Hall of India |
| Modern Digital Electronics | R.P. Jain | Tata McGraw Hill Publishers |
| Basic Electronics | Grob Bernard | Tata McGraw Hill Publishers |
| Basic Electronics - a Text Lab Manual | PaulB.ZBar,Albert p.Malvino,Michael | Tata McGraw Hill Publishers |
| | A. Miller | |
| Industrial Electronics - a Text Lab Manual | Paul B. ZBar | Tata McGraw Hill Publishers |
| Fundamentals of Electronics | Ashish K Majumdar | Foundation Publishing |

**PRODUCTIONPROCESSES**
**(MECHANICALENGINEERING GROUP)**

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | Turning :<br>Lathe:Angle calculations for taper turning.Cutting tool nomenclature and tool signature. Cutting parameters and machining time calculation.<br>CNC Lathe:Introduction, classification, advantages, positioning system, constructional features. Part programming: programming format, word, statement, block. Preparatory and miscellaneous code, fixed cycles in programming – canned<br>cycle, do-loop, subroutine. | 03<br><br><br><br>10 |
| Unit-02 | Drilling:Twistdrillnomenclature.Cuttingparameters,machiningtimecalculation,Deep holedrilling. | 02 |
| Unit-03 | Milling and gear cutting<br>Milling:Cutting parameters, machining time calculation, Milling operations – plain milling,sideandfacemilling,formmilling,gangmilling,endmilling,face milling, T- slot milling,slitting.<br>Gear cutting:Gear cutting on milling machine –Dividing head and Indexing methodsGear hobbing, Principle of operation, Advantages And limitations. Hobbing techniques – climb and conventional, Gear shaping - Principle of operation, advantages, disadvantages, Gear finishing processes - Gear shaving , Gear grinding, Gear burnishing, gear lapping . | 03<br><br>06 |
| Unit-04 | Grinding:Classification of machines, Grinding wheel composition, types and shapes, Designation. Types of Grinding operations. | 02 |
| Unit-05 | Super Finishing Processes<br>Honing, Lapping, Burnishing, Buffing andpolishing. | 02 |
| Unit-06 | Plastic Moulding<br>Typesofplastic,Compressionmolding,Transfermoulding,Injectionmoulding, blowmolding,vacuumforming,extrusion,calendaring,rotationalmoulding. | 04 |
| | Total | 32 |

| Text/Referernce Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Elements of workshop Technology-Volume I & II | S.K.HajraChaudary,Bose,Roy | Media Promoters and Publishers Limited. |
| Production Technology Volume- I & II | O. P. Khanna & Lal | Dhanpat Rai Publications. |
| WorkshopTechnology-Volume–I,II&III | W. A. J. Chapman,<br>S. J. Martin | Viva Books (p) Ltd. |

**THERMAL ENGINEERING**
**(MECHANICAL ENGINEERING GROUP)**

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-1. | Sources of energy, Brief description of energysources<br>Classification of energysources, Renewable,Non-Renewable<br>Fossil fuels, including CNG,LPG. Solar,<br>Flatplateandconcentratingcollectors&itsapplication. Solar WaterHeater,<br>Photovoltaic Cell, SolarDistillation. Wind, Tidal,Geothermal, Biogas,<br>Biomass,Bio-diesel<br>Hydraulic,Nuclear, Fuel cell – list of fuelcells | 08 |
| Unit-2. | Fundamentals of Thermodynamics :<br>Concepts of pure substance, types of systems , properties of systems ,<br>ExtensiveandIntensivepropertieswithunitsandconversionlikeP,V,R<br>Andtemperature.Pointfunctionandpathfunction.<br>Work andEnergy- Thermodynamic definition of work, heat, difference between heat<br>andwork,P.E.,K.E,InternalEnergy,Flowwork,conceptsofenthalpy, entropy.<br>Laws ofThermodynamic- Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermodynamics,<br>KelvinPlank,Clausiusstatementsandtheirequivalence,Concept ofperpetualmotionmachine1and2.<br>Application of Thermodynamiclaws - Steady Flow Energy equation and its application to open system like boiler, engine, nozzle, turbine, compressor & condenser.<br>ApplicationofSecondlawtoHeatEngine,HeatPumpandRefrigerator. | 12 |
| Unit-3. | Ideal Gases :<br>ConceptofIdealgas,Charle’slaw,Boyle’slaw,Avogadro’slaw,equation ofstate,Characteristicgasconstantanduniversalgasconstant.<br>Ideal gas processes:- Isobaric, Isochoric, Isothermal, Adiabatic,Polytropic, Isentropic with representationoftheprocessesonP-VandT-Sdiagram(onlysimple numericals) | 08 |
| Unit-4 | Steam and Steam Boiler :<br>Generation of steam at constant pressure with representation on variouschartssuchasT-H,T-S,H-S,P-H.Propertiesofsteamanduseof steam table, Quality of steam and its determination with Separating, throttling and combined Separating and throttling calorimeter (no numerical).<br>Vapour process :-constant pressure, constant volume, constant enthalpy, constant entropy (numericals using steam table and Mollier chart), Rankine Cycle.<br>Steam Boilers:-Classification ofboilers.<br>ConstructionandworkingofCochran,BabcockandWilcox,La-mont andLoefflerboiler.Boilerdraughtnaturalandmechanical.<br>Boilermountingandaccessories[tobecoveredinpractical]. | 14 |

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|---|---|---|
| Unit-6. | Heat Transfer :<br>Modes of heat transfer:-<br>Conduction, convection andradiation.<br>Conduction by heattransfer<br>Fourier's law, thermalconductivity,<br>conduction through cylinder, thermal resistance, composite walls,<br>combined conduction and convection (Simple numerical).<br>Heat transfer by Radiation:-<br>Thermal Radiation, Absorptivity, Transmissivity,<br>Reflectivity, Emissivity,blackandgraybodies,Stefan-Boltzmanlaw.<br>Heat Exchangers:-<br>Shell and tube, plate type, multiphase heat exchangers. Materials Usedandapplicationsofheatexchangers. | 10 |
| | Total | 52 |

| Text /Referemce Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| A Course in Thermal Engineering | Domkundwar V. M. | Dhanpat Rai & Co. |
| A Course in Thermal Engineering | P. L. Ballaney | Khanna Publishers |
| A text book of Thermal Engineering. | R. S. Khurmi | S. Chand & co. Ltd. |
| A Course in Thermal Engineering | R. K. Rajput | Laxmi Publication, Delhi |
| Heat Engine Vol. - I & II | Patel and Karmchandani | Acharya Publication |
| Engineering Thermodynamics | P. K. Nag | Tata McGraw Hill |
| Thermal Engineering | B. K. Sarkar | Tata McGraw Hill |
| Thermal Engineering | Rajiv Kr Singh, P.K. Gupta | Foundation Publishing |

**FLUID MECHANICS & MACHINERY**
**(MECHANICAL ENGINEERING GROUP)**

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | Properties of fluid:<br>Density,Specificgravity,SpecificWeight,SpecificVolume,<br>DynamicViscosity,KinematicViscosity,Surfacetension,Capillarity,<br>Vapour Pressure,Compressibility | 04 |
| Unit -02 | Fluid Pressure & Pressure<br>Measurement:Fluidpressure,Pressurehead,Pressureintensity, Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolutepressure.<br>Simpleanddifferentialmanometers,Bourdenpressuregauge.<br>ConceptofTotalpressureonimmersedbodies,centerofpressure.<br>Note: Numericals on Manometers, Total Pressure & Centre of pressure | 09 |
| Unit-03 | Fluid Flow:<br>Typesoffluidflows, Continuityequation, Bernoulli'stheorem, Venturimeter – Construction, principle of working, Coefficient of discharge,Derivationfordischargethroughventurimeter.<br>Orifice meter –Construction, Principle of working, hydraulic coefficients,DerivationfordischargethroughOrificemeter<br>Pitottube–Construction,PrincipleofWorking<br>Note :- Numericals on Venturimeter, orifice meter, pitot tube | 09 |
| Unit-04 | Flow Through Pipes:<br>Lawsoffluidfriction(Laminarandturbulent),<br>Darcy'sequationandChezy'sequationforfrictionallosses. Minor losses inpipes, Hydraulicgradientandtotalgradientline., Hydraulic power transmission throughpipe. Note: Numericals to estimate major and minor losses | 05 |
| Unit-05 | Impact of jet :<br>Impactofjetonfixedvertical,movingverticalflatplates.<br>Impact of jet on curved vanes with special reference to turbines & pumps | 07 |
| Unit-06 | Hydraulic Turbines :Layout of hydroelectric powerplant.<br>Features of Hydroelectric powerplant. Classification of hydraulicturbines.<br>Selectionofturbineonthebasisofheadanddischargeavailable<br>ConstructionandworkingprincipleofPeltonwheel,FrancisandKaplan turbine. Drafttubes–typesandconstruction,Conceptofcavitationinturbines<br>CalculationofWorkdone,Power,efficiencyofturbine. | 10 |
| Unit-07 | A] Centrifugal Pumps: Construction,principleofworkingandapplications. Types of casings andimpellers.<br>B] Reciprocating Pump:<br>Construction,workingprincipleandapplicationsofsingleanddouble acting reciprocatingpumps. | 06 |

| | Text/Reference Books: | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |

| | | |
|---|---|---|
| Hydraulic, fluid mechanics & fluid machines | Ramamrutham S. | DhanpatRaiandSonsNew Delhi |
| Hydraulics and fluid mechanics including Hydraulic machines | Modi P. N. and Seth S. M. | Standard Book House. New Delhi |

# ADVANCED MANUFACTURING PROCESSES
# (MECHANICAL ENGINEERING GROUP)

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | Non-traditional machining processes:<br>Electrical discharge Machining.Principle ofworking, Setup of EDM, Dielectric fluid, tools (electrodes),Process parameters, Output characteristics, Applications e.g. micro holedrilling, curve hole drilling.<br>Wire cut EDM- Principle of working, Setup of WEDM, controlling Parameters, Applications.<br>Laser Beam Machining. Physical principle of Laser, Laser action in ruby rod, Types of Lasers.Set-up for LBM. Characteristics, controlling Parameters, Applications,Application of Laser Beam for Welding (LBW)<br>Other non-traditional machines such as ECM Principle of working, Applications. | 05<br>03<br>05<br>03 |
| Unit-02 | CNC milling machines:<br>Vertical and horizontal machining center: Constructional features, Axis identification, Electronic control system. Automatic tool changer and tool magazine.<br>CNC programming: Preparatory functions (G code), miscellaneous functions (M code), Part programming including subroutines and canned cycles. Principles of computer aided part programming. | 12 |
| Unit-03 | Machine Tool Automation: Introduction and Need:<br>Single spindle automates, transfer lines.<br>Elements of control system, Limit switches, Proximity switches, Blockdiagram for feedback and servo control system, Introduction to PLC, Blockdiagram of PLC. | 05<br>07 |
| Unit-04 | Special Purpose Machines (SPM):<br>Concept, General elements of SPM, Productivity improvement by SPM, Principles of SPM design. | 03 |
| Unit-05 | Maintenance of Machine Tools:<br>Types of maintenance, Repair cycle analysis, Repair complexity, Maintenance manual, Maintenance records, Housekeeping. Introduction to Total Productive Maintenance (TPM). | 05 |
| | Total | 48 |

| Text /Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Manufacturing Science | Amitabh Ghosh , Mallik | East-West Press Pvt. Ltd. |
| Production Technology | HMT, Banglore | Tata Mc-Graw Hill |
| CNC machines | Pabla B. S. M. Adithan | New Age international limited. |

| | | |
|---|---|---|
| Industrial maintenance | H.P.Garg | S. Chand & Co. Ltd. |
| Non conventional Machining | P. K. Mistra | NarvasaPublishining House |
| Maintenance Engg. Handbook | Lindley R. Higgins | Mc-Graw Hill |
| Manufacturing Processes | Begman, Amsted | John Willey and Sons. |
| Fundamental of metal cutting and machine tools | B. L. Juneja | New age international limited. |
| Technology of Machine Tools. | Steve Krar, Albert Check | Mc-Graw-Hill International. |
| CAD/CAM Principals and Applications | P. N. Rao | Tata McGrow-Hill |
| Manufacruting Technology Metal Cutting &Machne tools | P. N. Rao | Tata McGrow-Hill |
| Advanced Manufacturing Processes | R.M. Pandey, S.K. Goyal | Foundation Publishing |

**POWER ENGINEERING**
**(MECHANICAL ENGINEERING GROUP)**

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | I.C. Engine:<br>Power Cycles - Carnot, Otto, Diesel, Dual, Brayton Cycle, representation on P-V, T-S diagram and Simple numerical on Otto cycle only.<br>Classification of I.C. Engines<br>Two stroke and four stroke Engines Construction and working, comparison, valve timing Diagram.<br>Brief description of I.C. Engine combustion (SI & CI), scavenging, preignition, detonation, supercharging, turbo charging, simple Carburetor, M.P.F.I., fuel injection pump.<br>List of fuel, lubricant additives and their advantages. | 14 |
| Unit-02 | I.C. Engine Testing and Pollution Control:<br>Engine Testing - I.P., B.P. Mechanical, Thermal relative and volumetric efficiency, BSFC, Heat Balance sheet. Morse Test, Motoring test<br>Pollution Control- Pollutants in exhaust gases of petrol and diesel engines, their effects on environment, | 10 |
| Unit-03 | AIR COMPRESSER:<br>Introduction, uses of compressed air, Classification of air compressors<br>Definition: - Compression ratio, Compressor capacity, Free Air Delivered<br>Swept volume, reciprocating air compressor, Construction and working of single stage and two stage compressor<br>Efficiency: - Volumetric, Isothermal & Mechanical (only simple numerical) - Advantages of multi staging.<br>Rotary Compressor- Construction and working of screw, lobe, vane, centrifugal compressors (No numerical), Comparison and applications of reciprocating and rotary compressors, Purification of air to remove oil, moisture and dust, Methods of energy saving in air compressors | 12 |
| Unit-04 | Gas Turbine And Jet Propulsion :<br>Classification and applications of gas turbine.<br>Constant volume and constant pressure gas turbines.<br>Closed cycle and open cycle gas turbines and their comparison.<br>Methods to improve thermal efficiency of gas turbine- Regeneration, inter- cooling, reheating using T- Ø diagram (no analytical treatment).<br>Jet Propulsion -Principles of turbojet, turbo propeller, Ram jet. | 10 |
| Unit-05 | Refrigeration and Air- Conditioning: Introduction, COP of Heat Pump and refrigerator, Tonnes of Refrigeration.<br>Vapour compression system- Vapour compression refrigeration cycle, components of VapourCompression Cycle. Applications- Water Cooler Domestic refrigerator, Ice plant & cold storage.<br>Air conditioning systems- Definition of Air conditioning and classification of Air Conditioning Systems. | 10 |

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|---|---|---|
| | Total | 56 |

| Text / Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Course in Thermal Engineering | V. M. Domkundwar | Dhanpat Rai & Co |
| Thermal Engineering | P.L.Ballaney | Khanna Publishers |
| Text Book of Thermal Engineering | R.S.Khurmi | S.Chand & Co. Ltd |
| Heat Engine Vol.-I and Vol.-II | Patel. Karamchandani | Acharya Publication |
| Automobile Engineering | R. k. Jain | Tata McGraw Hill |
| Industrial power engg.& application handbook | K.C.Agrawal | |
| Power Engineering | BishwajeetRanjan, Rajesh Verma | Foundation Publishing |

## ENVIRONMENTAL POLLUTION & CONTROL
## (MECHANICAL ENGINEERING GROUP)

| Name of the Topic | | |
|---|---|---|
| Unit -1 | Introduction<br>Environment, Ecosystem, Classification of pollution & pollutants, Environment & pollution control acts, ISO 14OOO standards, Kyoto treaty / protocol, carbon units. | 04 |
| Unit -2 | Air Pollution<br>Part A<br>Sources &classification of air pollution, Effects of air pollution on human health, Effects of air pollution on economy, Photochemical air pollution<br>Air pollution from major Industrial operations e.g. Fertilizer industries aluminum manufacturing plants, Acid plants, Cement industries, Coal & tar industries, paper industries, Refinery & petrochemical industries | 10 |
| | Part B<br>Air pollution due to Automobiles-design and operating parameters and methods of control, Pollution due to S. I. Engines. Design & operating parameters responsible for emission and methods of pollution control. Pollution due to C. I. Engines. Design & operating parameters responsible for emission and methods of pollution control. Air quality & emission standards of India & Europe, Air pollution in Indian metro cities- Delhi, Mumbai, Chennai, Kolkata | 14 |

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| Unit – 3 | Water Pollution<br>Sources of water pollution. Effects of water pollution. Water pollution analysis<br>Physical examination of water, Chemical characteristics of water, Biological investigation of water<br>Definitions of Important terms used in water pollution – Dissolved $O_2$ , Chemical $O_2$ demand, Biological O2 demand, Theoretical O2 demand, Total solids, Total suspended solids, Total dissolved solids, Turbidity, Alkalinity, Acidity. Water quality standards, Steps in Water treatment, Sampling & analysis of water pollution | 06 |
| Unit – 4 | Noise Pollution<br>Definition of noise, Sources of noise Types of noise – Impulsive & sonic noise<br>Effects of noise on health, Noise measurement, Noise mapping | 04 |
| Unit – 5 | Other Types of Pollution<br>Solid waste, Classification of solids, Solid waste management, Method of solid waste disposal, Reuse, Recycling & recovery of materials from refuse, Soil pollution, Chemistry of soil, Soil irrigation by effluents, Agricultural pollution<br>Radiation pollution, Sources & effects of radiation, Radiation exposure standards, Radiation protection, Treatment & disposal of radiation waste<br>Global pollution, Greenhouse effect, Acid rain, Ozone depletion problem | Total |
| | | 48 |



Text/ Reference Books:-

| Titles of the Book | Name of Authors | Name of the Publisher |
|---|---|---|
| Air pollution | M.N. Rao & H.V.N. Rao | Tata McGraw Hill |
| Automotive Mechanics | William H. Course & Donald L. Anglin | Tata McGraw Hill |
| Internal Combustion Engines | K.K. Ramlingam | Scitech |
| Water Supply and Sanitary Engineering | G.S. Bilgi | Dhanpat Rai and Sons. |
| Elements of Environment Science & Engineering | P. Meenakshi | Prentice-Hall |
| A basic course in environmental studies | S.Deswal& A. Deswal | Dhanpat Rai and Sons. |
| Introduction to Environmental Engineering. | P. AarneVesilind&Susan M. Morgan | Thomson |
| Environmental Pollution Control Engineering | C.S Rao | |
| Environmental pollution control microbiology | McKinney | |

# METROLOGY & QUALITY CONTROL
# (MECHANICAL ENGINEERING GROUP)

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | Introduction to metrology:<br>Metrology Basics- Definition of metrology, Categories of metrology, Scientific metrology, Industrial metrology, Legal metrology, Need of inspection, Revision of ( no questions be set) | 03 |
| | Precision, Accuracy, Sensitivity, Readability, Calibration, Traceability, Reproducibility, Sources of errors, Factors affecting accuracy, Selection of instrument, Precautions while using an instruments for getting higher precision and accuracy.<br>Standards and Comparators- Definition and introduction to line standard, end standard, Wavelength standard, Slip gauge and its accessories, Length bars. Definition, Requirement of good comparator, Classification, use of comparators, Working principle of comparators, Dial indicator, Sigma comparator, Pneumatic comparator, Electrical, Electronic, Relative advantages and disadvantages.<br>Limits, Fits, Tolerances and Gauges<br>Concept of Limits, Fits, And Tolerances, Selective Assembly, Interchangeability, Hole and Shaft Basis System, Taylor's Principle, Design of Plug, Ring Gauges, IS919-1993 (Limits, Fits & Tolerances, Gauges IS 3477-1973, concept of multi gauging and inspection.<br>Angular Measurement<br>Concept, Instruments for Angular, Measurements, Working and Use of Universal Bevel Protractor, Sine Bar, Spirit Level, Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges). | 05 |
| Unit-02 | Threads and Gear Metrology:<br>Screw thread Measurements<br>ISO grade and fits of thread, Errors in threads, Pitch errors, Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch, two wire method, Thread gauge micrometer, Working principle of floating carriage dial micrometer.<br>Gear Measurement and Testing<br>Analytical and functional inspection, rolling test, Measurement of tooth thickness (constant chord method), gear tooth vernier, Errors in gears such as backlash, run out, composite. | 03<br>03 |

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| Unit-03 | Testing Techniques:<br>Measurement of surface finish<br>Primary and secondary texture, Sampling length, Lay, terminology as per IS 3073- 1967, direction of lay, Sources of lay and its significance, CLA, Ra, RMS, Rz values and their interpretation, Symbol for designating surface finish on drawing, Various techniques of qualitative analysis, Working principle of stylus probe type instruments.<br>Machine tool testing<br>Parallelism, Straightness, Squareness, Coaxiallity, roundness, run out, alignment testing of machine tools as per IS standard procedure. | 03<br><br><br><br><br><br>06 |
| Unit-04 | Quality Control:<br>Quality: Definitions, meaning of quality of product & services, Quality characteristics, Quality of design, Quality of conformance, Quality of performance, Concept of reliability, Cost, Quantity assurance, Cost of rework & repair, Quality & Inspection, Inspection stages. | 04 |
| | Total Quality Management:<br>Principles of total quantity management. Customer focus. Commitment by top management. Continuous improvement–PDCA, Quality Circles. Employee empowerment (JIDOKA).<br>Quality Audit: Concept of audit practices, lead assessorcertification.<br>Six sigma: Statistical meaning, methodology of system Improvement, DMAIC cycle, Yellow belt, Green belt, Black belt certification.<br>ISO 9000 Series & other standards:<br>Concept, ISO 9000 series quality standards, QS14000, Standards in general, Its evaluation & Implications, necessity of ISO certification, other Quality systems. | 06<br><br><br><br><br><br><br><br>04 |
| Unit-05 | Elementary Statistics & it's application in quality control:<br>Statistical Quality Control – Meaning and importance of SQC, Variableand attribute Measurement. control charts – inherent and assignablesources of variation, control charts for variables – X & R charts, controlcharts for attributes p, np, C charts | 10 |

| | Text / Reference Books:- | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Engineering metrology | R. K. Jain | Khanna Publisher, Delhi. |
| Metrology for Engineers | J.F.W. Galyer and C. R. Shotbolt | ELBS |
| Engineering Metrology | K. J. Hume | Kalyani publishers |
| A text book of Engineering metrology | I.C. Gupta | Dhanpat Rai and Sons, |

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|---|---|---|
| Metrology Lab. Manual | M. Adithan and R. Bahn | T.T.T.I. Chandigarh. |
| Statistical Quality Control | M. Mahajan | Dhanpat Rai and Sons , |
| Quality control | T.T.T.I. Chennai | Tata McGraw Hill, |
| Quality planning and analysis | Juran U.M. and Gryna | Tata McGraw Hill, |
| Inspection and quality control | National productivity council | N.P.C., New Delhi. |
| Managing for Total Quality | N. Logothetis | Prentice – Hall, Delhi. |
| Statistical Process analysis | LauthAlwan | Tata McGraw Hill. |
| Metrology & Quality Control | S.P. Singhal | Foundation Publishing |
| Metrology & Precision | A.J.T. Scarr | Tata McGraw hill |

2. IS/ International Codes :
IS 919 – 1993 Recommendation for limits, fits and tolerances IS 2029 – 1962 Dial gauges. IS 2103 – 1972 Engineering Square
IS 2909 – 1964 Guide for selection of fits. IS 2921 – 1964 Vernier height gauges IS 2949 – 1964 V Block.
IS 2984 – 1966 Slip gauges.
IS 3139 – 1966 Dimensions for screw threads. IS 3179 – 1965 Feeler gauges.
IS 3455 – 1966 Tolerances for plain limit gauges.
IS 3477 – 1973 Snap gauges.
IS 6137 – 1971 Plain plug gauges. IS 3651 – 1976 - Vernier Caliper
IS 4218 - Isometric screw threads
IS 4440 – 1967 Slip gauges accessories
IS 5359 – 1969 Sine bars
IS 5402 – 1970 Principle and applications of sine bars IS 5939 – 1970 Sine angles, sine tables.

## AUTOMOBILE ENGINEERING
## (MECH. ENGG. GROUP)

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | Introduction of Automobile<br>Classification of automobiles, Vehicle layout & types<br>Body construction - Types & Nomenclature of car body. Introduction to aerodynamic body shapes, Automobile market in India of “on road vehicles”, major manufacturers, their products & their collaborations. | 06 |
| Unit-02 | Automobile Transmission<br>Clutch- necessity, construction & working of coil spring & diaphragm spring type clutch.<br>Gear Box- tractive effort and tractive resistance, types of G.B construction & working of constant mesh G.B., & synchromesh G.B., Epicyclic G.B., Torque converter, Overdrive, Transfer case<br>Final drive- necessity, construction & working of propeller shaft & differential. | 12 |

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| | Axle- Type of rear axles, front axles & their applications. | |
| Unit-03 | Control Systems<br>Steering system- Requirement of steering system. Construction and working of steering linkage. Steering gear box- construction & working of rack and pinion & re-circulating ball type gearbox. Introduction to Power steering, Steering geometry- camber, caster, toe-in, toe-out, Kingpin inclination & their effects.<br>Brake system- construction & working of hydraulic & Pneumatic brakes.<br>Comparison of disc & drum brake. | 08 |
| Unit-04 | Suspension systems, wheels & Tyres<br>Necessity & classification of suspension system. Working & construction of Leaf spring, rigid axle suspension. Introduction to air suspension. Construction & working of McPherson & wishbone, trailing link suspensions. Construction & working of telescopic shock absorbers.<br>Construction & working of spoked wheel, disc wheel & light alloy cast wheel. Types of rims, their construction & working. Construction, working & comparison of radial, cross-ply and tubed, tubeless tyre & tyre specifications, Factors affecting tyre life, Wheel Alignment and Balancing | 08 |
| Unit-05 | Automobile Electrical Systems & Body<br>Battery- working, construction & rating of battery. Ignition system-construction & working of electronic and CDI ignition system. Starting system- construction & working of starting motor. Charging system-construction & working of alternator, Wiring system-harnessing & colour codes. Lighting system-head light, tail light, indicator light & their circuits. Gauges- construction & working of Fuel level gauge, oil gauge and water temperature gauge. Use of microprocessor in automobile control systems | 14 |
| | Total | 48 |

| Text / Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Automobile Engineering | K. K. Jain and R.B. Asthana | Tata Mcgraw hill |
| Automobile Mechanics | William Crouse | Tata Mcgraw hill |
| Automobile Mechanics | SRINIVASAN | Tata Mcgraw hill |

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|---|---|---|
| Automotive Technology | H.M.Sethi | Tata Mcgraw hill |
| Automobile Engineering | G.B.S. Narang | Khanna Publication |
| Auto Mechanics | Harold T. Glenn | Bennett &Mckknight |
| Automobile Engineering Vol. I and Vol. II | Kirpal Singh | Standard Publication |
| Automotive Mechanics | Joseph Hitner | -- |
| Automobile Engg. | Kaushik Berman | Foundation Publishing |

# MANAGEMENT (COMMON)

| Chapter | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | Overview Of Business<br>Types ofBusiness, Service, Manufacturing, Trade, Industrialsectors<br>Introduction to Engineeringindustry, Processindustry, Textileindustry<br>Chemicalindustry, Agroindustry, Globalization<br>Introduction Advantages&disadvantagesw.r.t.India<br>Intellectual Property Rights(I.P.R.) | 02 |
| Unit-02 | Management Process<br>What isManagement?<br>Evolution, Variousdefinitions, Concept ofmanagement, Levels ofmanagement, Administration &management, Scientific management byF.W.Taylor, PrinciplesofManagement(14principlesofHenryFayol), Functions ofManagement, Planning, Organizing, Directing, Controlling | 07 |
| Unit-03 | Organizational Management<br>Organization:- Definition, Steps inorganization, Types oforganization, Line, Line &staff, Functional, Project, Departmentation, Centralized &Decentralized, Authority &Responsibility, Span ofControl, Forms ofownership, Propriotership, Partnership, Jointstock, Co-operativeSociety Govt.Sector | 07 |
| Unit-04 | Human Resource Management, PersonnelManagement, Introduction, Definition<br>Functions, Staffing, Introduction to HRPlanning, RecruitmentProcedure, Personnel– Training &Development, Types oftraining, Induction, Skill, Enhancement, Leadership &Motivation, Maslow's Theory ofMotivation<br>SafetyManagement, Causes ofaccident, Safetyprecautions<br>Introduction to– FactoryAct, ESIAct, Workmen CompensationAct, Industrial DisputeAct | 08 |
| Unit-05 | Financial Management, FinancialManagement-Objectives&Functions<br>Capital Generation &Management, Types ofCapitals, Sources of raisingCapital, Budgets andaccounts, Types ofBudgets, Production Budget (including Variance Report), LabourBudget<br>IntroductiontoProfit&LossAccount(onlyconcepts); BalanceSheet<br>Introduction to– ExciseTax, ServiceTax, IncomeTax, VAT, CustomDuty | 08 |
| Unit-06 | Materials Management<br>Inventory Management (NoNumerical), Meaning &Objectives, ABCAnalysis<br>Economic OrderQuantity, Introduction & GraphicalRepresentation, PurchaseProcedure, Objects ofPurchasing, Functions of PurchaseDept. Steps inPurchasing<br>Modern Techniques of MaterialManagement, IntroductorytreatmenttoJIT/SAP/ERP | 08 |

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| Unit-07 | Project Management ( No Numerical), ProjectManagement, Introduction &Meaning, IntroductiontoCPM&PERTTechnique, Concept of Break EvenAnalysis, QualityManagement, DefinitionofQuality,conceptofQuality,QualityCircle, QualityAssurance, IntroductiontoTQM,Kaizen,5'S',&6Sigma | 08 |
| | TOTAL | 48 |

| Text/ Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Industrial Engg & Management | Dr. O.P. Khanna | Dhanpal Rai & sons New Delhi |
| Business Administration & Management | Dr. S.C. Saksena | SahityaBhavan Agra |
| The process of Management | W.H. Newman E.Kirby Warren Andrew R. McGill | Prentice- Hall |
| Industrial Management | Rustom S. Davar | Khanna Publication |
| Industrial Organisation& Management | Banga& Sharma | Khanna Publication |
| Industrial Management | Jhamb& Bokil | Everest Publication , Pune |
| Management | Deepak Chandra | Foundation Publishing |

**DESIGN OF MACHINE ELEMENTS**
**(MECHENICAL ENGINEERING GROUP)**

| | Name of the Topic | Hours |
|---|---|---|
| Unit-01 | Introduction to Design, Machine Design philosophy andProcedures, GeneralConsiderationsinMachineDesign<br>Fundamentals: - Types of loads, concepts of stress, Strain, Stress – Strain Diagram for Ductile and Brittle Materials, Types of Stresses such as Tension, Compression, Shear, Bearing pressure Intensity, Crushing, bending and torsion, Principle Stresses (SimpleNumerical), Creep strain and CreepCurve, Fatigue,S-Ncurve,EnduranceLimit., FactorofSafetyandFactorsgoverningselectionoffactorofSafety.<br>StressConcentration–Causes&Remedies<br>Convertingactualloadortorqueintodesignloadortorqueusingdesign factorslikevelocityfactor,factorofsafety&servicefactor.<br>PropertiesofEngineeringmaterials,Designationofmaterialsasper IS and introduction to International standards & advantages of standardization,useofdesigndatabook,useofstandardsindesign and preferred numbers series.<br>Theories of Elastic Failures – Principal normal stress theory, Maximum shearstresstheory&maximumdistortionenergytheory. | 10 |
| Unit-02 | Design of simple machine parts<br>CotterJoint,KnuckleJoint,Turnbuckle<br>DesignofLevers: -Hand/FootLever&BellCrankLever<br>DesignofC–Clamp,Off-setlinks,OverhangCrank,ArmofPulley | 08 |
| Unit-03 | Design of Shafts, Keys and Couplings and Spur Gears<br>TypesofShafts,Shaftmaterials,StandardSizes,DesignofShafts(Hollow andSolid)usingstrengthandrigiditycriteria,ASMEcodeofdesignfor line shafts supported between bearings with one or two pulleys in between.<br>DesignofSunkKeys,EffectofKeywaysonstrengthofshaft.<br>DesignofCouplings–MuffCoupling,ProtectedtypeFlangeCoupling, Bush-pin type flexiblecoupling.<br>Spur gear design considerations. Lewis equation for staticbeam strengthofspurgearteeth.Powertransmissioncapacityofspurgears inbending. | 12 |
| Unit-04 | Design of Power Screws<br>ThreadProfilesusedforpowerScrews,relativemeritsanddemeritsof each, Torque required to overcome thread friction, self locking and overhauling property, efficiency of power screws, types of stresses induced.<br>DesignofScrewJack,ToggleJack. | 10 |
| Unit-05 | Design of springs<br>ClassificationandApplicationsofSprings,Spring–terminology, materials andspecifications. Stresses in springs, Wahl's correction factor, Deflection of springs, Energy stored insprings.<br>DesignofHelicaltensionandcompressionspringssubjectedto uniformappliedloadslikeI.C.enginevalves,weighingbalance,railway buffers and governorsprings. Leaf springs – constructionand application | 07 |

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| Unit-06 | Design of Fasteners<br>StressesinScrewedfasteners,boltsofUniformStrength.<br>DesignofBoltedJointssubjectedtoeccentricloading.<br>Design of parallel and transverse fillet welds, axially loaded symmetricalsection,Meritsanddemeritsofscrewedandweldedjoints | 07 |
| | Total | 64 |

| Text / Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | NameofthePublisher |
| Introduction to Machine Design | V.B.Bhandari | Tata Mc- Graw Hill |
| Machine Design | R.K.Jain | Khanna Publication |
| Machine design | Pandya & Shah | Dhanpat Rai & Son |
| Mechanical Engg. Design | Joseph Edward Shigley | Mc- Graw Hill |
| Design Data Book | PSG Coimbtore | PSG Coimbtore |
| Hand Book of Properties of Engineering Materials &Design Data for Machine Elements | Abdulla Shariff | Dhanpat Rai & Sons |
| Theory and Problems of Machine Design | Hall, Holowenko, Laughlin | Mc- Graw Hill |
| Design of Machine Elements | D.P. Mandal | Foundation Publishing |

IS/ InternationalCodes
IS4218:1967 ISO MetricThreads
IS2693:1964 Cast Iron FlexibleCouplings
IS2292:1963 Taper keys &Keyways
IS2293:1963 Gib Head Keys &Keyways
IS2389:1963 Bolts,Screws,Nuts&LockNuts
IS4694:1968 Squarethreads
g) IS808:1967 StructuralSteel
3. SKF Catalogue forBearings
SOFTWARE
Think 3 CAD Software developed byacebrain.
E-Yantra Software, developed byFEAST.

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|---|---|---|
| Machine Elements in Mechanical Design | Robert L.Mott,Jong Tang | Pearson |
| MechanicalDesignofMachine Elements andMachines | Jack A. Collins, Henry R. Busby | Willey Publications |

**INDUSTRIAL FLUID POWER**
**(MECHENICAL ENGINEERING GROUP)**

| | Name of the topic | Hours |
|---|---|---|
| Unit-01 | Introduction to oil hydraulic systems : Practical applications of hydraulicsystems. General layout of oil hydraulicsystems. Meritsandlimitationsofoilhydraulicsystems. | 05 |
| Unit-02 | Components of Hydraulic systems :<br>Pumps – Vane pump, gear pump, Gerotor pump, screw pump, piston Pump.<br>Valves – Construction, working and symbols of Pressure controlvalves – pressure relief valve, pressure reducing, pressure unloading Directioncontrolvalves–Poppetvalve,spoolvalve,3/2,4/2D.C.valves, Sequencevalves.<br>Flow control valves – pressure compensated, non-pressure compensated flow controlvalve. | 08 |
| | Actuators- Construction, working and symbols of Rotary Actuators - Hydraulicmotors.<br>Linear Actuators – Cylinders - single acting, double acting.<br>Accessories – Pipes, Hoses, fittings, Oil filters, Seals and gaskets, Accumulators.<br>(Types,construction,workingprincipleandsymbolsofallcomponents) | 07 |
| Unit-03 | Hydraulic Circuits : Meter in, Meter outcircuits, Bleed offcircuit, Sequencingcircuit, Hydraulic circuits for Milling machine, Shaper machine, Motion synchronizationcircuit. | 07 |
| Unit-04 | Introduction to pneumatic Systems : Applications of pneumaticsystem, General layout of pneumaticsystem, Merits and limitations of pneumaticsystems | 04 |
| Unit-05 | Components of pneumatic system :<br>Compressor–Reciprocating&Rotarycompressors. Control Valves – Pressure regulating valves, Flow Control valves, Direction ControlValves. | 06 |
| | Actuators–Rotary-Airmotors,Types,construction,workingprinciple<br>Linear-Cylinders-Types,construction&workingprinciple.<br>Accessories – Pipes, Hoses, Fittings, FRL unit (Types, construction, workingprincipleandsymbolsofallcomponents) | 07 |
| Unit-06 | Pneumatic Circuits Speed control circuits. Sequencing circuits. | 04 |
| | Total | 48 |

| Text / Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Industrial Hydraulics | Pippenger Hicks | McGraw Hill International |
| Oil Hydraulic system- Principle and maintenance | Majumdar S.R | Tata McGraw Hill |
| Pneumatics Systems Principles and Maintenance | Majumdar S.R | Tata McGraw Hill |
| Hydraulics and Pneumatics | Stewart | Taraporewala Publication |
| Industrial Fluid Power | S. Laxmikant | Foundation Publishing |

| Catalogues:<br>Various system components' manufacturers' Catalogues.<br><br>CDs:<br>CDs developed by various system components' manufacturers. | | |
|---|---|---|
| Industrial fluid power | Charles Hedges | Womack Educational Publications |
| Industrial hydraulic control | Peter Rhoner | Prentice Hall |

**ELECTIVE - (ANY ONE) – (I) MATERIAL HANDLINGSYSTEMS**
**(MECH. ENGG. GROUP)**

| Chapter | Name of the topic | Hrs/week |
|---|---|---|
| Unit-01 | Introduction to Material Handling System<br>Main types of material handling equipments& their applications, types of<br>load to be handled, types of movements, methods of stacking, loading & unloading systems, principles of material handling systems. | 04 |
| Unit-02 | Hoisting Machinery &Equipments<br>Construction, working & maintenance of different types of hoists such as lever operated hoist , portable hand chain hoist, differential hoists, worm geared and spur geared hoists, electric & pneumatic hoists, jumper.<br>Construction,working&maintenanceofdifferenttypesofcranessuch as rotary cranes, trackless cranes, mobile cranes, bridge cranes, cable cranes,floatingcranes&cranestravelingonguiderails.<br>Construction,working&maintenanceofelevatingequipmentssuchas stackers,industriallifts,freightelevators,passengerlifts,andmast type's elevators, vertical skip hoist elevators. | 12 |
| Unit-03 | Conveying Machinery<br>Construction,working&maintenanceoftractiontypeconveyorssuch asbeltconveyors,chainconveyors,bucketelevators,escalators.<br>Construction, working & maintenance of traction less type conveyors suchasgravitytypeconveyors,vibrating&oscillatingconveyors,screw conveyors, pneumatic & hydraulicconveyors,hoppers gates& feeders. | 06 |
| Unit-04 | Surface Transportation Equipment<br>Construction, function, working of trackless equipment such as hand operated trucks, powered trucks, tractors, AGV- Automatic Guided vehicle, industrialTrailers.<br>Construction, function, working of cross handling equipment suchas winches, capstans, Turntables, Transfer tables, monorail conveyors. | 08 |
| Unit-05 | Components of material handling systems<br>Flexiblehoistingappliancessuchasweldedloadchains,rollerchains, hemp ropes, steel wire ropes, fastening methods of wire & chains, eye bolts, liftingtackleslifting&riggingpractices. Load handlingattachments.<br>Various types of hooks-forged, triangular eye hooks, appliances for suspendinghooks, Cranegrabforunit&pieceloads,<br>Electricliftingmagnet,vacuumlifter. Grabbing attachment for loosematerials, Craneattachmentforhandlingliquids/moltenmetals<br>Arresting gear & Brakes.<br>Arresting gear – construction &working, Construction & use of electromagnetic, shoe brakes Thruster operated shoe brakes, controlbrakes. | 08 |

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| Unit-06 | Mechanism used in material handling equipment, Steady state motion, starting & stopping of motion in following mechanisms. Hoisting mechanism, LiftingMechanism, TravelingMechanism, SlewingMechanism, Rope&chainoperatedCross-TraverseMechanism. | 06 |
| Unit-07 | Selection of material handling equipment<br>Factors affecting choice of material handling equipment such as type of loads,hourlycapacityoftheunit,direction&lengthoftravel, methodsof stockingatinitial,final&intermediatepoints,natureofproductionprocess, involved,specificloadconditions&economicsofmaterialhandlingsystem. | 04 |
| | Total | 48 |

| Text / Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Material handling equipment | N. Rundenko | Peace Publisher, Moscow |
| Material handling equipment | M. P. Alexandrov | MIR Publisher, Moscow |
| Material handling | Y. I. Oberman | MIR Publisher, Moscow |
| Material handling equipment | R.B.Chowdary&G.R.N.Tagore | Khanna Publisher, Delhi |
| Material handling (Principles &Practice) | Allegri T. H. | CBS Publisher, Delhi |
| Plant layout & materials handling | Apple j. M | JohnWiley Publishers. |
| Material handling Hand book | Bolz and others | -- |
| Encyclopedia of materials handling | Daylas R. W. Pergaman, Berlin | -- |
| Material handling | Immer J. R. | Mc Graw Hill, New York |
| Material handling equipment | Parameswaran M. A. | C.D.C. in Mechanical Engg., I.I.T., Chennai |
| Material Handling Cyclopedia | Roy V. Wright, John G. Little, Robert C. Augur | Kessinger Publishing |
| Manufacturing facilities design and material handling | Matthew P. Stephens | |
| Material Handling System | - | - |

**ELECTIVE - (ANY ONE) –**
**(II) REFRIGERATION AND AIR CONDITIONING (MECH. ENGG. GROUP)**

| Chapter | Name of the Topic | Hrs/week |
|---|---|---|
| Unit-01 | Basics of Refrigeration, Definition ofrefrigeration., Necessity ofrefrigeration<br>Methods of refrigeration: - Icerefrigeration, Refrigerationbyexpansionofair Refrigerationbythrottlingofgas Vapour refrigeration system Steamjet,refrigerationsystem, Non-conventionalmethodsofrefrigerationlikeVortextube,Pulse tube refrigeration, solarrefrigeration,<br>Conceptofheatengine,heatpumpandrefrigerator.<br>Unitofrefrigeration,C.O.P.andrefrigeratingeffect.<br>MajorapplicationareasofR.A.C.likedomestic,commercialand industrial. | 06 |
| Unit-02 | Refrigeration Cycles<br>Reversed Carnot Cycle and its representation on PV and TS diagram.<br>Air Refrigeration Cycles:- Bell Coleman air refrigerator, it's representation on PV and TS diagram, types and applications like air craft refrigerationusingsimpleaircoolingsystem.<br>(SimplenumericalonReversedCarnotcycle.)<br>VapourCompressionCycle(V.C.C):-<br>principle,components,RepresentationonP-HandT-Sdiagram, effects of wet compression, dry compression, calculation of COP, Effect of superheating, undercooling, suction pressure and discharge pressure, Actual V.C.C., (simple numerical), Methods of improving COP (no description).IntroductiontomultistageV.C.C.,itsnecessity,advantages.<br>Vapour Absorption system:- Principle, components and working of aqua- ammonia system (simple &practical), Li-Br Absorption System Electrolux Refrigeration System,<br>DesirablepropertiesofRefrigerantandabsorbentusedinVapour AbsorptionSystem. Comparison of above Refrigeration Cycles. | 10 |
| Unit-03 | Refrigerants, Classification ofrefrigerants. Desirable properties ofrefrigerants.<br>Nomenclature ofrefrigerants.<br>Selectionofrefrigerantforspecificapplications.<br>ConceptofGreenHouseEffect,Ozonedepletion,Globalwarming. Eco-friendlyrefrigerantslikeR-134a,hydrocarbonrefrigerantsetc. | 04 |

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| Unit-04 | Equipment selection<br>ComponentsofVapourCompressionRefrigerationSystem<br>Compressors: - Classification, Construction and working of open type, hermetic,<br>centrifugal,rotary,screwandscrollcompressorandtheirapplications.<br>Condensers: - Classification, description of air cooled and water cooled condensers, comparison and applications,<br>Evaporativecondensers.<br>Expansiondevices:<br>Types:-Capillarytube,automatic,thermostaticandtheirapplications<br>Evaporators and chillers:-<br>ClassificationofevaporatorsConstructionandworkingofBare tube,Platesurface,finned,shellandtube,floodedanddry expansionevaporator. Capacity of evaporator and theirapplications, Classification ofchillers, Construction and working of dry expansion Chillers and flooded chillers and theirapplications.<br>SelectioncriteriaforVapourcompressionrefrigerationsystem components for thefollowing applications: Water coolers, ice plants, cold storage, domestic refrigerator | 10 |
| Unit-05 | Psychrometry, Definition and necessity of airconditioning., Properties of Air, Dalton's law of partialpressure, Psychrometricchart, Psychrometric processes, Bypass Factor, ADP, concept of SHF, RSHF, ERSHF,GSHF, Adiabatic mixing of Airstreams, Simple numerical using Psychrometricchart, Equipments, used, for Air-conditioning like humidifier, dehumidifier, filter, heating and coolingcoils. | 06 |
| Unit-06 | Comfort conditions and cooling load calculations, Thermalexchangeofbodywithenvironment, Factors affecting humancomfort, Effective temp. and comfortchart, Components of cooling load- sensible heat gain and latent heat gainsources | 04 |
| Unit-07 | Air- conditioning systems, Classification of A.C.systems, Industrial and commercial A.C.systems,<br>Summer,winterandyearroundA.C.systems, Central and unitary A.C.systems, Application areas of A.C.systems | 04 |
| Unit-08 | Air distribution systems<br>Duct systems:-<br>Closedperimetersystem,extendedplenumsystem,radialduct system,ductmaterials,requirementofductmaterials,losses in ducts<br>Fans and Blowers:- Types, working of fans andblowers<br>Air distribution outlets:- Supply outlets, return outlets, grills, diffusers<br>Insulation: - Purpose, properties of insulating material, types of insulating materials, methods of applying insulation. | 04 |
| | Total | 48 |

| Text/ Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| Refrigeration and Air Conditioning | R.S.Khurmi | S.Chand and Co |
| Refrigeration and Air Conditioning | Arrora and Domkundwar | Dhanpat Rai and Sons |
| Refrigeration and Air Conditioning | Manohar Prasad | New Age Publications |
| Refrigeration and Air Conditioning | P.N.Ananthanarayanan | Tata McGraw Hill |
| Principles of Refrigeration | Roy Dossat | Pearson Education |
| Commercial Refrigeration | Edwin P. Anderson | Taraporevala Sons & Co |
| Refrigeration and Air Conditioning | Ahmadul Ameen | Prentice Hall-India |
| Refrigeration and Air Conditioning | C.P.Arora | Tata McGraw Hill |
| Refrigeration & Air-Conditioning | BiswajetRanjan/AnandPal | Foundation Publishing |

2. IS/InternationalCodes/Publications:
   a) ISHRAEhandbooks
   b) ManoharPrasad:RefrigerationandAirConditioninghandbook,NewAgePublications.

**ELECTIVE - (ANY ONE) – (III) CAD-CAM & AUTOMATION**
**(MECH. ENGG. GROUP)**

| Chapter | Name of the Topic | Hrs/week |
|---|---|---|
| Unit-01 | Introduction to CAD/CAM<br>Computers in industrial manufacturing. Product Cycle, CAD/CAM CAD/CAMhardware: -basicstructure,CPU,Memory,I/Odevices,Storage devices and system configuration. | 06 |
| Unit-02 | Geometric Modelling<br>Requirement of geometric modelling, Types of geometric models. Geometric construction method-sweep, solid modelling- Primitives & Booleanoperations,freeformedsurfaces(Classificationofsurfaceonly) (No numerical treatment) | 10 |
| Unit-03 | Introduction to computer numerical Control<br>Introduction-NC,CNC,DNC,AdvantagesofCNC,Thecoordinatesystemin CNC,Motioncontrolsystem-pointtopoint,straightline,Continuouspath (Contouring). Application ofCNC. | 05 |
| Unit-04 | Part programming<br>Fundamentals, manual part programming, NC –Words, Programming format, part programming, use of subroutines and do loops, computer aided part programming (APT). | 12 |
| Unit-05 | Industrial Robotics<br>Introduction, physical configuration, basic robot motions, technical features suchas-workvolume,precisionandspeedofmovement,weightcarrying capacity,drivesystem,Endeffectors,robotsensors. Application–Materialtransfer,machineloading,welding,spraycoating, | 09 |
| Unit-06 | Automation<br>Basic elements of automated system, advanced automation functions, levels of automation. Flexible manufacturing system :-Introduction, FMS equipment, FMS application, Introduction toCIM | 06 |
| | Total | 48 |

| Text / Reference Books: | | |
|---|---|---|
| Titles of the Book | Name of Authors | Name of the Publisher |
| CAD/CAM Principles and Applications | P.N.Rao | Tata McGraw-Hill |
| CAD/CAM/CIM | RadhaKrishna P. &Subramanyam | Wiley EasternLtd |
| CNC Machine | B.S.Pabla and M.Adithan | New age International(P)Ltd |
| ComputerAideddesignandmanufacturing | Groover M.P. &Zimmers Jr | Prentice hall of India |
| ComputerAideddesignandmanufacturing | Lalitnarayan,M. Rao | PHI |
| CAD-CAM & Automation | S.M. Kiran / S.P. Singh | Foundation Publishing |