Netaji Subhas University

Diploma In Mechanical Engineering' Course Structure (Effective from Session2021-22)

First Year

SUBJECTCODE	SEMESTER1	SUBJECT CODE	SEMESTER2
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	PHYSICS LAB	DIP207L	ED LAB
DIP108L	COMPUTER FUNDAMENTAL LAB	DIP208L	CHEM LAB

SECOND YEAR

SUBJECTCODE	SEMESTER 3	SUBJECTCODE	SEMESTER 4
DIP3ME01	Engg.Mathematics-II	DIP4ME01	THEORY OF MACHINES & MECHANISMS
DIP3ME02	Mechanical Engineering Drawing	DIP4ME02	Fundamentals of Electronics
DIP3ME03	Mechanics of Solid	DIP4ME03	Production Processes
DIP3ME04	Mechanical Engineering Material	DIP4ME04	Thermal Engineering
DIP3ME05	Electrical Engineering	DIP4ME05	Fluid Mechanics & Machinery
DIP3ME06L	Machine shop lab	DIP4ME06L	Fluid mechanics lab
DIP3ME07L	Mechanics of solid lab	DIP4ME07L	MANUFACTURING TECHNOLOGY LAB

THIRD YEAR

SUBJECTCODE	SEMESTER 5	SUBJECTCODE	SEMESTER 6
DIP5ME01	Advanced Manufacturing Processes	DIP6ME01	Industrial Fluid Power
DIP5ME02	Power Engineering	DIP6ME02	Design Of Machine Elements
DIP5ME03	Environmental Pollution& Control	DIP6ME03	Industrial Management
DIP5ME04	Metrology & Quality Control	DIP6ME04	Elective (Any One)
DIP5ME05	Automobile Engineering	DIP6ME05	Project & Viva (Sip)
DIP5ME06L	Metrology & Quality Control Lab		
DIP5ME07L	CIM & Automation Lab		

ELECTIVE–REFRIGERATION AND AIR CONDITIONING

SEMESTER–1									
THEORY		PERIOD			Evaluation Scheme			Credit	Hours
SUBJECTCODE	NAMEOFTHE PAPER	LECTURES	TUTORIALS	PRACTICALS	MSE	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	Physics LAB	0	0	2	15	35	50	2	2
DIP108L	COMPUTER FUNDAMENTAL LAB	0	0	2	15	35	50	2	2
							Total Credits: 28		

SEMESTER 1

Basic Physics (DIP101)

Course Outcome:

I: **Learn about the measurements used in science and units of all physical quantities .**
II: Learn about the elasticity, Surface tension and Viscosity properties of any material.
III: Learn about the heat and its transmission and different types of laws its follows.
IV: Learn about the Light , Properties of light , Wavelength of Light and Laser.

Basic Physics (DIP101)

Unit -1
UNITS AND MEASUREMENTS
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. Accuracy, Precision of instruments, Errors in measurement, Estimation of errors - Absolute error, Relative error and percentage error, significant figures. (Simple Problems).Basic Measuring instruments – Vernier Caliper, Micrometer screw gauge, inner & outer caliper thermometer, speedometer, ammeter, voltmeter with their least count, range, accuracy and precision. Standard reference surfaces used in engineering measurements surface plate, angle plate, V- block, Engineer's square.

Unit -2
GENERAL PROPERTIES OF MATTER
Elasticity : Deforming force, Restoring force, Elastic and plastic body, 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). (Simple problems). Stress strain diagrams of H.T. Steel, Cast iron, Aluminum and Concrete, Ultimate and breaking stress, Factor of safety. 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. Viscosity : Velocity gradient, Newton's law of viscosity, coefficient of viscosity, streamline and turbulent flow, critical velocity,

Reynolds's number, (simple problems), Stokes law and terminal velocity (no derivation), buoyant (up thrust) force, effect of temperature & adulteration on viscosity of liquid.

Unit - 3
HEAT
Transmission 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. Gas laws and specific heats of gases: Boyle's law, Charles's law, Gay Lussa'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).

Unit – 4
LIGHT
Properties 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). 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 super position of waves, Interference of light, constructive and destructive interference, Young's experiment. Analytical treatment of interference, conditions for stationary interference pattern. 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

Unit – 5
MODERN PHYSICS
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. 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.

Text/Reference Books:-

Titles of the Book	Name of Authors.	Name of the Publisher
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

Basic Chemistry (DIP102)

Course Outcome:

I: Learn about the Atomic Structure, Isotopes and Isobars, Valency, Electrovalent and Covalent Bond.

II: Learn about the Electrolysis and Electrolytic Solutions and their applications.

III: Learn about the Metals and Alloys and their occurrence and preparation of different type of alloys.

IV: Learn about the Non Metallic Materials Plastics, Rubber and Thermal Insulating Materials.

V: Learn about the environmental effects , Air Pollution and Water Pollution.

Basic Chemistry (DIP102)

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 & Orbital's, Hand's Rule, Filling Up of the Orbital's by Aufbau's Principles (till Atomic no. 30), Pauli's exclusion principle, Valency – Definition, types (Electrovalency & Covalence), 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.

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, Electrolysis of $CuSO_4$ Solution by using Cu Electrode & Platinum Electrode, Electrolysis of NaOH solution & fused NaCl, Faraday's first & second law of Electrolysis & Numerical, Electrochemical Cells & Batteries, Definition, 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.

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. Alloys: Definition of Alloy, Purposes of Making alloy Preparation Methods, Classification of Alloys such as Ferrous & Non Ferrous, examples. Composition, Properties & Applications of Alnico, Duralumin, Dutch metal, German Silver / Nickel Silver, Gun Metal, Monel metal, Wood's Metal, Babbitt Metal.

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, and Engineering Applications of Plastic based on their Properties. 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. Thermal Insulating Materials: Definition, Characteristics & Applications of Glass, Wool, Thermocole, Asbestos, Cork.

Unit – 5
Environmental Effects (Awareness Level):
Introduction, Definition, Causes of Pollution, Types of Pollution, Such as Air & Water Pollution. 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. 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.

Text/Reference Books:-

Titles of the Book	Name of Authors.	Name of the Publisher
(i) Engineering Chemistry	Jain & Jain	DhanpatRai 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

BasicMathematics(DIP103)

Course Outcome:
I: **Learn about the Algebra, Partial fraction, Determinant and Matrices.**
II: Learn about the Binomial Theorem and Trigonometry functions.
III: Learn about the Inverse Trigonometric Ratios & Properties of triangles.
IV: Learn about the Straight line and Circle, their slope, equations and angles.
V: Learn about Vectors, types of vectors and their applications.

Basic Mathematics (DIP103)

Unit -1
 Laws of Indices,

Formula of factorization and expansion ($(a2-b2)$, $(a+b)^2$ etc.), Laws of logarithm with definition of Natural and Common logarithm.

PARTIAL FRACTION,
Definition of polynomial fraction proper & improper fractions and definition of partial fractions., To Resolve proper fraction into partial fraction with denominator containing non repeated linear factors, repeated linear factors and irreducible non repeated quadratic factors. To resolve improper fraction into partial fraction.

DETERMINANT AND MATRICES:
Determinant
Definition and expansion of determinants of order 2 and 3, Cramer's rule to solve simultaneous equations in 2 and 3unknowns.
Matrices
Definition of a matrix of order m x n types of matrices. Algebra of matrices such as equality, addition, Subtraction, scalar multiplication and multiplication. Transpose of a matrix. Minor, cofactor of an element of a matrix, adjoint of matrix and Inverse of matrix by adjoint method. Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversion method.

BINOMIAL THEOREM:
Definition of factorial notation, definition of permutation and combinations with formula. Binomial theorem for positive index. General term. Binomial theorem for negative index.
Approximate value (only formula)

Unit -2
TRIGONOMETRY.
 Measurement of an angle (degree and radian). Relation Between 02 degree and radian. Trigonometric ratios of 00, 300, 450 etc. Fundamental identities. Trigonometric ratios of allied, compound, multiple & submultiples angles (Questions based on numerical computations, which can also be done by calculators, need not be asked particularly for allied angles). Factorization and defactorization formula: inverse trigonometric ratios: Definition of inverse trigonometric ratios, Principal values of Inverse trigonometric ratios. Relation between inverse trigonometric ratios. Properties of triangle, Sine, Cosine, Projection and tangent rules (without proof) Simple problems.

Unit -3
CO ORDINATE GEOMETRY
POINT AND DISTANCES: Distance formula, Section formula, midpoint, centriod of triangle.
 Area of triangle and condition of co linearity. STRAIGHT LINE: Slope and intercept of straight line. Equation of straight line in slope point form, slope-intercept form, two-point form, two-intercept form, normal form. General equation of line. Angle between two straight lines condition of parallel and perpendicular lines. Intersection of two lines. Length of perpendicular from a point on the line and perpendicular Distance between parallel lines.
 CIRCLE:
Equation of circle in standard form, centre – radius form, diameter form, two – intercept form. General equation of circle, its centre and radius.

Unit-4
VECTORS
 Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication) Dot (Scalar) product with properties. Vector (Cross) product with properties. Applications .Work done and moment of force about a point &line

Text Books:-

Titles of the Book	Name of Authors.	Name of the Publisher
(i) Mathematics for Polytechnic	S.P. Desh pande	Pune Vidyarthi Griha
(ii) Trigonometry	S.L. Lonely	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)

Course Outcome:

I: Know about the Communications, and the benefits of communication and its application in daily life.
II: Know how to write a letter, like Government letter, Formal letter ,writing essays and small   paragraphs
III: Know about Preparation for Job and Writing Applications for Jobs and Interviews.
IV: Know about the Grammar, use of different types of speech direct and indirect speech, active and passive voice.
V: Know about the Preparing for Group Discussions

Communication Skill-I (DIP104)

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.

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. 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.

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.

Unit -4
Grammar: Sentence Structure, Idiomatic Usage of Language, Tenses, Direct & Indirect Parts of Speech, Active & Passive Voice, Vocabulary.

Unit -5
Preparation for Job:
Writing Applications for Jobs, Preparing Curriculum Vitae, Preparing for Interviews, Preparing for Group Discussions.

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)

Course Outcome:

I: Know about the Drawing Instrument sand their uses.
II: Learn to draw curves &LociofPoint, ellipse, parabola, hyperbola, polygon and hexagon.
III: Know how to draw Orthographicprojections.
IV: Know how to draw Isometricprojection.
V: Know how to draw projections of circle, square, rectangle and rhombus.

Engg. Graphics (DIP105)

Unit -1

Drawing Instruments and their uses:
Letters and numbers (single stroke vertical), Convention of lines and their applications.
Scale (reduced, enlarged & full size) plain scale and diagonal scale. Sheet layout. Introduction to CAD (Basic draw and modify Command). Geometrical constructions.

Unit 2

Engineering   curves & Loci of Point:
2.1   To draw an ellipse by :
2.1.1   Directrix and focus method
2.1.2   Arcs of circle method.
2.1.3   Concentric circles method.

2.2   To draw a parabola by :
2.2.1   Directrix and focus method
2.2.2   Rectangle method

2.3   To draw a hyperbola by :
2.3.1   Directrix and focus method
2.3.2   passing through given points with reference
                    To asymptotes.

2.3.3	Transverse Axis and focus method.
2.4	To draw involutes of circle & polygon (up to hexagon)
2.5	: To draw a cycloid, 21 picycloids, hypocycloid To
2.6	draw Helix & spiral.
2.7	Loci of Points:
2.7.1	Loci of points with given conditions and examples
	Related to simple mechanisms.

Unit – 3

Orthographic projections:

3.1	Introduction to Orthographic projections.
3.2	Conversion of pictorial view into Orthographic Views (First Angle Projection Method Only).
3.3	Dimensioning technique as per SP-46.

Unit – 4

Isometric projection :

4.1	Isometric scale.
4.2	Conversion of orthographic views into isometric View/projection (Simple objects)
4.3	Projection of Straight Lines and Planes. (First Angle Projection Method Only).

Unit – 5

| 5.1 | Lines inclined to one reference plane only and limited to both ends in One quadrant. |
| 5.2 | Projection of simple planes of circular, square, rectangular, Rhombus, pentagonal, and hexagonal, inclined to one reference plane And perpendicular to the other. |

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

COMPUTER   FUNDAMENTALS (DIP106)

Course Outcome:

I: **Know about the Computer origination, about its hardware and software and its applications.**

II: **Know about the Computer memory and Number system .**

III: **Know about the Operating System in computer and its commands.**

IV: **Know about word processors, Spreadsheet and database package.**

V: **Know concept of data communication and networking, communication and transmission.**

Computer Fundamentals (DIP106)

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, 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).

Unit -2
Input and Output Devices, Computer Memory: & Number System (Logic gates)
Primary Memory (ROM and its 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.
Introduction to Number System, Conversion of Number System, Signed and Unsigned Numbers, Binary Coding, Logic gates, Boolean algebra, Combination of Logic Gates.

Unit -3
Operating System Concept:
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

Unit -4
Editors and Word Processors 5 Basic Concepts: MS-Word, Introduction to desktop publishing Spreadsheets and Database packages: Purpose, usage, commands - MS-Excel Creation of files in MS-Access, MS – PowerPoint

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

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

SEMESTER–2								
THEORY		**PERIOD**			**EvaluationScheme**			**Credit**	**Hours**
SUBJECTCODE	NAMEOFTHE PAPER	LECTURES	TUTORIALS	PRACTICALS	MSE	ESE	SUB-TOTAL		
DIP201	CommunicationSkills-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
DIP206L	Basic Workshop Practice	0	0	2	30	70	100	2	2
DIP207L	ED LAB	0	0	2	15	35	50	2	2
DIP208L	Chemistry LAB	0		2	15	35	50	2	2
							TotalCredits:	28	

COMMUNICATION SKILLS-II (DIP201)

Course Outcome:
I : Know about the elements of communication: sender-message–channel- Receiver –   Feedback & Context
II: Know about the types of communication.
III: Know about the Effective Communications like knowing the audience and their feedbacks.
IV: Know about the Non-verbal graphic communications.
V: Learn to write letters like complaint letter, order letter, accident and Investigation letter writing.

Communication Skills-II (DIP201)

Unit -1

Introduction to communication:
Definition, Communication Cycle/Process, The elements of communication: sender-message–channel Receiver –Feedback & Context. Definition of Communication Process. Stages in the process: defining the context, knowing the audience, designing the message, encoding, selecting proper channels, transmitting, receiving, decoding and giving feedback.

Unit -2

Types of communication:
Formal- Informal, Verbal- Nonverbal, Vertical- Horizontal- Diagonal.

Unit – 3

Principals of effective communication:
Definition of Effective Communication. Communication Barriers &how to overcome them. Developing effective messages: Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers & facilitating feedback.

Unit – 4

Non verbal- graphic communication:
 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.

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Unit – 5

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Formal written skills:
Office Drafting: Circular, Notice , and Memo. Job Application with resume. Business correspondence: Enquiry, Order letter, Complaint letter, and Adjustment letter. Report writing: Accident report, fall in production, Progress/ Investigative. Defining & describing objects & giving Instructions

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Text Books:-

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Tiles 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 House	Foundation Publishing
(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.

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Engg.Mathematics-I (DIP202)

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Course Outcome:
I: Know about the functions and limits and their uses.
II: Know about the different types of derivative functions.
III: Know about the Statistics And Probability.
IV: Know about the nApplications OF Derivative and complex number.
V: Learn to Numerical Solution of Algebrai cEquations

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Engg. Mathematics-I (DIP202)

Unit -1

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Function and Limit:
Function, Definitions of variable, constant, intervals such as open, closed, semi-open etc.
Definition of Function, value of a function and types of functions, Simple Examples.
Limits. Definition of neighborhood, concept and definition limit. Limits of algebraic, trigonometric, exponential and logarithmic functions with simple examples.

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Unit -2

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Derivatives:
Definition of Derivatives, notations. Derivatives of Standard Functions Rules of Differentiation. (Without proof).Such as Derivatives of Sum or difference, scalar multiplication, Product and quotient. Derivatives of composite function (Chain rule) , Derivatives of inverse and inverse trigonometric functions. Derivatives of Implicit Function. Logarithmic differentiation Derivatives of parametric Functions. Derivatives of one function w.r.t another function,
Second order Differentiation.

Unit – 3

Statistics and Probability:
Statistics, Measures of Central tendency (mean, median, mode) for Ungrouped and grouped frequency distribution. Graphical representation (Histogram and Ogive Curves) to find Mode and median. Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation. Comparison of two sets of observations. Probability Definition of random experiment, sample space, event, Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely). Definition of Probability, addition and multiplication theorems of Probability

Unit – 4

Applications of Derivative
Geometrical meaning of Derivative, Equation of tangent and Normal. Rates and Motion. Maxima and minima, Radius of Curvature, Complex number, Definition of Complex number. Cartesian, polar, Exponential forms of Complex number. Algebra of Complex number (Equality, addition, Subtraction, Multiplication and Division) , De- Moivre's theorem (without proof) and simple problems. Euler's form of Circular functions, hyperbolic functions and relations between circular & hyperbolic functions

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)

Course Outcome:
I: Know about the Rectilinear motion and angular motion and their velocity time graphs.
II: Know about Kinetics and work, power and energy.
III: Know about the Nondestructive testing of materials and their different methods used.
IV: Know about the the factors affecting planning of auditorium, sound insulation and noise pollution.

V: Know about the acoustics and indoor lighting of buildings

Applied Science (DIP203)

(A) PHYSICS

Unit-1
1. Kinematics , Rectilinear Motion, Equations of Motions- $v = u+at$, $S = ut+1/2at2$, $V2 = u2+2as$ (only equation), Distance traveled by particle in nth second, Velocity Time Diagrams-uniform velocity, uniform acceleration and uniform retardation, equations of motion for motion under gravity. Angular Motion 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 nth 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.

Unit-2
2. Kinetics, 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.
 Work, Power, Energy 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. Testing 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. Working, Advantages, limitations, Applications and Application code of following N.D.T. methods - Penetrant method, Magnetic particle method, Radiography, Ultrasonic, Thermographs .

Unit -4
Acoustics and Indoor Lighting of Buildings
Acoustics, 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. Indoor lighting ,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.

Text/Reference Books :-

Tiles 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) Physics   Resrie and Holliday -

(v) Concept of Physics Part-I, II   H.C. Verma -

(vi) Applied science   Roshan Kr. Sinha   Foundation Publishing
                                                                          House

Course Outcome:
I: Know about the Electrochemistry, electrolysis and conductor, metallic and electrolytic conduction.
II: Know about the non-metallic engineering materials.
III: Know about the metals and different types of alloys.
IV: Know about the corrosion, galvanization and electroplating of metals
V: Know about the metallurgy of iron different process involved in it .

(B) CHEMISTRY

Unit -1

Electrochemistry
Definition of Electrolyte & Conductor, Difference between Metallic& Electrolytic Conduction, Ionization,
Degree of Ionization & Factors Affecting Degree of Ionization, Conductivity of Electrolytes. 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. Industrial Application of Electrolysis – Metallic or
Protective Factors for Selection of Method of Coating, Process of Electroplating, Electro refining,
Electrometallurgy (Applications of Electroplating), Impregnated Coating or Cementation on Base Metal
Steel - Coating Metal Zn (Sheradizing),Cr (Chomozing), Al (Colorizing), Applications, Advantages &
Disadvantages.

Unit -2

Non Metallic Engineering Materials (Plastic, Rubber, Insulators, Refractories, Composite Material,
Ceramics). 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.
. Ceramics: Definition, Properties & Engineering Applications, Types – Structural Ceramics, Facing
Material, Refractories, Fine Ceramics, Special Ceramics.. Refractories:Definition, Properties, Applications
& Uses of Fire Clay, Bricks, Silica Bricks. Composite Materials:
Definition, Properties, Advantages, Applications & Examples.

Unit -3

Metals & Alloys 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. 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. Non-Ferrous Alloys – Copper Alloy –Brass, Bronze, Nickel Silver or German Silver,
their Composition, Properties & Applications, Aluminum Alloy – Duralumin, Bearing Alloy – Babbitt
Metal, Solders – Soft Solder, Brazing Alloy, Tinamann's Solder, Nickel Alloy – Monel Metal, Low Melting
Alloys – Woods Metal

Engg. Mechanics (DIP204)

Course Outcome:

I: Know about the force and its units and types, moment of force and resolution of force.

II: Know about the equilibrium of concurrent and non-concurrent and parallel forces?

III: Know about the friction and its types and their applications.

IV: Know about the Centroid and Centre of gravity.

V: Know about the uses of simple machines in our daily life and their mechanism.

Engg. Mechanics (DIP204)

Unit 1

Force

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.
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.
c. Resolution of a force: Definition, Method of resolution, Types of component forces, Perpendicular
components and Non perpendicular components.
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.
e. Force system: - Definition, classification of force system according to plane and line of action
 f. Composition of Forces: - Definition, Resultant force, methods of composition of forces, I – Analytical
method:– (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of
resolution), 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.

Unit -2

Equilibrium:

Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram.
Lami's Theorem – statement and explanation, Application of Lami's theorem for solving various engineering problems. Equilibrant – Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system.. 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.

Unit – 3

Friction:

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 co eff. Of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. Equilibrium of bodies on level plane –external force applied horizontal and inclined up and down. Equilibrium of bodies on inclined plane – external forces is applied parallel to the plane, horizontal and incline to inclined plane. Ladder friction, Wedge and block.

Unit – 4

Centroid and Centre Of Gravity:

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. 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.

Unit – 5

Simple Machines:

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. 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.

Text Books :-

Titles of the Book	Name of Authors.	Name of the Publisher
Engineering Mechanics	Beer-Johnson	Tata McGraw Hill, Delhi
Engineering Mechanics	Basu	Tata McGraw Hill, Delhi

| Vector Mechanics for Engineers Vol. - I & II | Joslph F. Shelley | Tata McGraw Hill, Delhi |
| Engg. Mechanics | Ram Manohar Pandey | Foundation Publishing House |

Engg. Drawing(DIP205)

Course Outcome:

I: Know about the Conversion of pictorial view into sectional orthographic views.

II: Know about the Orthographic views-simple components First Angle Projection Method only.

III: Know about the isometric projections on plane surfaces.

IV: Know about the projections of solids and sections of solids.

V: Know about the the development of surfaces and free hand sketches.

Engg. Drawing (DIP205)

Unit -1

Sectional Views.

Types of sections, Conversion of pictorial view into sectional orthographic views (First Angle Projection Method only)

Unit -2

Missing Views.

Draw missing view from the given Orthographic views - simple components (First Angle Projection Method only)

Unit – 3

Isometric Projection

Conversion of Orthographic Views into Isometric view/projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces).

Unit – 4

Projections of Solids.

Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other.

Unit – 5

Sections of Solids.

Solids:-Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube. Cone, Pyramid and Tetrahedron resting on their base on Horizontal Plane. Prism, Cylinder:-a)Axis parallel to both the reference plane b) Resting on their base on HP. Section plane inclined to one reference plane and perpendicular to other.

Unit – 6

Developments of Surfaces.

Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such astray, funnel, Chimney, pipe bends etc.

Unit – 7 Free Hand Sketches of nuts, bolts, rivets, threads, and split pin, foundation bolts,Text **Free Hand Sketches** of nuts, bolts, rivets, threads, and split pin, foundation bolts,

Text Books:-

Titles 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.
- (iv) Machine Drawing	N.D. Bhatta	Charotkar Publishing House

CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	MSE	ESE	SUB-TOTAL	credit	Hours
DIP301	Engineering Mathematics-II	4	0	0	30	70	100	4	
DIP3ME02	Mechanical Engineering Drawing	1	0	3	30	70	100	4	4
DIP3ME03	Mechanics of Solid	4	0	0	30	70	100	4	4
DIP3ME04	Mechanical Engineering Material	4	0	0	30	70	100	4	4
DIP3ME05	Electrical Engineering	4	0	0	30	70	100	4	4
DIP3ME06L	Machine shop lab	0	0	2	15	35	50	2	4
									2
DIP3ME07L	Mechanics of solid lab	0	0	2	15	35	50	2	
							Total credit:	24	

Semester -3

Course-1   Course Title: Applied Mathematics

Course Outcomes:
CO-1   **Students will be able to apply the knowledge of solving 1st order & 1st degree differential equations in finding orthogonal trajectories of families of curves, Growth & Decay problems**
CO-2   **Student will be able to find the solution of initial value problems and be able to evaluate improper integrals of particular kind by using Laplace Transforms**
CO-3   **Students will be able to apply the concepts of Maxima and Minima for finding extreme values**
CO-4   **Student will be able to formulate and solve P.D.E and be able to apply the knowledge in finding the solutions of one dimensional wave equation and one dimensional heat equation**

...APPLIED   MATHEMATICS--I

Unit-01
Definition of Integration as anti-derivative, Integration of Standard function. Definition of Integration as anti-derivative. Integration of Standard function. Rules of integration (Integrals of Sum, difference, scalar multiplication). Methods of Integration. Integration by substitution Integration of rational functions. Integration by partial fractions. Integration by trigonometric transformation. Integration by parts..

Unit-02.
Definite Integration. Definition of Definite integral. Properties of definite integral with simple problems. Applications of definite integrals. Area under the curve. Are abounded by two curves, Volume of revolution. Centre of gravity of a rod, plane lamina. Moment of Inertia of uniform rod, rectangular lamina, Theorems of parallel and perpendicular axes. Differential Equation Definition of differential equation, order and degree of differential equation. For motion of differential equation for function containing single constant. Solution of differential equations of first order and first degree such as variable separable type, reducible to Variable separable, Homogeneous, No homogeneous, Exact, Linear and Bernoulli equations. Applications of Differential equations. Rectilinear motion (motion under constantan variable acceleration) Simple Harmonic Motion.

Unit-03
Probability Distribution, Binomial distribution, Poisson's distribution. Normal distribution, Simple examples corresponding to production process.

Unit-04
Numerical Methods Solution of algebraic equations Bisection method, Regular false method and Newton – Rap son method. Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method. Iterative methods- Gauss Seidal and Jacobi's methods

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

Course-2   Course Title: Mechanical Engineering Drawing

Course Outcomes:
CO-1 Student will be able to construct regular polygons, conic curves and simple scales
CO-2 Student will be able to draw orthographic projections of points, lines, planes and solids
CO-3 Student will be able to produce isometric projection from orthographic projections & vice
co -4   student   will able to understand   and can draw projection of different types of thread and nut which will help them in factory
Co-5 Student will be able to draw different views of coupling   and bearing which will help them in solving industrial problem.

MECHANICAL ENGINEERING DRAWING

(MECHANICAL ENGINEERING GROUP)

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. 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

UNIT- 02
Couplings Split muff coupling, protect ted type flanged coupling, pin (bush) type Flexible coupling, Oldham's coupling and universal coupling(Hooke's Joint)

UNIT - 03
Key & Joints:

Parallel key, taper key, feather key, Gib head key and Wood ruff key Riveted joint: Single and double riveted lap joints, Butt joints, with Single/Double covers Straps (chain and zigzag, using snap head rivets. Cotter joint (socket and spigot), knuckle joint (pin joint) for two rods.

 UNIT -03
Thread forms: thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and Acme. Sellers thread, American Standard thread.
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

UNIT- 04
Details to Assembly
Introduction- Couplings–Universal couplings& Oldham's Coupling Bearing–Foot Step Bearing & Pedestal Bearing, Lathe tool Post Machine vice & Pipe Vice, Screw Jack, Steam Stop Valve.

UNIT -05
Assembly to Details
Introduction– Pedestal Bearing, Lathe Tail Stock, Drilling Jig, Piston & Connecting rod, Gland and Stuffing box Assembly, Valve–Not more Than eight parts, Fast & loose pulley.

Text/ Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Machine Drawing	N.D.Bhatt	Charotar Publication, Anand
Code of practice for engineering drawing.	IS Code SP 46 (1988)	Engineering Drawing Practice general for School and colleges

Course-3   Course Title: Mechanics of solid

Course Outcomes:
CO-1 Design structural members given the dimensions, material properties such as force-displacement relationships, boundary conditions, loading, allowable stresses, and factor of safety
 CO-2 Determine the bending, compressive, tensile strength, torsional strength of the Material.
 CO-3 Draw the Shear force and bending moment diagrams for various beams under different loading conditions, selection of beam for a given application
 CO-4 Determine the stresses developed in thin and thick cylinders for given pressure (internally or externally)

CO-5 Determine the deflections of beams under various loading conditions (Double integration and Macaulay's methods

MECHANICS OF SOLIDS

(MECHANICAL ENGINEERING GROUP)

UNIT- 01
Mechanical Properties of Materials, Simple stresses & Strains Types of loads, Simple stresses & strains viz. tensile, compressive, Shear, Crushing, Thermal stresses, Hoop stresses & corresponding Strains, Volumetric Strain, Bulk modulus, Hook's law, Young's
Modulus, Modulus of Rigidity, stress-strain curves for ductile & brittle Materials, Poisson's ratio. Concept of stresses & strains in thin cylindrical & spherical shells, Subjected to internal pressure. Concepts of Buckling – Rankin's & Euler's formulae for buckling Load for columns/shafts under compression, concepts of equivalent Length for various end conditions. Concepts of Deflection & slope of beams–relation between bending Moment & slope. Deflection of simply supported beams and cantilever Beams subjected to point load.(No derivation) (Problems on compressive & tensile stresses, Thermal stresses, butt &lap riveted joints, simple cases of buckling).

UNIT- 02
Strain Energy
Concept, derivation & use of expression for deformation of axially Loaded member sunder gradual, sudden & impact load. Strain energy due to self-weight.

UNIT -03
Bending Moment & Shear Force Shear force, bending moment &relation between them.
Shear force & bending moment diagrams for simply supported beam & Cantilevers subjected to point loads & uniformly distribution load, Concept of Uniformly varying load & couples acting on beam Location of point of contra flexure. (Problems to be based on simply supported & cantilever beams with Point load & UDL only)

UNIT -04
Moment of Inertia
Definition of Moment of inertia, Moment of inertia of different Lamina, radius of gyration. Parallel & perpendicular axis theorem.
Moment of inertia of rectangular, circular, semicircular. Triangular, Hollow Rectangular, symmetrical-Section, Channel section, Tee- section, angle section about centroidal axis. Polar moment of inertia

UNIT- 05
Bending & Shear stresses Theory of simple bending, equation of bending. Assumptions in the theory of bending, moment of resistance, section Modulus & neutral axis. Shear stresses–concepts of direct & transverse shear stress.

UNIT -06
Combination of Bending & Direct stresses
Axial load, eccentric load, direct stresses, bending stresses maximum & minimum stresses. Application of the above concepts for machine parts such as offset links, C-clamp, Bench vice, Drilling machine frame, stresses at base of a short column, condition for no tension at extreme fibers, total stress variation diagrams.(Simple problems on above applications)

UNIT- 07
Principal Planes & Principal Stresses
Definition of principal plane &principal stresses. Expression for normal and tangential stress, maximum shear stress. Stresses on inclined planes. Position of principal planes & planes of maximum shear. Graphical solution using Mohr's circle of Stresses

UNIT- 08
Principal Planes & Principal Stresses Definition of principal plane &principal stresses. Expression for normal and tangential stress, maximum shear stress. Stresses on inclined planes. Position of principal planes & planes of maximum shear. Graphical solution using Mohr's circle of Stresses

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Strength of Material	G.H.Ruder	ELBS with Macmillan third edition
Materials Science	G.K.NarulaK.S.Narula	Tata McGraw hill New Delhi
Mechanics of Solids	Roshan Sinha, Pradeep Kumar	Foundation Publishing

Course-4   Course Title: Mechanical Engineering Materials

Course Outcomes:
CO-1 Student can distinguish between different kinds of materials and classify them according their applications
CO-2 Enable to take adequate decision about heat treatment.
CO-3   Latest techniques of heat treatment applicable for non ferrous alloys.
CO-4 Different   processing techniques involved in modern materials.
CO-5   student will know about different types of plastic and their application.

MECHANICAL ENGINEERING MATERIALS
(MECHANICAL ENGINEERING GROUP)

UNIT -01
Engineering Materials and their Properties Introduction, Classification and Application of Engineering materials, I.S specification of materials like plain carbon steel, Grey Cast iron, low
Alloy steels & bearing Materials. Properties of metals Physical Properties– Structure, Density, Melting point. Mechanical Properties– Strength, elasticity, ductility, malleability, plasticity, toughness, Hardness, harden ability, brittleness, fatigue, thermal conductivity, electrical conductivity, thermal coefficient of linear expansion , Introduction to Corrosion, types of Corrosion, Corrosion resisting Materials.

UNIT- 02
Ferrous Metals and Alloys Characteristics and application of ferrous metals
Phase equilibrium diagram for Iron and Iron Carbide. Flow diagram for production of Iron and Steel, Classification, Composition and uses of cast iron, effect of sulphur, silicon and
Phosphorous. Classification, composition and application of low carbon steel, medium
Carbon steel and high carbon steel with their chemical composition. Alloy Steels:-Low alloy steel, high alloy steel, tools steel &stainless Steel. Effect of various alloys in elements such as–Chromium, nickel, Manganese, molybdenum, tungsten, vanadium. Tool Steels:-High speed Steels (HSS), Hot & cold Working dies, shear, Punches etc., properties & applications.
Magnetic materials:-Properties & Applications of commonly used Magnetic materials (Permanent magnets and temporary magnets). Special Cutting Tool Materials–Diamond, Stelites & Tungsten Carbide.

UNIT -03
Non Ferrous Metals and Alloys Properties, applications & chemical compositions of Copper alloys (Naval brass, muntz metal, Gun metal &bronzes), Aluminum alloys (Y alloy & duralumin) & bearing materials like white metals, leaded Bronzes & copper lead alloys. Desired properties of bearing materials.

UNIT -04
Heat Treatment of Steels
Introduction to Heat treatment processes such as Annealing, subcritical Annealing, Normalizing, Hardening, Tempering (Aus tempering and Mar tempering)-Principle, Advantages, limitations and applications. Surface Hardening-Methods of surface hardening, I) case hardening ii)
Flame Hardening, iii) Induction Hardening, IV) Nitriding, v) Carburizing - Principle, advantages, limitations and applications

UNIT -05
Non Metallic Materials
Polymeric Materials – Introduction to Polymers- types, characteristics, Properties and uses of Thermoplastics, Thermosetting Plastics & Rubbers. Thermoplastic Plastics - characteristics and uses of ABS, Acrylics, Nylons and Vinyl's Thermosetting Plastics - Characteristics and uses of polyesters, Epoxies, Melamine's & Bakelite's. Rubbers–Neoprene, Butadiene, Buna & Silicons–Properties & applications. Properties and applications of following Engineering Materials – Ceramics, Abrasive, Adhesive and Insulating materials such as Cork, Asbestos, Thermocole and Glass Wool. Introduction to Composite Materials – Laminated & Fibre reinforced Materials- Structure, Properties & Applications.

UNIT- 06

Powder Metallurgy & Nondestructive Testing 6.1Advantages, limitations and applications of Powder Metallurgy for Engineering products. Brief Description of Process of Powder Metallurgy – Powder making, Blending, compacting, sintering, infiltration & impregnation. Applications of Powder metallurgy for tungsten carbide tip tools & Porous bearing. Importance of Non-destructive testing, Difference between Destructive and Non destructive testing. Non destructive testing methods-Radiography (X-Ray &Gamma Ray), Ultrasonic crack detection, Dye penetrant test, Magnaflux test – Comparison & applications.

Text/Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Material Science And Metallurgy	Dr.V.D. Kodgire	Everest Publishing House [1990]
Mechanical Engineering Materials	R.M. Pandey, Umesh Kumar	Foundation Publishing
Introduction to Physical metallurgy	Sidney H. Avner	Tata Mc Graw Hill edition (2nd)

Course-   *Course Title: Electrical Engineering*

Course Outcomes:

CO-1 Student will be able to select suitable motor for a particular application.
CO-2 Student will be able to design and analyze the performance of dc and ac machines.
CO-3 Will be able to select a suitable device for a required application
CO-4 Will be able to determine different parameters and different ranges of operation
 CO-5 Will be able to design and analyze the performance of a rectifier for a required application

ELECTRICAL ENGINEERING
(MECHANICAL ENGINEERING GROUP)

UNIT -01
Introduction to Electrical power supply system Generation, Transmission, Distribution & Utilization. AC supply & DC supply

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

UNIT- 03

Three phase supply: Star & Delta circuit, Line & Phase relationship, power equation.

UNIT -04
Measuring Instruments: Introduction to construction, operation and use of AC & DC ammeter, voltmeter, Electro dynamic Wattmeter, energy meter & Digital multimeter, Clip on meter.

UNIT- 05
DC Motor: Construction and principle of operation. Speed torque characteristics. Types, specifications & ratings and applications. Types of insulation used.

UNIT- 06
A.C. Machines: Transformer: Construction and principle of operation. EMF. Equation and transformation ratio. Load test, efficiency and regulation. Specifications & rating. Auto transformer &3phase transformer concept only. Applications of transformers. AC motor: Construction and principle of operation of 3 phase induction motor. Speed torque characteristics, slip, speed control (VFD), reversal of rotation, starters. Single phase motor, universal motor, stepper motor & servomotor. Motor specification & ratings. Applications of these motors in various fields. Testing of motors. Alternator: Construction, principle of operation & applications .Self and Separate excitation. Synchronous Motor: - Construction, principle of operation, methods of starting & Applications

UNIT -07
Utilization of Electrical Energy
Industrial applications: Classification of drives, factors for selection of Motor for different drives, Enclosures & Mountings Electric heating & welding: Working principle & types selection of system, Specifications & rating. Electrometallurgical & Electro Agro Systems: Concept & principle used in electroplating, Electrical machines used in electro-agro systems (irrigation pumps)

UNIT- 08
Electric wiring & Illumination: Simple Electric Installations with 2sockets , 2fans, 2 lamps, fuses. Introduction to different accessories like MCCB, ELCB, RCCB, Wires & cables. Different types of lamps their specifications

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.

Text/Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Electrical Technology	E. Hughes	ELBS
Electrical Technology Vol I To IV	B. L. Theraja	S. Chand
Electrical Engineering	K.D. Joshi	Foundation Publishing

SEMESTER - 4				
THEORY		**PERIOD**		
			Evaluation	

CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	MSE	ESE	Scheme SUB-TOTAL	credit	Hours
DIP4ME01	THEORY OF MACHINES & MECHANISMS	4	0	0	30	70	100	4	4
DIP4ME02	Fundamentals of Electronics	4	0	3	30	70	100	4	4
DIP4ME03	Production Processes	4	0	0	30	70	100	4	4
DIP4ME04	Thermal Engineering	4	0	0	30	70	100	4	4
DIP4ME05	Fluid Mechanics & Machinery	0	0	4	30	70	100	4	4
DIP4ME06L	Fluid mechanics lab	0	0	2	15	35	50	2	2
DIP4ME07L	MANUFACTURING TECHNOLOGY LAB	0	0	2	15	35	50	2	2
							Total credit:	24	

Semester-IV

Course-1   Course Title: Theory of machines &Mechanism

Course Outcomes:

 CO-1 The students will be able to identify and differentiate different types of pairs and their usage in different types of mechanisms in achieving a desired motion

CO-2 The students will be able to enunciate concepts behind mechanisms which produce straight line motion, steering mechanisms and universal joint

CO-3 The students will be able to draw velocity and acceleration diagrams of various mechanisms.

CO-4 The students will be able to enunciate different types of cam and followers, their design and practical application.

CO-5 The students will be able to enunciate different types of gears, their terminology and practical application

THEORY OF MACHINES & MECHANISMS
(MECHANICAL ENGINEERING GROUP)

UNIT -01
Fundamentals and types of Mechanisms:
Kinematics of Machines: - Definition of Kinematics, Dynamics, Statics, Kinetics, Kinematic link, Kinematic Pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine and structure. Inversions of Kinematic Chain: Inversion of four bar chain, coupled wheels of Locomotive & Pento graph. Inversion of Single Slider Crank chain-Rotary I.C. Engines mechanism, Whit worth quick return mechanism, Crank and Slotted lever quick return mechanism. Ackerman's Steering gear mechanism.

UNIT- 02
Velocity and Acceleration in Mechanism: Concept of relative velocity and relative acceleration of a point on link, angular velocity and angular acceleration, inter-relation between linear and angular velocity and acceleration. Drawing of velocity and acceleration diagram of a given configuration, Diagrams of simple mechanisms. Determination of velocity and acceleration of a point on link by relative velocity method Analytical method [no derivation] and Klein's construction to determine Velocity and acceleration of different links in single slider crank mechanism.

UNIT - 03
Cams and Followers: Concept, definition and application of Cams and Followers. Classification of Cams and Followers. Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation.Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method).

UNIT- 04
Power Transmission: Types of Drives–Belt, Chain, Rope, Gear drives &their comparison. Belt Drives-flat belt, V–belt & its applications, material for flat and V-belt, angle of lap, belt length. Slip and creep. Determination of velocity ratio, ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission (Simple numerical) Chain Drives – Advantages & Disadvantages, Selection of Chain & Sprocket wheels, methods of lubrication. Gear Drives – Spur gear terminology, types of gears and gear trains, their Selection for different application, methods of lubrication, Law of gearing. Rope Drives–Types, applications, advantages &limitations of Steel ropes.

UNIT -05
Flywheel and Governors: Flywheel- Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C. Engine (no Numerical). Coefficient of fluctuation of energy, coefficient of   fluctuation of speed and its significance.
Governors - Types, concept, function and application & Terminology of
Governors. Comparison between Flywheel and Governor.

UNIT- 06
Brakes, Dynamometers, Clutches & Bearings:
Function of brakes and dynamometer, types of brakes and Dynamometers, comparison between brakes and dynamometer. Construction and working of I) shoe brake, ii) Band Brake, iii) Internal
Expanding shoe brake IV) Disc Brake. Concept   of Self Locking &Self energizing brakes.
Numerical problems to find braking force and braking torque for shoe &band brake. Construction and working of I) Rope   Brake Dynamometer, ii) Hydraulic Dynamometer, iii) Eddy current Dynamometer. Clutches- Uniform pressure   and Uniform Wear theories.
Function of Clutch and its application, Construction and working of Single plate clutch, ii) Multi plate clutch, iii) Centrifugal Clutch iv) Cone clutch v) Diaphragm clutch. (No numerical on single and Multi plate clutch). Bearings – I) Simple Pivot, ii) Collar Bearing, iii) Conical   pivot. Torque & Power lost in friction (no derivation and numerical).

UNIT -07
Balancing &Vibrations: Concept of balancing. Balancing of single rotating mass. Graphical method for Balancing of several masses revolving in same plane.
Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies.

Text/Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Theory of machines	P.L.Ballaney	Khanna Publication
Theory of machines	TimoShenko	Wiley Eastern
Theory of machines	Jagdishlal	Bombay Metro –Politan book ltd.

Course-2   Course Title: fundamental of Electronics

Course Outcomes:

CO-1 The students will be able to analyze various types of electrical circuits

CO-2 The students will have ability to identify suitable machine for a particular application

CO-3 The students will have the ability to explain the working principle of different types of semiconductor devices

CO-4 The students will have the ability to explain the concepts of Communication Systems

CO -5 Students wil get knowledge about the various coder and encoder ,flip flop device which will help them in industrial application

FUNDAMENTALS OF ELECTRONICS

(MECHANICAL ENGINEERING GROUP)

UNIT- 01
Electronic Devices: Introduction to electronic devices, their symbols, principle of working And testing procedure– Diode, Zener diode, Power diode, Varactor Diode, Bipolar Junction Transistor(BJT),Field Effect Transistor(FET)- JFET & MOSFET,Uni- junction Transistor(UJT), power devices – DIAC,TRIAC, SCR, Photo devices-, LDR, Photodiode, Photo transistor, LED & LED display(7segment),Liquid crystal display(LCD),
optocoupler, thermister -NTC, PTC Power supply.

UNIT- 02
Circuit diagram and operation: Half wave, full wave & bridge rectifier. Filters – L, C, L-C, π filter Concept of unregulated power supply, regulated power supply-line Regulation & load regulation. Principle of operation, block diagram and Application of shunt regulated power supply, series regulated power Supply, switch mode power supply (SMPS), 3 pin IC regulated, IC 723 Adjustable power supply. Block diagram of UPS, Concept of online and off line UPS. Concept of constant current limiting and fold back current Limiting, concept of constant voltage source, constant current source

UNIT - 03
Transistor:
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. Power amplifier- class A, class B, class C, class AB, their comparison on Operating point, conduction cycle, efficiency, application. (No circuits
Expected) Oscillator: Requirement of oscillator circuit, Barkhauson's criteria of Oscillator, circuit diagram and its application-. Phase shift oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillator.

UNIT- 04
OP Amp : Block diagram, configurations and use of op amp as - Inverting, Noninverting, Summing, Voltage to current converter, current to voltage converter, differentiator, Comparator, Wien bridge oscillator, Schmitt's trigger, Instrument amplifier

UNIT- 05
Digital Electronics:

Number system- Decimal, Binary, Hexadecimal, BCD, Decimal to binary Conversion, Decimal – Hexadecimal conversion. Study of logic gates, Symbol, truth table and IC numbers - NOT, AND, OR, NAND, NOR, XOR, XNOR and NAND as universal gate. Flip Flops–Block diagram of flip flop, RS flip flop, D flip flop, Toggle, JK flip flop, Master Slave JK flip flop, Clocked flip flop – level triggered and edge triggered, Application of flip flop–Frequency divider,Ring counter, Shift register. Seven segment driving circuit, Encoder, Decoder, Multiplexer, Demultiplier.

UNIT- 06

IC 555: Block diagram, Multi vibrator circuit diagram and working for Mono stable, B is table and As table Multivibrator, Analog to Digital Converters, Digital to Analog converter.
Block diagram and working of–Welding control circuits–sequential Timer Temperature control circuits using SCR, FWR Speed control Circuits Level control circuit using variable capacitor and potentiometer.

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Electronic Principles	Paul Malvino	Tata McGraw Hill Publishers
Electronic Devices India	A. Mottershead	Prentice Hall of & Components'
Fundamentals of Electronics	Ashish K Majumdar	Foundation Publishing

Course-3   Course Title: Production   Processes

Course Outcomes:

CO-1 students will know about different types of machine like lathe machine, CNC machine ,drill machine etc..

CO- students will know about drill tool and their nomenclature.

 CO-3 Indicate which types of manufacturing process are suited to producing different shapes of product.

CO-4 Indicate which processes are likely to be used for producing a particular product using a specific material or class of material.

CO-5 Student able to know about different welding techniques for joining of different materials and can judge the type of welding to be done.

 CO-6 Outline the concept of surface engineering for improving the properties of a component

PRODUCTION PROCESSES
(MECHANICALENGINEERING GROUP)

UNIT -01
Turning:
Lathe: Angle calculations for taper turning Cutting tool nomenclature and tool signature. Cutting parameters and machining time calculation. CNC Lathe: Introduction, classification, advantages, positioning system, Constructional features. Part programming: programming format, word, statement, and block. Preparatory and miscellaneous code, fixed cycles in Programming – canned Cycle, do-loop, subroutine.

UNIT- 02
Drilling: Twist drill nomenclature. Cutting parameters, machining time
Calculation, Deep hole drilling.

UNIT- 03
Milling and gear cutting
Milling: Cutting parameters, machining time calculation, Milling operations – plain milling, side and face milling, form milling, gang milling, end milling, face milling, T- slot milling, slitting.
Gear cutting: Gear cutting on milling machine –Dividing head and Indexing methods Gear 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 .

UNIT- 04
Grinding: Classification of machines, Grinding wheel composition, types and shapes, Designation. Types of Grinding operations.

UNIT- 05
Super Finishing Processes Honing, Lapping, Burnishing, Buffing and polishing.

UNIT- 06
Plastic Moulding Types of plastic, Compression molding, Transfer Moulding, Injection moulding, blow molding, vacuum forming, extrusion, calendaring, rotational moulding.

Text/Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Production Technology Volume- I & II	O. P. Khanna & Lal	Dhanpat Rai Publications.
WorkshopTechnology-. Volume–I,II&III	W. A. J Chapman, S. J. Martin	Viva Books (p) Ltd.

Course-4   Course Title: Thermal   Engineering

Course Outcomes:

CO-1 Identify open and closed systems and analyze related problems which will help them to analyze problem in different power plant.

CO-2 Understanding the concepts such as work interaction, heat transfer and laws of thermodynamics, it will help them in designing nozzle ,boiler and various other equipment.

 CO-3 By understanding different laws and different process student will able to indentify various process going in thermal power plant.

 CO-4 Analyze the performance of gas and vapor power cycles and identify methods to improve thermodynamic performance

CO-5 By studying different types of boiler student will get knowledge under which condition which boiler should be chosen. it will help them in industry.

THERMAL ENGINEERING

(MECHANICAL ENGINEERING GROUP)

UNIT -01

Sources of energy, Brief description of energy sources Classification of energy sources, Renewable, Non-Renewable Fossil fuels, including CNG, LPG. Solar, Flat plate and concentrating collectors & its application. Solar Water Heater, Photo voltaic Cell,
Solar Distillation. Wind, Tidal, Geothermal, Biogas, Biomass, Biodiesel Hydraulic, Nuclear, Fuel cell – list of fuel cells

UNIT- 02
Fundamentals of Thermodynamics :
Concepts of pure substance, types of systems , properties of systems , Extensive and Intensive properties with units and conversion like P,V,R And temperature. Point function and path function.Work and Energy- Thermodynamic definition of work, heat, difference between heat and work, P.E., K.E, Internal Energy, Flow work,concepts of enthalpy, entropy.Laws of Thermodynamic- Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermodynamics, Kelvin Plank, Claudius statements and their equivalence, Concept of perpetual motion machine1and 2.Application of Thermodynamic laws - Steady Flow Energy equation and its application to open system like boiler, engine, nozzle, turbine,compressor & condenser.Application of Second law to Heat Engine, Heat Pump and Refrigerator.

UNIT- 03
Ideal Gases :
Concept of Ideal gas, Charle's law, Boyle's law, Avogadro's law, equation of state, Characteristic gas constant and universal gas constant. Ideal gas processes:- Isobaric, Isochoric, Isothermal, Adiabatic, Polytrophic, Isentropic with representation of the processes on P-V and T-S diagram (only simple numerical)

UNIT -04
Steam and Steam Boiler :

Generation of steam at constant pressure with representation on various charts such as T-H,T-S,H-S,P-H. Properties of steam and use of steam table, Quality of steam and its determination with Separating, throttling and combined Separating and throttling calorimeter (no numerical).

Vapour process :-constant pressure, constant volume, constant enthalpy, constant entropy (numerical using steam table and Mollier chart), Rankine Cycle.Steam Boilers:-Classification of boilers. Construction and working of Cochran, Babcock and Wilcox ,Lamont and Loeffler boiler. Boiler draught natural and Mechanical. Boiler mounting and accessories [to be covered in practical].

UNIT -05
Heat Transfer :
Modes of heat transfer:- Conduction, convection and radiation.Conduction by heat transfer Fourier's law, thermal conductivity,conduction through cylinder, thermal resistance, composite walls,combined conduction and convection (Simple numerical).Heat transfer by Radiation:- Thermal Radiation, Absorptive, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Boltz man law. Heat Exchangers:- Shell and tube, plate type, multi phase heat exchangers. Materials Used and applications of heat exchangers.

Course-5   Course Title: Fluid Mechanics and Machinery

 Course Outcomes:

CO-1 student will know about different properties of fluid which help them to select fluid for different application according to their properties.

 CO-2 student will know about different   measuring devices used for measuring fluid properties.

 CO-3 student will know about Venturimeter and orificemeter .so that they determine discharge rate and velocity of fluid while fluid is flowing..

CO-4   Estimate major and minor losses in different types of pipe flow

CO-5 Students will know about different types of turbine like pelton ,Kaplan etc.which help them in power plant.

CO-6 students will get knowledge about different types of pumps and their application

FLUID MECHANICS & MACHINERY
(MECHANICAL ENGINEERING GROUP)

UNIT- 01
Properties of fluid:
Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility

UNIT- 02
Fluid Pressure & Pressure Measurement: Fluid pressure, Pressure head, Pressure intensity, Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure. Simple and differential manometers, Bourdon pressure gauge. Concept of Total pressure on
immersed bodies, center of pressure. Note: Numerical on Manometers, Total Pressure & Centre of pressure

UNIT -03
Fluid Flow:
Types of fluid flows, Continuity equation, Bernoulli's theorem, Venturi meter – Construction, principle of working, Coefficient of discharge, Derivation for discharge through venturi meter.
Orifice meter –Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter
Pitot tube–Construction, Principle of Working
Note :- Numerical on Venturi meter, orifice meter, Pitot tube

UNIT- 04
Flow Through Pipes:
Laws of fluid friction(Laminar and turbulent), Darcy's equation and Chezy's equation for frictional losses. Minor losses in pipes, Hydraulic gradient and total gradient line., Hydraulic power transmission through pipe. Note: Numerical to estimate major and minor losses

UNIT- 05
Impact of jet :
Impact of jet on fixed vertical, moving vertical flat plates.
Impact of jet on curved vanes with special reference to turbines & pumps

UNIT- 06
Hydraulic Turbines : Layout of hydro electric power plant. Features of Hydro electric power plant. Classification of hydraulic turbines. Selection of turbine on the basis of head and discharge available Construction and working principle of Pelton wheel, Francis and Kaplan turbine. Draft tubes–types and construction, Concept of cavitation in turbines
Calculation of Work done, Power, efficiency of turbine.

UNIT- 07
A- Centrifugal Pumps: Construction, principle of working and applications. Types of casings and impellers.

B- Reciprocating Pump: Construction, working principle and applications of single and double acting reciprocating pumps.

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
A Course in Thermal Engineering	Domkundwar V. M.	Dhanpat Rai & Co.

| Heat Engine Vol. - I & II | Patel and Karmchandani | Acharya Publication |
| Thermal Engineering | B. K. Sarkar | Tata McGraw Hill |

		SEMESTER - 5							
THEORY		PERIOD						Evalutation Scheme	
CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	MSE	ESE	SUB-TOTAL	credit	Hours
DIP5ME01	Advanced Manufacturing Processes	4	0	0	30	70	100	4	4
DIP5ME02	Power Engineering	4	0	0	30	70	100	4	4
DIP5ME03	Environmental Pollution& Control	4	0	0	30	70	100	4	4
DIP5ME04	Metrology & Quality Control	4	0	0	30	70	100	4	4
DIP5ME05	Automobile Engineering	0	0	4	30	70	100	4	4
DIP5ME06L	Metrology & Quality Control Lab	0	0	2	15	35	50	2	2
DIP5ME07L	CIM & Automation Lab	0	0	2	15	35	50	2	4
							Total credit:	24	

Course-1   Course Title: Advanced Machining Processes

Course Outcomes:

CO-1 Students will be having a proper understanding on basic concepts and difference between conventional and unconventional machining process

CO-2   Gains domain knowledge on Abrasive and water jet machining Methods and their implementation in respective industry.

CO-3 Understand the application of electro chemical machining and their principles in practice.

CO-4 Understand the practical aspects of the industry by using the Electro discharge machining   and its principles

CO-5 Estimate the material removal rate and cutting force, in an industrially useful manner, for practical machining processes like electro beam and laser beam machining process.

CO-6 Gains the domain knowledge on use of plasma machining in various industries and its influence on cost

ADVANCED MANUFACTURING PROCESSES
(MECHANICAL ENGINEERING GROUP)

UNIT- 01
Non-traditional machining processes:
Electrical discharge Machining. Principle of working, Setup of EDM, Dielectric fluid, tools (electrodes), Process parameters, Output characteristics, Applications e.g. micro hole drilling, curve hole drilling.Wire cut EDM- Principle of working, Setup of WEDM, controlling
Parameters, Applications. 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) Other non-traditional machines such as ECM Principle of working, Applications.

UNIT- 02
CNC milling machines: Vertical and horizontal machining centre : Constructional features, Axis identification, Electronic control system. Automatic tool changer and tool magazine.
CNC programming: Preparatory functions (G code), miscellaneous functions (M code), Part programming including subroutines and canned cycles. Principles of computer aided part programminng

UNIT- 03
Machine Tool Automation: Introduction and Need:
Single spindle automates, transfer lines. Elements of control system, Limit switches, Proximity switches, Block diagram for feedback and servo control system, Introduction to PLC, Block diagram of PLC.

UNIT -04
Special Purpose Machines (SPM):

Concept, General elements of SPM, Productivity improvement by SPM, Principles of SPM design.

UNIT- 05
Maintenance of Machine Tools:
Types of maintenance, Repair cycle analysis, Repair complexity, Maintenance manual, Maintenance records, Housekeeping. Introduction to Total Productive Maintenance (TPM).

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	Narvasa Publishining House
Technology of Machine Tools.	Steve Krar, Albert Check	Mc-Graw-Hill International.
CAD/CAM Principals	P. N. Rao	Tata McGrow- Hill

Course-2   Course Title: Power   Engineering

Course Outcomes:

 CO-1 Able to understand the layout and functioning of steam power plant

 CO-2 Understand the working of Diesel and Gas turbine power plant.

 CO-3 Able to explain the working principle of different types of Hydro electric power plant.

 CO-4 Able to understand the working of Nuclear power generation and different types of reactors.

 CO-5 Able to explain the working of various non-conventional power generations.

 CO-6 Able to understand the economics of power generation and distribution

POWER ENGINEERING
(MECHANICAL ENGINEERING GROUP)
UNIT- 01
I.C. Engine:
Power Cycles - Carnot, Otto, Diesel, Dual, Brayton Cycle, representation on P-V, T-S diagram and Simple numerical on Otto cycle only. Classification of I.C. Engines Two stroke and four stroke Engines Construction and working, comparison, valve timing Diagram.Brief description of I.C. Engine combustion (SI & CI), scavenging, preignition, detonation, super charging, turbo charging, simple Carburetor, M.P.F.I., fuel injection pump.List of fuel, lubricant additives and their advantages.

UNIT -02
I.C. Engine Testing and Pollution Control:
Engine Testing - I.P., B.P. Mechanical, Thermal relative and volumetric efficiency, BSFC, Heat Balance sheet. Morse Test, Motoring test Pollution Control- Pollutants in exhaust gases of petrol and diesel engines, their effects on environment,

UNIT -03
AIR COMPRESSER:
Introduction, uses of compressed air, Classification of air compressors Definition: - Compression ratio, Compressor capacity, Free Air Delivered Swept volume, reciprocating air compressor, Construction and working of single stage and two stage compressor Efficiency: - Volumetric, Isothermal & Mechanical (only simple numerical) - Advantages of multi staging. 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

UNIT- 04
Gas Turbine And Jet Propulsion :
Classification and applications of gas turbine. Constant volume and constant pressure gas turbines. Closed cycle and open cycle gas turbines and their comparison. Methods to improve thermal efficiency of gas turbine- Regeneration, inter-cooling, reheating using T- Ø diagram (no analytical treatment). Jet Propulsion -Principles of turbojet, turbo propeller, Ram jet.

UNIT -05
Refrigeration and Air- Conditioning: Introduction, COP of Heat Pump
and refrigerator, Tonnes of Refrigeration.Vapour compression system- Vapour compression refrigeration cycle, components of Vapour Compression Cycle. Applications- Water Cooler
Domestic refrigerator, Ice plant & cold storage. Air conditioning systems- Definition of Air conditioning and classification of Air Conditioning Systems.

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	G.S. Bilgi	Dhanpat Rai and Sons

Course -3   Course Title: Environmental pollution & control

Course Outcomes:

CO-1 student should be able to decide the ambient air quality based on the analysis of air pollutant

CO-2 should be able to explain different types of wind mills for power generation and the biomass sources

CO-3 should be able to explain the generating of power from geothermal energy and ocean energy.

CO-4 should be able to explain about different direct energy conversion devices

CO-5 student should be able to judge the plume behavior in a prevailing environmental condition

CO-6 student should be able to design particulate and gaseous control measures for an industry

ENVIRONMENTAL POLLUTION & CONTROL
(MECHANICAL ENGINEERING GROUP)

UNIT -01
Introduction
Environment, Ecosystem, Classification of pollution & pollutants, Environment & pollution control acts, ISO 14OOO standards, Kyoto treaty / protocol, carbon units.

UNIT- 02
Air Pollution Part A Sources &classification of air pollution, Effects of air pollution on human health, Effects of air pollution on economy, Photochemical air pollution Air pollution from major Industrial operations e.g. Fertilizer industries aluminium manufacturing plants, Acid plants, Cement industries, Coal & Tar industries, paper industries, Refinery & petrochemical industries

Part B
Air pollution due to Auto mobiles-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

UNIT -03
Water Pollution
Sources of water pollution. Effects of water pollution. Water pollution analysis Physical examination of water, Chemical characteristics of water, Biological investigation of water Definitions of Important terms used in water pollution – Dissolved O2, Chemical O2 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

UNIT- 04
Noise Pollution

Definition of noise, Sources of noise Types of noise – Impulsive & sonic Noise, Effects of noise on health, Noise measurement, Noise mapping

UNIT- 05
Other Types of Pollution 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, Radiation pollution, Sources & effects of radiation, Radiation exposure standards, Radiation protection, Treatment & disposal of radiation waste Global pollution, Green house effect, Acid rain, Ozone depletion problem

Text / Reference Books:-

Titles of the Book	Name of Authors	Name of the Publisher
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.

Course-4   Course Title: Metrology &Quality Control

Course Outcomes:

 CO-1 Apply the fundamental principles of measurements and instrumentation methodology to solve practical problems related to experimental measurement and data analysis.

 CO-2 Demonstrate the working principles of various instruments and calibration methods.

 CO-3 Able to analyze the working of an instrument and error analysis.

 CO-4 Ability to understand the quality of performance and various other quality which help them to get knowledge how quality of final product being checked in industries..

CO-5 To understand the need of optical measuring instruments and how to operate the instruments

METROLOGY & QUALITY CONTROL
(MECHANICAL ENGINEERING GROUP)

UNIT -01
Introduction to metrology:
Metrology Basics- Definition of metrology, Categories of metrology, Scientific metrology,
Industrial metrology, Legal metrology, Need of inspection, Revision of (no questions be set)
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. 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. Limits, Fits,
Tolerances and Gauges Concept of Limits, Fits, And Tolerances, Selective Assembly,
Interchange ability, 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. Angular Measurement 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).

UNIT- 02
Threads and Gear Metrology:
Screw thread Measurements 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 methods, Thread gauge micrometer, Working principle of floating carriage dial
micrometer.Gear Measurement and Testing 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.

UNIT- 03
Testing Techniques:
Measurement of surface finish 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. Machine tool testing Parallelism, Straightness, Squareness, Coaxiality, roundness, run out, alignment testing of machine tools as per IS standard procedure.

UNIT- 04
Quality Control:
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.
Total Quality Management: Principles of total quantity management. Customer focus. Commitment by top management. Continuous improvement–PDCA, Quality Circles. Employee empowerment (JIDOKA). Quality Audit: Concept of audit practices, lead assessor certification. Six sigma: Statistical meaning, methodology of system Improvement, DMAIC cycle, Yellow belt, Green belt, Black belt certification. ISO 9000 Series & other standards: Concept, ISO 9000 series quality standards, QS14000, Standards in general, Its evaluation & Implications, necessity of ISO certification, other Quality systems.

UNIT -05
Elementary Statistics & it's application in quality control: Statistical Quality Control – Meaning and importance of SQC, Variable and attribute Measurement. control charts – inherent and assignable sources of variation, control charts for variables – X & R charts, control charts for attributes p, np, C charts

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 Engg.	Kaushik Berman	Foundation Publishing
Auto Mechanics	Harold T. Glenn	Bennett &Mckknight

Course-5   Course Title: Automobile Engineering

Course Outcomes:

CO-1 Identify automobile components and select the automobiles for different applications

CO-2 Select the appropriate fuel supply, cooling systems for a particular field of automobile

CO-3 understand different electrical systems & transmission systems used in proper functioning of automobile

CO-4 Identify the different suspension systems and braking systems for different automobiles

CO-5 Able to understand national and international standards of emissions and their control

CO-6 understand the various safety measures for automobiles,also understanding the different control system of automobile.

AUTOMOBILE ENGINEERING
(MECH. ENGG. GROUP)

UNIT- 01
Introduction of Automobile
Classification of automobiles, Vehicle layout & types 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.

UNIT- 02
Automobile Transmission Clutch- necessity, construction & working of coil spring & diaphragm spring type clutch. 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 Final drive- necessity, construction & working of propeller shaft & differential. Axle- Type of rear axles, front axles & their applications.

UNIT -03
Control Systems
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. Brake system- construction & working of hydraulic & Pneumatic brakes. Comparison of disc & drum brake.

UNIT- 04
Suspension systems, wheels & Tyres 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. 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

UNIT- 05
Automobile Electrical Systems & Body 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

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
Metrology & Quality Control	S.P. Singhal	Foundation Publishing

		SEMESTER - 6							
THEORY		**PERIOD**					**Evaluation Scheme**		
CODE	**NAME OF THE PAPER**	**LECTURES**	**TUTORIALS**	**PRACTICALS**	**MSE**	**ESE**	**SUB-TOTAL**	**credit**	**Hours**
DIP6ME01	**Industrial Fluid Power**	4	0	0	30	70	100	4	4
DIP6ME02	**Design Of Machine Elements**	4	0	0	30	70	100	4	4
DIP6ME03	**Management**	4	0	0	30	70	100	4	4
DIP6ME04	**Elective (Any One)**	4	0	0	30	70	100	4	4
DIP6ME05	**Project & Viva (Sip)**	0	0	2	30	70	100	4	4
							Total credi	**24**	

Course-1   Course Title:MANAGEMENT

Course Outcomes:

CO-1   Students will able to learn about different types of business and about india intellectual Property Rights.

CO-2   students will   learn about the various management process also about the administration ,Planning ,organizing ,directing etc

CO-3 students will learn about the organizational and department al management, about responsibility and ownership

Co-4 students will able to understand Human Resource Management   ,Skill Enhancement, Leadership & Motivation

Co-5 students will learn about financial management .so that they can manage the finance of any company.

MANAGEMENT (COMMON)

UNIT -01
Overview Of Business
Types of Business, Service, Manufacturing, Trade, Industrial sectors Introduction to Engineering industry, Process industry, Textile industry Chemical industry, Agro industry, Globalization Introduction Advantages &disadvantages w. r. t. India Intellectual Property Rights(I.P.R.)

UNIT -02
Management Process
What is Management?
Evolution, Various definitions, Concept of management, Levels of management, Administration & management, Scientific management by   F. W. Taylor, Principles of Management (14principles of Henry Fayol), Functions of Management, Planning, Organizing, Directing, Controlling

UNIT- 03
Organizational Management
Organization:- Definition, Steps in organization, Types of organization, Line, Line &staff, Functional, Project, Departmentation, Centralized &Decentralized, Authority &Responsibility, Span of Control, Forms of ownership, Propriotership, Partnership, Joint stock, Co-operative Society Govt.Sector

UNIT -04
Human Resource Management, Personnel Management, Introduction, Definition Functions, Staffing, Introduction to HR Planning, Recruitment Procedure, Personnel– Training &

Development, Types of training, Induction, Skill, Enhancement, Leadership & Motivation, Maslow's Theory of Motivation Safety Management, Causes of accident, Safety precautions Introduction to– Factory Act, ESI Act, Workmen Compensation Act, Industrial Dispute Act

UNIT- 05
Financial Management, Financial Management- Objectives &Functions Capital Generation &Management, Types of Capitals, Sources of raising Capital, Budgets and accounts, Types of Budgets, Production Budget (including Variance Report), Labour Budget Introduction to Profit &Loss Account(only concepts); Balance Sheet Introduction to– Excise Tax, Service Tax, Income Tax, VAT, Custom Duty

UNIT- 06
Materials Management Inventory Management (No Numerical), Meaning &Objectives, ABC Analysis Economic Order Quantity, Introduction & Graphical Representation, Purchase Procedure, Objects of Purchasing, Functions of Purchase Dept. Steps in Purchasing Modern Techniques of Material Management, Introductory treatment to JIT/SAP/ERP

UNIT- 07
Project Management (No Numerical), Project Management, Introduction &Meaning, Introduction to CPM & PERT Technique, Concept of Break Even Analysis, Quality Management, Definition of Quality, concept of Quality, Quality Circle, Quality Assurance, Introduction to TQM, Kaizen, 5'S', &6 Sigma

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	Jhamb& Bokil	Everest Publication , Pune
Management	Deepak Chandra	Foundation Publishing

Course-2   Course Title:DESIGN OF MACHINE ELEMENT

Course Outcomes:

CO-1 Able to deign curved beams such as crane hooks, machine frames and C- clamps.

CO-2 Able to design power transmission elements such as gears, belts, chains, pulleys and ropes.

CO-3 Able to select the suitable bearing based on the application of the loads and predicts the life of the bearing.

CO-4 Able to design engine parts such as cylinder, piston, connecting rod, crank shaft and gearbox.

CO-5 Able to design bolt, spring and fillet which can help them in industries.

DESIGN OF MACHINE ELEMENTS
(MECHENICAL ENGINEERING GROUP)

UNIT- 01
Introduction to Design, Machine Design philosophy and Procedures,
General Considerations in Machine Design 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 (Simple Numerical), Creep strain And Creep Curve, Fatigue, S- N curve, Endurance Limit., Factor of Safety and Factors governing selection of factor of Safety.
Stress Concentration–Causes & Remedies Converting actual load or torque into design load or torque using design Factors like velocity factor, factor of safety &service factor. Properties of Engineering materials, Designation of materials as per IS and introduction to International standards & advantages of Standardization, use of design data book, use of standards in design And preferred numbers series. Theories of Elastic Failures – Principal normal stress theory, Maximum Shear stress theory & maximum distortion energy theory.

UNIT- 02
Design of simple machine parts
Cotter Joint, Knuckle Joint, Turnbuckle Design of Levers: -Hand/ Foot Lever & Bell Crank Lever Design of C–Clamp, Off-set links, Overhang Crank, Arm of Pulley

UNIT- 03
Design of Shafts, Keys and Couplings and Spur Gears Types of Shafts, Shaft materials, Standard Sizes, Design of Shafts (Hollow and Solid)using strength and rigidity criteria, ASME code of design for line shafts supported between bearings with one or two pulleys in between.
Design of Sunk Keys, Effect of Keyways on strength of shaft. Design of Couplings–Muff Coupling, Protected type Flange Coupling, Bush-pin type flexible coupling. Spur gear design considerations. Lewis equation for static beam Strength of spur gear teeth. Power transmission capacity of spur gears in Bending

UNIT- 04
Design of Power Screws

Thread Profiles used for power Screws, relative merits and demerits of each, Torque required to overcome thread friction, self locking and overhauling property, efficiency of power screws, types of stresses induced. Design of Screw Jack, Toggle Jack.

UNIT- 05
Design of springs Classification and Applications of Springs, Spring–terminology, materials and specifications. Stresses in springs, Wahl's correction factor, Deflection of springs, Energy stored in springs. Design of Helical tension and compression springs subjected to uniform applied loads like I.C. engine valves, weighing balance, railway buffers and governor springs. Leaf springs – construction and application

UNIT- 06
Design of Fasteners Stresses in Screwed fasteners, bolts of Uniform Strength. Design of Bolted Joints subjected to eccentric loading. Design of parallel and transverse fillet welds, axially loaded symmetrical section, Merits and demerits of screwed and welded joints

Text / Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
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

Course-3

Course Title : Industrial fluid Power

Course Outcomes:

CO-1 Understand the hydraulics fluids and its properties.

CO - 2 Recognize the concepts of different hydraulic actuation elements.

CO-3. Understand the concepts of seals, filters and accumulators used in fluid system

CO- 4. Recognize the concepts of different hydraulic and pneumatic combination systems

CO- 5. Recognize and uses the different controls in pneumatics

CO- 6. Understand the concepts of different electrical controls in fluid power.

INDUSTRIAL FLUID POWER
(MECHENICAL ENGINEERING GROUP)

UNIT -01
Introduction to oil hydraulic systems : Practical applications of
hydraulic systems. General layout of oil hydraulic systems. Merits and
limitations of oil hydraulic systems.

UNIT- 02
Components of Hydraulic systems :
Pumps – Vane pump, gear pump, Gerotor pump, screw pump, piston Pump. Valves –
Construction, working and symbols of Pressure control valves – pressure relief valve, pressure
reducing, pressure unloading Direction control valves–oppetvalve,spoolvalve,3/2,4/2D.C.valves,
Sequence valves. Flow control valves – pressure compensated, non-pressure compensated flow
control valve. Actuators- Construction, working and symbols of Rotary Actuators – Hydraulic
motors. Linear Actuators – Cylinders - single acting, double acting. Accessories – Pipes, Hoses,
fittings, Oil filters, Seals and gaskets, Accumulators.(Types, construction, working principle and
symbols of all components)

UNIT- 03
Hydraulic Circuits : Meter in, Meter out circuits, Bleed off circuit, Sequencing circuit, Hydraulic
circuits for Milling machine, Shaper machine, Motion synchronization circuit.

UNIT- 04
Introduction to pneumatic Systems : Applications of pneumatic system, General layout of
pneumatic system, Merits and limitations of pneumatic systems

UNIT -05
Components of pneumatic system : Compressor–Reciprocating & Rotary compressors. Control
Valves – Pressure regulating valves, Flow Control valves, Direction Control Valves. Actuators–
Rotary-Air motors, Types, construction, working principle Linear-Cylinders-Types, construction
&working principle. Accessories – Pipes, Hoses, Fittings, FRL unit (Types, construction,
working principle and symbols of all components)

UNIT- 06
Pneumatic Circuits Speed control circuits. Sequencing circuits.

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
Hydraulics and Pneumatics	Stewart	Taraporewala Publication
Industrial Fluid Power	S. Laxmi kant	Foundation Publishing

Course Title : Material Handling Systems

Course Outcomes:

CO-1   Students will understand the material handling equipment

Co-2   Students will classify and understand the usage of material handling equipment

Co-3 students will understand how to connect   loading station with different discharge condition

CO -4 Will understand the usage of cranes ,ropes, steel wire in industries .

CO-5 will understand material handling system in industries.

ELECTIVE - (ANY ONE) –   (I) MATERIAL HANDLINGSYSTEMS
(MECH. ENGG. GROUP)
UNIT 01
Introduction to Material Handling System
Main types of material handling equipments& their applications, types Of load to be handled, types of movements, methods of stacking, loading & unloading systems, principles of material handling systems.

UNIT- 02
Hoisting Machinery &Equipments 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. Construction, working

&maintenance of different types of cranes such as rotary cranes, trackless cranes, mobile cranes, bridge cranes, cable cranes, floating cranes & cranes traveling on guiderails. Construction, working & maintenance of elevating equipments such as stackers, industrial lifts, freight elevators, passenger lifts, and mast type's elevators, vertical skip hoist elevators

UNIT -03
Conveying Machinery
Construction, working &maintenance of traction type conveyors such as belt conveyors, chain conveyors, bucket elevators, escalators. Construction, working & maintenance of traction less type conveyors such as gravity type conveyors, vibrating & oscillating conveyors, screw conveyors, pneumatic & hydraulic conveyors, hoppers gates& feeders

UNIT -04
Surface Transportation Equipment
Construction, function, working of trackless equipment such as hand operated trucks, powered trucks, tractors, AGV- Automatic Guided vehicle, industrial Trailers. Construction, function, working of cross handling equipment such as winches, capstans, Turntables, Transfer tables, monorail conveyors.

UNIT- 05
Components of material handling systems
Flexible hoisting appliances such as welded load chains, roller chains, hemp ropes, steel wire ropes, fastening methods of wire & chains, eye bolts, lifting tackles lifting & rigging practices. Load handling attachments. Various types of hooks-forged, triangular eye hooks, appliances for suspending hooks, Crane grab for unit & piece loads, Electric lifting magnet, vacuum lifter. Grabbing attachment for loose materials, Crane attachment for handling liquids/ molten metals Arresting gear & Brakes. Arresting gear – construction &working, Construction & use of electromagnetic, shoe brakes Thruster operated shoe brakes, control brakes.

UNIT- 06
Mechanism used in material handling equipment, Steady state motion, starting & stopping of motion in following mechanisms. Hoisting mechanism, Lifting Mechanism, Traveling Mechanism, Slewing Mechanism, Rope &chain operated Cross-Traverse Mechanism.

UNIT -07
Selection of material handling equipment
Factors affecting choice of material handling equipment such as type of loads, hourly capacity of the unit, direction & length of travel, methods of stock in get initial, final &inter mediate points, nature of production process, involved, specific load conditions & economics of material handling system.

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
Plant layout & materials handling	Apple j. M	JohnWiley Publishers.

Course Title: Refrigeration and Air Conditioning

Course Outcomes:

CO-1 student should be able to understand the need of Air refrigeration and its applications.

CO-2 student should be able to demonstrate the working of vapor compression refrigeration system CO-3 student should be able to identify and explain the components of refrigerating systems and refrigerants

CO-4 student should be able to demonstrate the working of vapor absorption refrigerating system

CO-5 student should be able to sketch different Psychometric Processes on psychrometric chart

CO-6 student should be able to explain the difference between summer, winter and year-round air conditioning systems

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

UNIT- 01
Basics of Refrigeration, Definition of refrigeration., Necessity of
Refrigeration Methods of refrigeration: - Ice refrigeration, Refrigeration by expansion of air Refrigeration by throttling of gas Vapour refrigeration system Steam jet, refrigeration system, Non-conventional methods of refrigeration like Vortex tube ,Pulse tube refrigeration, solar refrigeration, Concept of heat engine, heat pump and refrigerator. Unit of refrigeration, C.O.P. and refrigerating effect. Major application areas of R.A.C. like domestic, commercial and industrial.

UNIT- 02
Refrigeration Cycles
Reversed Carnot Cycle and its representation on PV and TS diagram. Air Refrigeration Cycles:- Bell Coleman air refrigerator, it's representation on PV and TS diagram, types and applications like air craft refrigeration using simple air cooling system. (Simple numerical on Reversed Car not cycle.) Vapour Compression Cycle(V.C.C):- principle, components, Representation on P-H and T-S diagram, effects of wet compression, dry compression, calculation of COP, Effect of

superheating, under cooling, suction pressure and discharge pressure, Actual V.C.C., (simple numerical), Methods of improving COP (no description).Introduction to multistage V.C.C., its necessity, advantages. Vapour Absorption system:- Principle, components and working of aqua- ammonia system (simple &practical), Li-Br Absorption System Electrolux Refrigeration System, Desirable properties of Refrigerant and absorbent used in Vapour Absorption System. Comparison of above Refrigeration Cycles.

UNIT- 03
Refrigerants, Classification of refrigerants. Desirable properties of refrigerants. Nomenclature of refrigerants. Selection of refrigerant for specific applications. Concept of Green House Effect, Ozone depletion, Global warming. Eco-friendly refrigerants like R-134a,hydrocarbon refrigerants etc.

UNIT 04
Equipment selection
Components of Vapour Compression Refrigeration System Compressors: - Classification, Construction and working of open type, hermetic, centrifugal, rotary, screw and scroll compressor and their applications. Condensers: - Classification, description of air cooled and water cooled condensers, comparison and applications, Evaporative condensers. Expansion devices: Types:-Capillary tube, automatic, thermostatic and their applications Evaporators and chillers:- Classification of evaporators Construction and working of Bare tube, Plate surface, finned, shell and tube, flooded and dry expansion evaporator. Capacity of evaporator and their applications, Classification of chillers, Construction and working of dry expansion Chillers and flooded chillers and their applications. Selection criteria for Vapour compression refrigeration system components for the following applications: Water coolers, ice plants, cold storage, domestic refrigerator

UNIT- 05
Psychometric, Definition and necessity of air conditioning., Properties of Air, Dalton's law of partial pressure, Psychometric chart, Psychometric processes, Bypass Factor, ADP, concept of SHF, RSHF, ERSHF,GSHF, Adiabatic mixing of Airstreams, Simple numerical using Psychometric chart, Equipments, used, for Air-conditioning like humidifier, dehumidifier, filter, heating and cooling coils.

UNIT- 06
Comfort conditions and cooling load calculations, Thermal Exchange of body with environment, Factors affecting human comfort, Effective temp. And comfort chart, Components of cooling load, sensible heat gain and latent heat gain source

UNIT 07
Air- conditioning systems, Classification of A.C. systems, Industrial And commercial A.C. systems, Summer, winter and year round A.C.systems, Central and unitary A.C.systems, Application areas of A.C.systems

UNIT 08
Air distribution systems Duct systems: - Closed perimeter system, extended plenum system,

Radial duct system, duct materials, requirement of duct materials, Losses in ducts, Fans and Blowers: - Types, working of fans and blowers Air distribution outlets: - Supply outlets, return outlets, grills, diffusers Insulation: - Purpose, properties of insulating material, types of Insulating materials, methods of applying insulation.

Text/ Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Refrigeration and Air Conditioning and Co	R.S.Khurmi	S.Chand
Refrigeration and Air Conditioning and Sons	Arrora and Domkundwar	Dhanpat Rai
Principles of Refrigeration Education	Roy Dossat	Pearson
Commercial Refrigeration Taraporevala Sons & Co	Edwin P. Anderson	

Course Title: CAD-CAM & AUTOMATION

Course Outcomes:

CO-1 generate 3D model from engineering drawings by using any 3D modeling CAD tool

CO-2 assemble number of 3D CAD parts as per the assembly drawing

CO-3 perform structural analysis by identifying appropriate elements, meshing and other tasks using FEA tool

CO-4 perform Thermal analysis by identifying appropriate elements, meshing and other tasks using FEA tool

CO-5 perform coupled field analysis by identifying appropriate elements, meshing and other tasks using FEA tool

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

UNIT -01
Introduction to CAD/CAM
Computers in industrial manufacturing. Product Cycle, CAD/CAM CAD / CAM hardware: - basic structure, CPU, Memory, I/O devices, Storage Devices and system configuration.

UNIT- 02
Geometric Modeling
Requirement of geometric modeling, Types of geometric models. Geometric construction method-sweep, solid modeling - Primitives & Boolean operations, free formed surfaces (Classification of surface only) (No numerical treatment).

UNIT- 03
Introduction to computer numerical Control
Introduction-NC, CNC, DNC, Advantages of CNC, The coordinate System in CNC, Motion control system-point to point, straight line, Continuous Path (Contouring). Application of CNC.

UNIT -04
Part programming Fundamentals, manual part programming, NC –Words, Programming format , part programming, use of subroutines and do loops, computer Aided part programming (APT).

UNIT- 05
Industrial Robotics
Introduction, physical configuration, basic robot motions, technical Features such as-work volume, precision and speed of movement, weight Carrying capacity, drive system, End effectors, and robot sensors. Application–Material transfer, machine loading, welding, spray coating.

UNIT- 06
Automation
Basic elements of automated system, advanced automation functions, Levels of automation. Flexible manufacturing system:-Introduction, FMS equipment, FMS application, Introduction to CIM.

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	New age

	M.Adithan	International (P) Ltd
Computer Aided design and Manufacturing	Groover M.P. & Zimmer's	Prentice hall of India
Computer Aided design and Manufacturing	Lalitnarayan, M. Rao	PHI
CAD-CAM & Automation	S.M. Kiran / S.P. Singh	Foundation Publishing