

SYLLABUS

DIPLOMA IN MECHANICAL ENGINEERING (DAY COURSE)

w. e. f. 2019

**UNIVERSITY POLYTECHNIC
FACULTY OF ENGINEERING & TECHNOLOGY
JAMIA MILLIA ISLAMIA
NEW DELHI-110025**

First Semester

S. No	Code	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods /Week
Theory Courses							
1	DMES-101	Communication Skills-I	4	40	60	100	4
2	DMEP-102	Applied Physics	4	40	60	100	4
3	DMEM-104	Applied Maths -I	4	40	60	100	4
4	DCE-105	Applied Mechanics	4	40	60	100	4
5	DME-106	Workshop Technology	4	40	60	100	4
Practical Courses							
1	DMEP-112	Applied Physics	2	30	20	50	2
2	DME-115	Applied Mechanics	2	30	20	50	2
3	DME-116	Workshop Practice-I	2	30	20	50	3
4	DME-117	Engg. Drawing-I	2	30	20	50	3
Total			28	320	380	700	30

Second Semester

S. No	Code	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods /Week
Theory Courses							
1	DMEM-201	Applied Maths-II	4	40	60	100	4
2	DMEC-202	Applied Chemistry	4	40	60	100	4
3	DEE-203	Elements of Electrical Engg.	4	40	60	100	4
	DME-204	Engg. Drawing-II	4	40	60	100	4
5	DME-205	Applied Thermodynamics	4	40	60	100	4
Practical Courses							
1	DMEC-212	Applied Chemistry	2	30	20	50	2
2	DEE-213	Elements of Electrical Engg	2	30	20	50	2
3	DME-214	W/S Practice-II	2	30	20	50	3
4	DME-215	Applied Thermodynamics	2	30	20	50	2
Total			28	320	380	700	29

Third Semester

S. No	Code	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods /Week
Theory Courses							
1	DEE-301	Electrical Technology	4	40	60	100	4
2	DME-302	Fluid Mechanics & Fluid Machines	4	40	60	100	4
3	DME-303	Thermal Engineering	4	40	60	100	4
4	DME-304	Machine Drawing	4	40	60	100	4
5	DCA-305	Computer Applications	4	40	60	100	4
Practical Courses							
1	DEE-311	Electrical Technology	2	30	20	50	2
2	DME-312	Fluid Mechanics & Fluid Machines	2	30	20	50	2
3	DME-313	Thermal Engineering	2	30	20	50	2
4	DCA-315	Computer Applications	2	30	20	50	2
Total			28	320	380	700	28

Fourth Semester

S. No	Code	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods /Week
Theory Courses							
1	DMES-401	Communication Skills-II	4	40	60	100	4
2	DME-402	Manufacturing Process-I	4	40	60	100	4
3	DME-403	Mechanics of Solid	4	40	60	100	4
4	DME-404	Material Science	4	40	60	100	4
5	DME-405	Theory of Machine	4	40	60	100	4
Practical Courses							
1	DME-412	Manufacturing Process-I	2	30	20	50	3
2	DME-413	Mechanics of Solid	2	30	20	50	2
3	DME-414	Material Science	2	30	20	50	2
4	DME-415	Theory of Machine	2	30	20	50	2
Total			28	320	380	700	29

Fifth Semester

S. No	Code	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods /Week
Theory Courses							
1	DME-501	Computer Aided Design & Manufacturing	4	40	60	100	4
2	DME-502	Manufacturing Process-II	4	40	60	100	4
3	DME-503	Estimating & Costing	4	40	60	100	4
4	DME-504	Automobile Engineering	4	40	60	100	4
5	DME-505	Renewable Energy Sources	4	40	60	100	4
Practical Courses							
1	DME-512	Manufacturing Process-II	2	30	20	50	3
2	DME-513	Auto Cad	2	30	20	50	2
3	DME-514	Automobile Engineering	2	30	20	50	2
4	DME-515	Renewable Energy Sources	2	30	20	50	2
Total			28	320	380	700	29

Sixth Semester

S. No	Code	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods /Week
Theory Courses							
1	DME-601	Industrial Management	4	40	60	100	4
2	DME-602	Machine Design	4	40	60	100	4
3	DME-603	Power Plant Engineering	4	40	60	100	4
4	DME-604	Metrology and Measurement	4	40	60	100	4
5	DME-605	Refrigeration & Air-Conditioning	4	40	60	100	4
Practical Courses							
1	DME-614	Metrology and Measurement	2	30	20	50	2
2	DME-615	Refrigeration & Air-Conditioning	2	30	20	50	2
3	DME-620	Project	8	120	80	200	6
4	DME-630	Industrial Training & Visits	2	50	-	50	-
Total			33	430	420	850	30

Note: Project Topics (DME-620) shall be assigned to the students at the commencement of 5th Semester.

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COMMUNICATION SKILLS -I
DMES-101

UNIT	Topic	Marks
I.	Reading <i>a. Comprehension (Beginner)</i>	10
II.	Grammar <i>a. Tenses , Active , Passive</i> <i>b. Vocabulary</i>	20
III.	Structure <i>a. Sentence Formation</i> <i>b. Word Formation</i>	10
IV.	Writing - I <i>a. Report Writing</i> <i>b. Curriculum Vitae</i>	10
V.	Writing - II <i>a. Application</i> <i>b. Business Letter</i>	10

APPLIED PHYSICS

DMEP-102

UNIT – I

Unit and Dimensions: Fundamental and derived units (SI System), Dimension of various physical quantities, uses of dimensional analysis and its limitations.

Oscillations: Periodic motion , Simple harmonic motion, derivation of velocity, acceleration, time period and frequency, vibration of simple spring mass system (vertical and horizontal)

UNIT – II

Electrostatics Coulomb's law, Electric field, Gauss's theorem, electric field at a point due to a uniformly charged thin sheet, potential due to a point charge, Equipotential surfaces, Capacitance of parallel plate capacitor, energy store in a capacitor, combination of capacitor (Series and Parallel)

D.C Circuit Kirchhoff's law, application of Kirchhoff's law to the wheat stone bridge, Post office Box, Meter bridge and potentiometer. Heating effect of current, Electric Power.

UNIT – III

Electromagnetism Motion of charged particles in uniform magnetic field and electric field, Biot-savart law, Magnetic field due to straight wire, circular loop, Force experienced by moving charge and a current carrying conductor in a uniform magnetic field, Torque on current loop, force between two parallel current carrying conductors, Definition of an Ampere, Moving coil galvanometer, conversion of galvanometer into ammeter and voltmeter.

UNIT – IV

Expansion of solids concept of linear expansion () superficial expansion () and cubical expansion (), Relation between α , β and γ . Experimental determination of coefficient of linear expansion by Searle's apparatus.

Heat Transfer Mode of heat transfer, Coefficient of thermal conductivity and its determination by Searle's and Lee's disc methods, thermal conduction through compound media (series and Parallel)

UNIT – V

Geometric optics Lens formula, Refraction through Prism, Principle working and magnifying power of simple Telescope, Astronomical Telescope and compound microscope.

Wave Optics Huygens's principle, reflection and refraction of wave at plane surface, Interference of light waves, Young's Experiment.

TEXT BOOK - Halliday & Resnick

REFERENCE BOOKS

Applied Physics by H. R Meena, Neeraj Pant, Arjun Singh & Har Lal

Applied Physics by R. K Gaur.

APPLIED MATHEMATICS-I

DMEM -104

UNIT-I ALGEBRA

Arithmetic progression, its nth term, sum to n terms. Geometric progression, its nth term, sum to n terms and sum of infinite terms. Binomial theorem (without proof) for any index, General and middle term, terms independent of x, First and second binomial approximation.

UNIT-II DETERMINANTS

Determinants (upto 3rd order only), minors, co-factors, Properties of determinants, solution of linear simultaneous equations in three variables by Cramer's rule.

UNIT-III MATRICES

Definition and examples of matrices, types of matrices, basic operations, equality of matrices, addition, multiplication and scalar multiplication of matrices, transpose of a matrix, symmetric, skew-symmetric matrices, singular and non-singular matrices, cofactor matrix, adjoint of a matrix, inverse of a matrix, solutions of simultaneous equations in three variables by matrix inverse methods.

UNIT-IV CO-ORDINATE GEOMETRY OF TWO DIMENSIONS

Definition of locus with problems, Equations of straight lines in various forms. Angle between two lines, Perpendicular distance formula, Conic sections, Circle, Parabola, Ellipse and Hyperbola.

UNIT-V VECTORS

Scalar and vectors, addition and subtraction of vectors and their simple applications, multiplication of vector by scalar, Scalar and vector product of two vectors. Scalar product of three vectors, Geometrical interpretation.

Text books

1. A text book of applied mathematics, vol-I and II by Dr. Neeraj Pant
2. Applied mathematics, vol- II by Hari Arora, A.Sachdeva

APPLIED MECHANICS DCE 105

Unit- I

Introduction: Concept of engineering mechanics, its importance and necessity, giving suitable examples on bodies at rest and motion, concept of rigid bodies.

Laws of forces: Principles of mechanics- superposition, transmissibility etc, types of forces, systems of forces, principles of forces, resultant of forces. Parallelogram law, triangle law, polygon law of forces, resolution of forces, free body diagram, equilibrium force and its determination, Lami's theorem.

Unit- II

Moments: Concept of moment, laws of moment, Varignon's theorem. Application of moment to simple mechanism, resultant of parallel/ non-parallel forces, reaction at support in statically determinate beam due to point load, u.d.l and triangular load.

Unit- III

Centre of gravity: Centre of gravity and centroid of regular bodies (cone, cylinder, sphere and hemisphere), areas (rectangle, circle and triangle), composite bodies, composite areas, remainder.

Moment of Inertia: Moment of inertia of Lamina- rectangular, circular (solid/hollow), triangular, parallel axis theorem, perpendicular axis theorem.

Unit- IV

Laws of motion: Newton's laws of motion, momentum, impulse, torque, linear and angular motion.

Circular motion: centripetal and centrifugal force.

Work, Power & Energy: Definition of terms, simple numerical problems

Unit- V

Friction: Concept of friction, laws of friction- static and dynamic, limiting friction, coefficient of friction, angle of friction. Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

Simple lifting Machines: Concept of machine, mechanical advantage, velocity ratio and efficiency of machine, their relationship, laws of machine, Simple machine winch crab, wheel and axle, simple screw jacks. System of pulley - first, second and third system of pulleys.

Reference Books:

1. A Text Book of Engineering Mechanics by A.R Basu, Dhanpat Rai & Co., New Delhi
2. A Text Book of Engineering Mechanics by R.K. Khurmi, S. Chand and Co., New Delhi
3. Applied Mechanics by A.K. Upadhyay, S.K. Kataria & Sons, New Delhi

WORKSHOP TECHNOLOGY

DME-106

UNIT-I Carpentry shop: Timber , classification of timber, structure and defects, conversion and selection timber, seasoning and protection, plywood and its advantages, tools : marking and measuring tools holding and supporting tools, cutting tools, planing tools, striking tools, boring tools and miscellaneous tools.

UNIT-II Fitting Shop: Material for tools, Vices, V block, surface plate, try square, combination set, files, scrapers, chisels, hacksaw, surface gauge, universal surface gauge, punches, hammers, calipers and dividers.

UNIT-III Smithy Shop: tools and equipments, hammers, swage block, anvil, tongs, chisels, hardie, gauges, fullers, flatters, set hammer, open fire and stock fire, fuel and blowers, Processes: forging upsetting welding in forging Sheet metal process.

UNIT-IV Welding Shop: Types of welding Arc welding and gas welding, tools and equipment used in arc and gas welding, types of flames, working pressure, use of A.C. and D.C., electrode , soldering and brazing, precautions.

UNIT-V Metal Cutting Shop: various metal cutting machines pertaining sawing shearing, plain turning, drilling, grinding milling and shaping.

Reference Books:

1. A Course in workshop Technology, by B.S. Raghuwanshi, Dhanpat Rai & Co., New Delhi
2. Workshop Technology by Hazra & Chaudhry, New Delhi
3. Workshop Technology by Chapman, ELBS
4. **Mechanical Workshop Practice, K. C. John, PHI Learning Pvt. Ltd.**

APPLIED PHYSICS

DMEP-112

List of Experiments:

1. To find the volume of metal used in a hollow cylinder closed at one end using vernier calipers.
2. To Measure Density of a Wire using Screw gauge
3. To Measure Radius of Curvature of a Lens, Mirror using Spherometer.
4. To Determine Refractive Index of Glass using Prism.
5. To find the acceleration due to gravity using simple pendulum and to draw $-T^2$ graph and hence to read the length of the second pendulum.
6. To determine the focal length of a convex lens by two-pin method.
7. To plot a graph between the distance of the knife edge from the centre of gravity and the time period of a bar pendulum and to determine its radius of gyration about the centre of gravity.
8. To find force constant of a Helical Spring by plotting a graph between load and extension.

REFERENCE BOOKS

Lab Manual in Physics Vol-I & II, R.S. Mittal & S. Singal

APPLIED MECHANICS LAB DME 115

List of Experiments:

1. To verify parallelogram law of forces with the help of Universal Table Apparatus
2. To verify polygon law of forces with the help of Universal Table Apparatus
3. To verify parallelogram law of forces with the help of Gravesands Apparatus
4. To verify triangular law of forces with the help of Gravesands Apparatus
5. To verify Lami's theorem with the help of Gravesands/Universal Force Table Apparatus
6. To verify the law of moments by Bell Crank Lever Apparatus
7. To verify the law of moments by Rotating Disc Apparatus
8. To determine the coefficient of friction between wood and glass surfaces by using Inclined Plane Friction Apparatus
9. To determine the coefficient of friction between wood and glass surfaces by using Horizontal Plane Friction Apparatus
10. To determine the personal horse power by Rope Brake Dynamometer Apparatus
11. To determine the mechanical advantages, velocity ratio & efficiency of a Single Purchase Winch Crab Machine and plot graph between (a) Load vs Effort and (b) Load vs Efficiency
12. To determine the mechanical advantages, velocity ratio & efficiency of a Double Purchase Winch Crab Machine and plot graph between (a) Load vs Effort and (b) Load vs Efficiency
13. To determine the mechanical advantages, velocity ratio & efficiency of a Worm and Worm Wheel and plot graph between (a) Load vs Effort and (b) Load vs Efficiency
14. To determine the mechanical advantages, velocity ratio & efficiency of a Differential Wheel and Axle and plot graph between (a) Load vs Effort and (b) Load vs Efficiency
15. To determine the mechanical advantages, velocity ratio & efficiency of a Simple Screw Jack and plot graph between (a) Load vs Effort and (b) Load vs Efficiency

WORKSHOP PRACTICE-I

DME-116

Machine shop: Introduction of machine shop. Study and sketch of lathe machine, Study and Sketch of bench grinder, milling machine, drilling machine. Study about various tools used in machine shop. To perform various operations on a given cylindrical job by lathe machine such as turning, step turning, taper turning, facing, and knurling.

Carpentry shop: Introduction of carpentry tools such as Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, marking gauges, Try-squares, steel rulers. Study about woods. Study about seasoning of wood. Making of various joints-Cross lap joint, half lap joint, Mortise and tenon joint, Dovetail joint.

Sheet Metal Shop: Introduction to sheet metal shop, use of hand tools and accessories e.g. hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material e.g. G I sheet. Preparation of seam joints such as lap seam/standard seam/flat lock seam/grooved seam.

Black Smithy Shop: Introduction of tools hot working and cold working process. Different types of Hearths used in Smithy shop. Purpose, specifications, uses, care of various tools and equipment used in hand forging by segregating as cutting tools, supporting tools, holding tools, measuring tools etc. Types of fuel used, and maximum temperature obtained. Types of raw materials used in Smithy shop Making of U clamp/fan hook.

Welding Shop: Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions. A/C welding and gas welding. Edge preparation of lap joint/butt joints Preparation of Oxy acetylene gas welding joints.

Fitting shop: Introduction to fitting shop tools, marking and measuring devices/equipment. Identification of materials such as Iron, Copper, Stainless Steel, Aluminium etc. Identification of various steel sections (flat, angle, channel, bar etc.). Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing) and filing practice as per drawing Drilling

ENGINEERING DRAWING -I

DME-117

Unit-I Introduction:

a. Drawing Instruments: Drawing instruments, Sizes and layout of standard drawing sheets, Sizes of drawing boards.

b. Lines, Lettering and Dimensioning :

Different types of lines and freehand Sketching , Different types of lines in engineering drawing as per BIS Specifications, Practice in free hand sketching of vertical , horizontal and inclined lines, geometrical figures such as triangles, rectangles, small and large circles, parabolas, curves and ellipses .

Unit-II Lettering techniques and Practice: Instrumental single stroke vertical and inclined) lettering of 3 to 7 mm. height. Instrumental double stroke lettering of 35 mm height in the ratio of 7:4 vertical

Unit-III Dimensioning: Necessity of dimensioning, terms and notations- methods and principles, dimensioning small components as in 4.2. below(mainly theoretical instructions) , Dimensioning of overall sizes, circles thread holes, chamfered surfaces, angles tapered surface holes equally spaced on PCD counter sunk hole counter bored holes, cylindrical parts narrow. Space and gaps radii curves and arches chain and parallel dimensioning.

Unit-IV Scale: Scales and their need and importance, Definition of representative fraction (RF) find RF of a given scale , Types of scales , Construction of plain and diagonal scales.

Unit-V Constructions of curves such as ellipse, parabola, hyperbola, cycloid, epicycloids, hypocycloid and involutes.

Recommended Books:

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt Charotar Publishing House
2. A text book of engineering drawing by Surjit Singh published by Dhanpat Rai and Co. Delhi R.B. Gupta N.D Bhatt.
3. Engineering Drawing by PS Gill published by SK Kataria and sons. Delhi.

APPLIED MATHEMATICS-II DCEM-201

UNIT-I DIFFERENTIAL CALCULUS

Limit and continuity (without problems), Differentiation of functions by First Principle, Differential of sum, product and quotient functions, Differential of a function of a function (Chain rule), Logarithmic differential, Higher order derivatives.

UNIT-II INTEGRAL CALCULUS

Indefinite integral, Integration of a function, standard formulae, the fundamental laws of integration, Integration by substitution method, by parts method and partial fractions method.

UNIT-III APPLICATIONS OF CALCULUS

Maxima and minima, Tangent and normal, Evaluation of definite integral. Properties of definite integral, Area bounded by a curve between two ordinates and x-axis.

UNIT-IV DIFFERENTIAL EQUATIONS

Differential equation, Order and degree of differential equations, Solution of differential equations of first order and first degree, variable separable, Homogeneous and linear differential equations, Solution of linear differential equations of 2nd order with constant coefficient.

UNIT-V COMPLEX NUMBERS

Complex Number, representation of a complex number (Argand Diagram), Complex number in rectangular, polar and exponential forms, Conversion from one form to another form. De Moivre's Theorem, Roots of complex number.

Text books

1. A text book of applied mathematics, vol-I and II by Dr. Neeraj Pant
2. Applied mathematics, vol- II by Hari Arora, A.Sachdeva

APPLIED CHEMISTRY

DMEC-202

Unit I: Problems based on Volumetric and Gravimetric analysis and Polymerization

1. Molecular mass, mole, weak and strong electrolytes Equivalent mass and Gram-equivalent.
2. Strength, Normality and Molarity of a solution, Normality equation.
3. Problems based on Volumetric and Gravimetric analysis.

Unit II: Analysis and Treatment of Water

1. Impurities in water, Hardness, Units of Hardness and Calcium carbonate equivalent.
2. Estimation of Dissolved Oxygen, Alkalinity and Hardness by EDTA method.
3. Problems in Boilers, Ion-Exchange Process for softening of water.

Unit III: Fuel and Combustion

1. Units of Heat, Characteristics of good fuel, Calorific value, Calculation and determination of Calorific value, types of coal, petroleum, LPG, CNG.
2. Producer gas, Water gas and Coal gas.
3. Problems based on combustion of solid, liquid and gaseous fuels. Analysis of Flue gases by Orsat apparatus.

Unit IV: Corrosion and Lubricants

1. Dry and Wet corrosion, Galvanic corrosion, Concentration corrosion, Pitting corrosion and Stress corrosion.
2. Protection of corrosion by Proper designing, Alloying, Cathode protection and Coating methods.
3. Types and Mechanism of Lubricants, Characteristics of lubricants like Viscosity, Acid value, Saponification value, Cloud point, Pour point, Flash point and Fire point.

Unit V: Polymerization, Metal and Alloys

1. Polymers: Classification, Types of polymerization reactions, Biodegradable Polymers, Examples.
2. Cast iron, Steel and Heat treatment
3. Necessity of making alloys, Composition, properties and uses of Brass, Bronze, Gun Metal, Invar and Duralumin

TEXT BOOKS

1. Engineering chemistry by S.S. Dara
2. Engineering chemistry by Shikha Agrawal

ELEMENTS OF ELECTRICAL ENGG

DEE-203

Unit-I DC CIRCUITS:

Basic concepts of current, voltage, resistance, power and energy, ohm's law, resistances in series and parallel, laws of resistances, Kirchoff's laws & their applications, cells in series, parallel & mixed grouping, simple numerical problems, simple numerical problems.

Unit-II AC CIRCUITS:

Concepts of alternating current & voltage, equations of instantaneous values, AC through pure resistance, inductance & capacitance, concept of conductance, susceptance and admittance; RL, RC & RLC series and parallel circuits, Different methods for solving parallel ac circuits, simple numerical problems.

Unit-III ELECTROMAGNETIC INDUCTION:

Faradays law of electromagnetic induction, Lenz's law, Fleming's rules, statically induced the emf and Dynamically induced the emf, Inductances in series and parallel, coefficient of coupling, concept of eddy current and hysteresis, Hysteresis loop, Eddy current and hysteresis losses, simple numerical problems.

Unit-IV POLYPHASE CIRCUITS:

Advantages of 3-ph over 1-ph system, Star and delta connections (relationship between phase & line voltages, phase & line current) power in 3ph circuits, power measurement by 2 wattmeter method, star delta transformation, simple numerical problems.

Unit-V DOMESTIC INSTALLATION & SAFETY MEASURES:

Different types of wiring systems, knowledge of different accessories used in different types of wiring, Types of earthing, construction & its function, IE rules for installation, common safety measures & shock treatment.

ENGINEERING DRAWING- II

DME-204

UNIT-1 Principle of Projections strictly in first angle projection

Projection of solids , such a Prism, Cube, Cylinder and Cones with axis perpendicular to horizontal plane or parallel to horizontal plane/vertical plane or both. Drawing 3 orthographic views of given objects (at least five objections). Identification of surfaces of drawn orthographic views from isometric object. Sketching practice of pictorial views from isometric objects.

UNIT-II Sectional Views:

Need for sectional views ó cutting planes methods of representing sections, conventional sections of various materials, classification of sections, conventions in sectioning. Drawing of full section, half section, partial broken out sections offset sections, revolved section and removed sections. Exercises on sectional views of different objects. Drawing of different conventions for materials in section conventional breaks for shafts pipes rectangular, square, angle, channel, rolled sections. Freehand Sketch of Nut and Bolt.

UNIT-III Isometric View:

Fundamentals of isometric projections (theoretical instructions). Free hand sketching of Isometric views from 2or 3 given orthographic views.

Recommended Books:

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt Charotar Publishing House
2. A text book of engineering drawing by Surjit Singh published by DhanpatRai and Co. Delhi R.B. Gupta N.D Bhatt.
3. Engineering Drawing by PS Gill published by SK Kataria and sons. Delhi.

APPLIED THERMODYNAMICS

DME-205

Unit I

Basic concepts and laws of thermodynamics:

Introduction, macroscopic and microscopic views of thermodynamics, system (closed system, open system, isolated system, adiabatic system), boundary, surrounding, properties of system (extensive and intensive), state and equilibrium, processes (flow, non-flow, quasi-static, steady flow, reversible, irreversible), cycle, Definition of volume, pressure, temperature, internal energy, enthalpy

Zeroth law, first law of thermodynamics of cyclic process, its limitations, derivation of steady flow energy equation (SFEE), its application for turbine, pump, boiler, compressor, nozzles

Second laws of thermodynamics (Kelvin Planck statement, Clausius statement), equivalence of statements, PMM-1, PMM-2

Introduction to third law of thermodynamics, concept of entropy, simple numerical problems on above topics

Unit II

Perfect Gases:

Laws of perfect gases (Boyle's law, Charles's law, Avogadro's law, Renault's law), Universal gas constant, characteristic gas constant, specific heat at constant pressure, specific heat at constant volume, relation between specific heats

Polytropic law, polytropic index, relation between pressure, temperature and volume for polytropic process, Derivation of work done, heat transfer, change in internal energy, change in entropy, for isochoric, isobaric, isothermal, adiabatic and polytropic processes, simple numerical problems on above topics

Unit III

Properties of steam and Boilers:

Pure substance, formation of steam, define sensible heat, latent heat, wet, dry and superheated steam, P-v and T-s diagram of pure substance (water), degree of superheat, dryness fraction, wetness fraction, steam table, Mollier chart, Determination of volume, enthalpy, entropy of wet, dry and superheated steam using steam table and Mollier chart

Steam boilers, fire tube and water tube boilers, boiler mountings and accessories, working principle of simple vertical boiler, Babcock and Wilcox boiler, Benson boiler, La Mont boiler, Loeffler boiler

Performance of boiler (equivalent evaporation, boiler efficiency, boiler horse power), simple numerical problems on above topics

Unit IV

Steam Nozzles and steam turbines

Steam nozzles, types, discharge of steam through nozzle, condition for maximum discharge, area of cross-section of nozzle, simple numerical problems on above topics

Steam turbines, working principle of impulse and reaction turbines, compounding of impulse turbine, velocity triangle of single stage impulse and reaction turbines, combined velocity triangle of moving blades, effect of friction on moving blades, simple numerical problems on above topics

Unit V

Mechanism of Heat Transfer:

Modes of heat transfer, Conduction: Fourier's law, thermal conductivity, Convection: Natural and forced type, Newton's law of cooling, convective heat transfer coefficient, steady heat conduction in plane walls, thermal resistances, composite walls, heat conduction in cylinders and spheres, multilayered cylinders and spheres, critical radius of insulation,

Radiation: Absorption, reflection and transmission of radiation by real surface, emissivity, Wien's law, Kirchhoff's law, Stefan Boltzmann's law, simple numerical problems on above topics

Books:

Text Books:

1. Basic and Applied Thermodynamics by P K Nag
2. Engineering Thermodynamics by R K Rajput

Reference Books:

1. Thermodynamics by Cengel
2. Fundamentals of Thermodynamics by Sonntag, R. E, Borgnakke, C. and Van Wylen,
3. Engineering Thermodynamics Jones, J. B. and Duggan,
4. Fundamentals of Engineering Thermodynamics, by Moran, M. J. and Shapiro,

APPLIED CHEMISTRY LAB
DMEC-212

List of Experiments: -

1. To determine the purity percentage of oxalic acid in a given impure mixture.
2. To analysis a mixture of NaOH and KOH (given a solution contacting 2.5g mixture of NaOH and KOH per litre)
3. To estimate the calcium and magnesium hardness in the given water sample.
4. To estimate the Chloride ion (Cl⁻) in the given water sample.
5. To estimate the free Chlorine (Cl₂) in the given water sample.
6. To estimate the dissolved Oxygen (D.O) in the given water sample.
7. To estimate the Alkalinity in the given water sample.
8. To estimate the temporary, permanent and total hardness in the given water sample by EDTA method.
9. To determine the viscosity of a lubricating oil by Redwood Viscometer.
10. To determine the moisture percentage in a given coal sample.

ELEMENTS OF ELECTRICAL ENGINEERING DEE-213

List of Experiments: -

1. To verify the Ohm's Law. Draw its V-I characteristics.
2. To verify Kirchoff's Current Law.
3. To verify Kirchoff's Voltage Law.
4. To find the Voltage- Current relationship in a Single Phase R-L series Circuit. Draw its Impedance triangle and determine the Power factor of the circuits.
5. To find the Voltage- Current relationship in a Single Phase R-C series Circuit. Draw its Impedance triangle and determine the Power factor of the circuits.
6. To find the Voltage- Current relationship in a Single Phase R-L & C series Circuit. Draw its Impedance triangle and determine the Power factor of the circuits.
7. To find for a filament lamp (a) Variation of Power with Voltage (b) Variation of Resistance with Voltage.

WORKSHOP PRACTICE –II

DME-214

Machine shop/Metal Cutting Shop: Introduction of lathe and its operation Introduction of drilling machine and its operations. Introduction of milling machine and its operations Introduction of shaping machine and its operations.

Paint Shop: Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating i.e. Electroplating etc. Different type of prints. Practice of Policing and painting on wooden and metallic surfaces. Painting practice by brush on metal sheets.

Sheet metal shop: Introduction of tools, making of sheet metal joints Practice: Prepare a lap riveting joint of sheet metal pieces. Making of sheet metal tray or a funnel.

Soldering and Brazing: Introduction about the soldering and brazing. Introduction about the tools used in soldering and brazing and practice in cutting, bending, flaring, swaging and brazing of tubes.

Plumbing Shop: Introduction of Plumbing tools and pipe fittings. Introduction of various pipes such as GI pipe, plastic pipe, copper pipe, cast iron pipe etc. and pipe fittings of elbow, nipple, socket, union etc. Threading practice on pipe with die.

Brazing and soldering:

Introduction of tools and practice

APPLIED THERMODYNAMICS DME-215

List of Experiments:

1. To determine the convective heat transfer coefficient in case of natural convection
2. To determine the convective heat transfer coefficient in case of forced convection
3. To determine the thermal conductivity of brass rod
4. To determine the convective heat transfer coefficient and efficiency of pin fin
5. To measure the emissivity of test plate
6. To determine the Stefan Boltzmann's constant

ELECTRICAL TECHNOLOGY

DEE-301

Unit I Transformer

Construction, Working and Working Principle of Transformer, E M F Equation of a Transformer, Voltage Transformation Ratio, Simplified Equivalent Circuit, Voltage Regulation. Losses in the Transformer, Efficiency of Transformer, Condition for Maximum Efficiency, All day Efficiency, Open Circuit Test, Short Circuit Test, Auto Transformer, and Simple numerical problems.

Unit II D C Machines

D C Generators- Main Constructional Features, Working Principle ,Commutation Action, E M F Equation, Types of D C Generators, Armature Reaction, Characteristics of D C Generators, Application of DC Generator, D C Motors-Working Principle of D C Motors, Types of D C Motors, Characteristics of D C Motors, Application of D C Motors, and Simple numerical problems.

Unit III Induction & Synchronous Machines

Constructional Features of Three Phase Induction Motors, Production of Revolving Field, Principle of Operation, Slip, Frequency of Rotor Current, Alternators-Constructional Features, Generator and Motor Action, Synchronous Motors-Working Principle of Synchronous Motor, Characteristics of Synchronous Motor, Application of Synchronous Motor sand Simple numerical problems.

Unit IV Measuring Instrument and Basics of Electronics

Measuring Instrument-Classification of Instruments, Essentials of Indicating Instruments, Moving Iron Instruments, Types of Moving Iron Instruments, Merits and Demerits of Moving Iron Instruments, Application of Moving Iron Instruments, Moving Coil Instruments, Difference Between Moving Iron and Moving Coil Instruments, Extension of Range of Ammeter and Voltmeter, Dynamometer Type Instruments, Semi-Conductors and Semi-Conductor Diodes, n-p-n Transistor, p-n-p Transistor, Transistor Connections and Characteristics, and Simple numerical problems.

Unit V Basic Electronics:

Semiconductor Diodes, HWR & FWR, Types of Transistors, Transistor configuration, Diac, Triac & SCR, Simple problems

FLUID MECHANICS AND FLUID MACHINES

DME-302

UNIT- I

Introduction: Concept of fluid, mechanics and hydraulics. Properties of fluid (viscosity, specific weight, specific volume, specific gravity, surface tension) Static Pressure: Pascal's law (with proof), static pressure, intensity of pressure and pressure head, total pressure and centre of pressure on vertical and inclined plane surfaces, walls and gate. Measurement of Pressure: Atmospheric pressure gauge pressure, vacuum pressure absolute pressure and differential pressure, Piezometer tube manometers (simple and differential type) Bourdon tube pressure gauge.

UNIT -II

Flow of liquids: Types of flow (laminar and turbulent, rotational and irrotational steady and unsteady, uniform and non uniform) Concept of Reynolds number. Rate of discharge, continuity equation. Bernoulli's theorem (without proof), its limitations and practical applications. discharge through venturimeter and orifice meter, Pitot tube.

Flow through Orifice: Hydraulic coefficients (C_d, C_v, C_c) and their relationship discharge through a small orifice, through a large rectangular orifice, fully submerged, partially submerged and free conditions. Time of emptying a tank of uniform area through a rectangular orifice at the bottom.

UNIT -III

Flow through Pipes: Loss of energy in a pipe flow, major losses, factors influencing the loss due to friction, Darcy's and Chezy's equation (without proof) Minor energy losses (without Proof.) Hydraulic gradient line and total energy line. Flow through series, parallel and branched pipes. flow through siphon pipe, Water hammer concept,

Impact of jet: impact of jet on a fixed moving vertical flat plate, work done on a fixed and moving vertical and inclined plate

UNIT -IV

Hydraulic turbines: types of turbines, impulse and reaction type (Concept only). Introduction and working of Pelton wheel, Francis and Kaplan turbines. Performance of water turbines, Hydraulic Pumps: Introduction working and application of single acting reciprocating and single stage centrifugal pumps, Power requirements for these pumps

UNIT -V

Working and applications of Hydraulic press, Hydraulic ram, Intensifier, Hydraulic accumulator and Hydraulic jack.

THERMAL ENGINEERING

DME-303

Unit I

IC engine and air standard cycles:

Introduction, classification of I C engines, comparison of S I and C I engines, two stroke and four stroke engines, working principle and valve timing diagram of four stroke, two stroke petrol and diesel engines,

Air standard cycles: Carnot cycle, Derivation of thermal efficiency and mean effective pressure of Otto cycle, Diesel cycle and dual cycle, simple numerical problems on above topics

Unit II

System in IC Engines:

Carburetion: Carburettor and its function, A/F mixture requirements under different loads, working principle of simple carburettor

Ignition systems: Requirement of ignition system, Battery ignition system, magneto ignition system, spark plug, firing order

Cooling systems: Necessity of cooling, types, liquid cooled system, air cooled system

Lubrication system: Function of lubrication, crankcase ventilation

Unit III

Combustion in IC Engines:

Combustion in S I engines: Stages of combustion, flame front propagation, factors influencing the flame speed, phenomenon of knock

Combustion in C I engines: Stages of combustion, ignition delay, factors affecting delay period, phenomenon of knock

Unit IV

Air Compressor, Jet propulsion:

Air compressor: Classification, reciprocating compressor, effect of clearance volume, volumetric efficiency, work input in single and multi stage compression, simple numerical problems, Working principle of root blower, vane blower, centrifugal and axial compressors

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines their processes, Principle of rocket propulsion

Unit V

Engine Emissions and Alternative fuels:

Emissions: Air pollution due to I C engines, Bharat stages and EURO norms of emissions, study of catalytic converter

Alternative fuels: Methanol, Ethanol, Bio diesel, Hydrogen, compressed natural gas (CNG), liquefied petroleum gas (LPG)

Text Books:

1. Internal Combustion Engine by V Ganesan
2. A Text book of Internal Combustion Engine by R K Rajput

Reference Books:

1. Internal Combustion Engine by Mathur and Sharma
2. Internal Combustion Engine by Domkundwar

MACHINE DRAWING DME 304

Unit-I

Threads (one sheet), Screw thread nomenclature, different forms right hand and left hand. Nut and Bolts (one sheet), Hexagonal and square headed nut and bolt. Locking Devices & Screws (one sheet). Different types of locking devices and screws.

Unit –II

Limits and fits (One Sheet). Limit system tolerance, limits, deviation, allowance, basic size. Tolerances fundamental tolerances, fundamental deviation, Method of placing limit dimensions.

Fits: Clearance fit transition fit. Interference fit hole basis system shaft basis system
Calculating values of clearance/interference, hole tolerance and shaft tolerance with given basic size for common assemblies like H7/g6, H7/m6 H8/u7

Surface roughness: (One sheet)

Sketch of the following: Introduction, actual profile, surface roughness number, indication of machining symbols and allowances. Indication of surface roughness symbols on drawing.

Unit III

Details of Assembling Drawing: practical exercises on drawing from details to assembly of the following . I.C. engine Parts & Steam Engine: (2 Sheets), Stuffing Box, Connecting rod/ Engine piston.

Boiler Mountings: (2 Sheets), Non-Return Valves, Stop Valve, Blow off Cock.

Machine tool Parts : (02 Sheets) Screw Jack, Flanged coupling , Flexible type.

Books for references:

1. Machine Drawing by R.K. Dhawan (S. Chand publishers)
2. Machine Drawing by Narayana Kanaiha (Willey Publications)

COMPUTER APPLICATIONS

DCA-305

UNIT-I

Digital Computer systems, Characteristics, History, Computer Generations, Types of computers & their classifications, application of Computer in various fields, Computer Hardware & Software, Elements of computer hardware-CPU, I/O devices, storage media, Computer Software-Types of Software, System Software, Application Software.

UNIT-II

Basic concept & functions of an operating system, textual Vs GUI Interface, type of Operating Systems, concept of multiprogramming, multitasking, multiprocessing, Introduction to disk operating system (DOS), Commands and utilities, working with MS Windows, Unix and Linux, Working knowledge of PC Software Word Processor.

UNIT-III

Computer Languages, Generation of Languages, Translators- Assemblers, Interpreters, Compilers, Algorithm, Pseudo-code, Flowcharts- rules & symbols, Structured Programming concepts, various techniques of programming, Use of programming.

UNIT-IV

Introduction to C, importance of C, basic structure of a C program, constants, variables and data types, operators and expressions, managing I/O operators, Control Statement: if statement and its various forms, goto statement, for, while and do-while loops, switch decision making statement, Arrays: Array notation, storage and representation, Functions: user defined functions and their use.

Reference Books:

1. Fundamentals of Computers & Programming with C by A.K. Sharma- Dhanpat Rai Publications.
2. Computing Fundamentals and C Programming by E Balagurusamy-Mc Graw Hill Education.
3. Programming in ANSI C by E Balagurusamy-Mc Graw Hill Education.

ELECTRICAL TECHNOLOGY LAB DEE-311

LIST OF EXPERIMENTS:

1. To find voltage current relationship in a single phase R-L series circuit. Draw its impedance triangle and determine the power factor.
2. To find voltage current relationship in a single phase R-C series circuit. Draw its impedance triangle and determine the power factor.
3. To find voltage current relationship in a single phase R-L-C series circuit. Draw its impedance triangle and determine all the parameters.
4. To measure the power and power factor in a single-phase A.C. Circuit by using three-voltmeter method.
5. To measure the power and power factor in a balanced three phase Circuit by using two-voltmeter method.
6. To calibrate single-phase Energy Meter.
7. To study DOL starter for three phase induction motor and measure the No Load current and change its DOR.
8. To study Star-Delta starter for three phase induction motor and measure the No Load current and change its DOR.
9. To identify the polarity of primary and secondary windings of a single phase transformer.
10. To find voltage ratio of single-phase transformer
11. To find the efficiency at different loads, maximum efficiency and voltage regulation of transformer.
12. To study and connect the air cooler.
13. To test a lead acid battery for charged and discharged conditions.
14. To charge a lead acid battery and measure its specific gravity and voltage.
15. To measure the resistance of ammeter and voltmeter.
16. To observe the difference in effect of switching on a single phase capacitor start induction motor.
 - (a) The capacitor disconnected (b) The capacitor connected
 - (c) Reverse its DOR.

FLUID MECHANICS LAB DME-312

LIST OF EXPERIMENTS

1. To verify the Bernoulli's theorem and plot the following graphs:
 - i. Static head VS length of passage
 - ii. Velocity head VS length of passage
 - iii. Total head VS length of passage
2. To Determine the coefficient of friction f in a given pipe line using Darcy's formula
3. To determine the coefficient of contraction C_c due to sudden contraction and enlargement in a given pipe line
4. To determine the coefficient of K_b in a given pipe line
5. To determine the coefficient of discharge C_d of a venturimeter
6. To determine the values of hydraulic coefficient (C_c , C_v & C_d) through circular orifice.
7. To study the characteristic of centrifugal pump
8. To study the characteristic of Pelton wheel turbine.
9. To determine the coefficient of discharge (C_d) through V-notch apparatus.
10. To determine the force exerted by a jet of water on a stationary vane.

Note: Lab manual is available on <http://www.academia.edu>

THERMAL ENGINEERING LAB DME-313

LIST OF EXPERIMENTS

List of Experiments:

1. To study the construction and working of two stage reciprocating air compressor.
2. To conduct a performance test on two stage reciprocating Air compressor and to determine its volumetric efficiency and isothermal efficiency.
3. To study the construction and working of single cylinder 4 stroke diesel engine
4. To conduct performance test on a single cylinder 4 stroke diesel Engine
5. To study the construction and working of single cylinder 2 stroke petrol engine
6. To conduct performance test on a single cylinder 2 stroke petrol Engine
7. To study the construction and working of 4 cylinders, 4 stroke petrol engine.
8. To conduct Mores test on 4- stroke 4 cylinder Petrol Engine and determine the indicated horse power (IHP) frictional horse power (FHP)

COMPUTER APPLICATION LAB DCA-315

LIST OF PRACTICALS

1. Given a PC, name its various components and list their functions.
2. Features of Windows Operating System:
 - a. Start
 - b. Shutdown and restore
 - c. Creating and operating on the icons
 - d. Opening, closing and sizing the windows
 - e. Creating, saving, modifying, renaming, finding and deleting a file
 - f. Creating and operating on a folder
 - g. Changing setting like-date, time
 - h. Using shortcuts
 - i. Windows system Tools
 - j. Control Panel
3. **MS-WORD**
 - a. File Management: Opening, creating and saving a document, files, copying contents in some different file(s).
 - b. Page Setup: Setting margins, tab setting, ruler, indenting.
 - c. Editing a Document: Entering text, cut, copy and paste using toolbars.
 - d. Formatting A Document: Using different fonts, changing font size and color, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods.
 - e. Aligning of text in a document justification of document, inserting bullets and numbering.
 - f. Use of headers, footers: inserting foot note, endnote, use of comments.
 - g. Inserting date, time, special symbols, importing graphic images, drawing tools.
 - h. Tables and border: Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table.
 - i. Print preview, zoom, page setup, printing options.
 - j. Using tools like: Spellchecker, help, use of macros, mail-merge, thesaurus word content and statistics, printing envelopes and labels.
4. **MS-EXCEL**
 - a. Starting excel, open worksheet, enter and edit data, formulas to calculate values, format data, create chart, printing chart, save worksheet.
 - b. Menu Commands: Create, format charts, organize, manage data, solving problem by analysing data.
 - c. Editing a worksheet, copying, moving cells, pasting inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet.
 - d. Creating a Chart: Working with chart types, changing data in chart, formatting a chart, use chart to analyse data.
 - e. Using a list to organize data, sorting and filtering data in list.

COMMUNICATION SKILLS-II

DMES-401

UNIT	Topic	Marks
I.	Reading <i>a. Comprehension (Advanced)</i>	10
II.	Grammar <i>a. Direct & Indirect</i>	5
III.	Writing <i>a. Dialogue b. Paragraph</i>	15
IV.	Speaking - I <i>a. Presentation Skills</i>	15
V.	Speaking - II <i>a. Interview</i>	15

MANUFACTURING PROCESS –I

DME-402

Unit I: Manufacturing concepts, Manufacturing Processes, Pattern Making (Types of patterns, Patterns materials ó relative advantages, Patterns allowances, Coloring codes for patterns, Introductions to cores and core boxes, Preservation and storage of patterns).

Unit-II: Introductions to moulding, Types of moulding sands and their properties, Synthetic sand moulds, Core materials, Core making, Position of cores, Types of core prints, Types of moulds, Gating systems, Moulding processes (Bench moulding, floor moulding, Pit moulding and Machine moulding), Melting furnaces (Pit furnace, Cupola furnace, Electrical furnace), Fettling of castings, Defects in casting and remedies

Unit-III: Working principle of Lathe machine, Description and function of main parts of centre Lathe, Specifications of Lathe, Lathe accessories and attachments, Lathe Tools (Types their angle and materials). Lathe operations (Plain turning, facing, different systems of taper turning, thread cutting, knurling, chamfering, grooving or necking, forming, drilling, boring, reaming, speed, feed and depth of cut, cutting fluid, safety guide lines for working on Lathe.

Unit-IV: Principle of drilling, classification of drilling machines and their description, operations performed on drilling machines, speeds and feeds during drilling, Types of drills and their features, drill holding devices, cutting fluid used in drilling

Principle of boring, Classification of boring machines and their description, Specifications of boring machines, Boring tools, Boring bars and boring heads, Alignment of bores and its importance

Unit-V: Introduction to shaping, Principle parts features and use of shaper, Specifications of a shaper, Quick return mechanism, Methods of job holding, Shaper tools- types, angles and materials, Operations performed on shaper, Description of slotter, its tools and uses, Drive mechanism of a slotter, Cutting fluid used in shaping and slotting.

Comparison of shaping and planing, Main parts and features of planer, its working and use, Specification of planer, Types of planer, Quick return mechanism of table, Planer tools, Job holding devices.

MECHANICS OF SOLID

DME-403

UNIT –I Stresses and Strains

Concept of loads, stresses and strains, Tensile, Compressive and shear stresses and strains. Concept of Elasticity , Elastic limit and Limit of proportionality, Hook's Law, Young Modulus of elasticity, nominal stress, Yield point, Plastic stage, Strain hardening, Ultimate strength and breaking stress, Percentage elongation, Proof stress and working stress, Factor of safety, Lateral strain, poisson's ratio, Volumetric strain, Shear modulus strain energy due to direct stresses, Proof resilience and modulus of resilience, Stresses due to gradual, sudden and falling load, Longitudinal and circumferential stresses in seamless thin walled cylindrical shells (derivation of these formulae not required)

Unit-II Beam and Bending Stress

Bending and Shearing Force– Concept of beam, form of loading, Concept of end supports roller , Hinged and fixed, Concept of bending moment and shearing force, B.M. and S.F. Diagram for cantilever and simple supported beams with and without overhang subjected to concentrate and U.D.L. Determination of position of maximum B M & S.F in a beam, point of contra flexure

Bending Stresses- Concept of bending stresses, theory of simple bending , Use of the equation $\sigma/Y = M/I = E/R$, Concept of moment of resistance, bending stress diagram, calculation of maximum bending stress in beams of rectangular, circular, I and T section permissible bending stress section modulus for rectangular circular and symmetrical section. Comparison between I, rectangular and circular section with regard to their strength & flexural formula.

Unit-III Columns

Concept of column, modes of failure, types of columns, Buckling load, crushing load, slenderness ratio, Factors effecting strength of a column, End restraints, Effective length , strength of column by Euler Formula without derivation, Rankin- Gourdan (without derivation)

Unit –IV Torsion

Concept of torsion & difference between torque and torsion , Derivation and use of torque equation $T/J = I / R = G\theta/l$ for circular shaft, shear stress diagram for solid and hollow shaft, Comparison between solid and hollow shaft with regard to their strength and weight. Power transmitted by shaft, concept of mean and maximum torque.

Unit-V Springs

Closed coil helical springs subjected to axial load, stress deformation, stiffness and angle of twist and strain energy, falling load on springs.

Slope and deflection

Simple cases of slope and deflection in simply supported beam with UDL on whole of the length and point load at the center , Cantilever with UDL on whole length and point load at the end(without derivation), Simple problems.

Combined direct and bending stresses: Simple cases of short columns of uniform section subject to eccentric loading with stress diagram. Slope and deflection of beams, combined and bending stress.

MATERIAL SCIENCE

DME-404

UNIT-I

Classification of Materials; Thermal, Chemical, Electrical and Mechanical Properties of Materials, structure of materials, metallic bonding, solid solution and their types, Unary and Binary diagrams, Phase rule, degree of freedom, Types of equilibrium diagrams. Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Imperfections & Defects in crystal structures

UNIT-II

Ferrous materials, Manufacture of Pig Iron, Wrought Iron, Cast Iron and Steel, Various types of Cast Iron (White, Malleable, Grey, Mottled, Modular and Alloy) and their usage types of carbon steels, alloy steels and its properties and uses. Effect of different alloying elements on the properties of steel. Iron carbon diagram

UNIT-III

Heat Treatment, Purpose of Heat Treatment, Various types of heat treatment processes such as Annealing, Normalizing, Quenching, Tempering and Case hardening (carburizing, nitriding, cyaniding, induction hardening, flame hardening). Time Temperature Transformation (TTT) diagrams.

UNIT -IV

Non-Ferrous metals and alloys : Properties and Uses of Aluminium and Al Alloys (Duralumin, Y alloy etc), Properties and Uses of Copper, various types of brasses and bronzes, Properties and Uses of Zinc & Zinc Alloys, Properties and Uses of nickel and nickel Alloys; Bearing Metals.

UNIT-V

Miscellaneous materials: Plastics (Thermoplastic and Thermo-set), Ceramics (types, properties and applications).
Various Heat Insulating Material and their Usage (Asbestos, Glass Wool, Thermocole, Cork), refractory materials.

Text books

1. Text book of Material Science, R.K. Rajput, Kaston Pubs.
2. Text book of Material Science, Varinder Kumar, Eagle Publisher.
3. Material and metallurgy by O.P. Khanna Dhanpatrai & sons

THEORY OF MACHINE

DME-405

UNIT-I Simple Mechanisms

Introduction to link, kinematic pair, lower and higher pair, Kinematic chain, mechanism, Inversions. Inversions of slider crank chain. Velocity and acceleration in mechanisms (instantaneous Centre method and relative velocity method), Kennedy's theorem, Coriolis component of acceleration

UNIT-II Friction

Definition and its necessity, Horizontal force required to move a body on an inclined plane both upward and downward, Frictional torque in screws (both for square and V threads), Screw jack (Simple numerical only). Friction in pivots and collars, power lost in friction in pivots and collars (derivation and simple numerical), introduction to clutches, disc clutches, conical clutches and centrifugal clutches (simple numerical)
Different types of bearings and their application

UNIT-III Power Transmission

Introduction to Belt and Rope drives, Types of belt drives and types of pulleys, Concept of velocity ratio, slip and creep; crowning of pulleys, Flat and V belt drive, Ratio of driving tensions, H.P. transmitted, centrifugal tension, and condition for maximum horse power, Different types of chains and their terminology Gear terminology, types of gears and their applications; simple and compound gear trains, epicyclic gear trains.

UNIT-IV Flywheel

Principle and applications of flywheel (engines and power press), Turning moment diagram of flywheel for different engines, Fluctuation of speed and fluctuation of energy, Coefficient of fluctuation of speed and coefficient of fluctuation of energy, determination of the mass of flywheel.

Governor

Principle of governor, Simple description and working of Watt, Porter and Hartnell governor (simple numerical based on watt and porter governor), Hunting, isochronisms, stability, sensitiveness of a governor

UNIT-V Balancing

Concept of balancing, Introduction to balancing of rotating masses, balancing of rotating masses in the same plane, concept of reference plane, balancing of rotating masses in the different planes. (simple numerical)

Vibrations:

Types of vibrations longitudinal, transverse and torsional vibrations, Dampening of vibrations, concept of free and forced vibrations, natural frequency of vibrations, (simple numerical)

Causes of vibrations in machines, their harmful effects and remedies

Text books

1. Theory of Machines by D.R. Malhotra; Satya Prakashan, New Delhi.
2. Theory of Machines by V.P Singh; Dhanpat Rai and sons, New Delhi.
3. Theory of Machines Jagdish Lal; Metropolitan Publishers, New Delhi.
4. Theory of Machines by Bharat Bhushan & Jindal., Ishan Publication
5. Theory of Machines by R. S Khurmi Schand publication, New Delhi

MANUFACTURING PROCESS –I

DME-412

PRACTICAL EXERCISES / PRACTICE

MACHINE SHOP

1. Lathe -job mounting and tool holding devices
2. Turning practice involving straight and steps turning, facing, chamfering, parting forming and drilling.
3. Drilling
4. Boring
5. Slotting
6. Planning

PATTERN MAKING SHOP

1. Introduction to pattern making tools and equipment.
2. Preparing single solid pattern with allowances, method of finishing pattern.
3. Preparation of split and loose piece pattern with all allowances.
4. Making pattern with core print and preparing a core box.
5. Use of wood working machines for pattern making.

FOUNDRY SHOP

1. Introduction to tools and equipment in a foundry shop.
2. Preparation of moulding sand to prepare open sand mould of a simple pattern.
3. To prepare floor mould using cope, cutting gates and risers.
4. To prepare a mould of split pattern in cope and drag.
5. To prepare a mould of step pulley and prepare the core for the same.
6. Prepare a mould in three moulding boxes.
7. To operate a pit furnace, melt metal in a crucible and carry out the pouring in a mould to get a casting.
8. Study defects in castings.

FITTING SHOP

Least count and other instrument

Advance Fitting Practice

Note:

- * An expert may be invited from the industry to deliver the lecture.
- ** An industrial visit may be planned to explain and show the facilities of the industry
- *** Making a record of exercise / job completed by the student in a part of the work for
Internal evaluation.

MECHANICS OF SOLIDS LAB DME-413

List of practical

1. To determine the moment of Inertia of a Flywheel by using Flywheel apparatus.
2. To determine the Modulus of Rigidity of a Horizontal Shaft by using Horizontal Torsion Apparatus.
3. To determine the Modulus of Rigidity of a given material by using Vertical Torsion Apparatus.
4. To determine the Modulus of Rigidity of a given material by using Helical Spring Apparatus.
5. To determine the Modulus of Elasticity of a given wire by Searle's Apparatus and plot a graph between stress and strain up to the Elastic Limit.
6. To verify the Bending Moment at a given cross section of a simple supported beam by using simple supported beam Apparatus.
7. To verify the forces in different members of Jib crane Apparatus.
8. To verify the forces in different members of the roof truss using a Roof Truss Apparatus.
9. To determine the impact strength of a given specimen by (a) Izod Test (b) Charpy Test.
10. To test the hardness of the given specimen with a Rockwell Hardness testing machine.
11. To determine the Brinell Hardness number of several materials.

**MATERIAL SCIENCE LAB
DME-414**

LIST OF EXPERIMENTS

1. Identification of materials from fifty items in a box
2. Study of a metallurgical microscope
3. Study of heat treatment furnaces and heat treatment process
4. Study of a wet grinding apparatus
5. Study of thermocouple/pyrometer used in heat treatment furnaces
6. Identification of metals through sound and spark test
7. Study of a diamond polishing apparatus
8. To prepare a specimen for microscopic examination under a metallurgical microscope

THEORY OF MACHE LAB DME-415

LIST OF EXPERIMENTS

1. Study of links, pairs and simple mechanisms.
2. Study of inversions of four bar linkage and verification of Grashof Law.
3. Study of inversions of single slider crank chain.
- 4 Study of types of gears, tooth profile, and nomenclature.
5. Study of Gear trains.
6. Study of longitudinal vibration
7. Study of transverse vibration
9. Study of centrifugal type governor

Computer Aided Design & Manufacturing

DME-501

UNIT-I Introduction:

Introduction to CAD/CAED/CAE/CIM, Elements of CAD and CAM, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications CAD/CAM systems, Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Colour CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

UNIT-II 3D Graphics:

Polygon surfaces-Polygon mesh representations, Quadric and Super quadric surfaces and blobby objects; Solid modelling-Solid entities, Fundamentals of Solid modelling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Colour models, Application commands for AutoCAD.

UNIT-III Finite Element Method:

Introduction, Principles of Finite elements modelling, Stiffness matrix/displacement matrix, Stiffness matrix for spring system, bar & beam elements, bar elements in 2D space (truss element)

CAD of Machine Elements

Basics of programming in MatLab, writing a program in MatLab for machine elements like shaft, keys, couplings, knuckle joint, welded joints etc.

UNIT-IV

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system. Manual part programming using M-codes and G-codes for Drilling, Turning and Milling. APT programming Geometry, Motion and Additional statements, Macro-statement. CNC, DNC, FMC, FMS, CIM, Concepts of AGV & Robots

UNIT-V System Devices

Introduction to DC motors, stepping motors, feedback devices such as encoder, counting devices, digital to analog converter and vice versa.

Control of NC Systems

Open and closed loops. Control of point to point systems- Incremental open loop control, Incremental close loop, Absolute close loop; Control loop in contouring systems; Adaptive control

Text books

1. Computer Aided Manufacturing by Kundra and Rao
2. Computer control of Manufacturing systems by Koren TMH
3. Computer Aided Design by RK Srivastava Umesh Publications.

References books

1. Computer Aided Engineering Design by Anupam Saxena & B. Sahay Anamaya Publishers
2. CAD/CAM by HP Groover & EW Zimmers, Jr. Prentice Hall India Ltd.
3. CAD/CAM Theory and Practice by Ibrahim Zeid & R Sivasubramaniam McGraw Hill

MANUFACTURING PROCESSES – II

DME-502

Unit-I METAL FORMING PROCESSES:

Die stamping, Rolling, Wire drawing, Sheet metal spinning, Extrusion (direct and indirect), Forging, Tube-drawing, Powder Metallurgy.

Unit-II MILLING:

Introduction of milling, Type of milling machines, principle of working, Description and construction of universal milling machines, specifications of milling machine, Milling operations, Milling cutters, Cutting speed, feed, depth of cut, Material removal rate, Indexing, Universal dividing head, indexing plate, Type of indexing methods ó simple, compound, differential and angular (Simple numerical).

Unit –III ADVANCE WELDING TECHNIQUES:

Welding principle, process, equipment used, advantages, limitations and applications of submerged arc welding, TIG welding, MIG welding, Laser beam welding, Atomic Hydrogen welding, Thermite welding, welding defects, Testing and inspection of welding joints, Defects in welding joints, Soldering and Brazing, Advantages, limitations and applications of soldering and brazing.

Unit- IV GRINDING:

Types of grinding machines and their working ó cylindrical, surface centreless tool and cutter grinder, jig grinder, Shapes of grinding wheels, Various elements of grinding wheel ó abrasive grade, structure, bond, Codification of grinding wheel, Dressing, truing, balancing and mounting of grinding wheel, selection of grinding wheel, Honing process: its applications, Brief idea of lapping machines, lapping process, its applications, Polishing, Buffing.

JIGS AND FIXTURES: Importance and use of jigs and fixtures, principles of location, locating devices, purpose of clamping elements, types of clamps, Types of drilling jigs and milling jigs

WORKING WITH PLASTICS: Industrial uses of plastics, situation where used, Injection moulding principle, working of injection moulding machine, Compression moulding principle, working of compression moulding machine, potential and limitations in the use of plastics.

Unit-V MODERN MACHINING METHODS:

Electro discharge machining, Electric chemical machining, Ultrasonic machining, Laser beam machining, Plasma arc machining, Abrasive jet

machining, Introduction to NC & CNC MACHINES: working of NC machine tools, Classification of NC MACHINE tools, programming for NC machine, advantages of NC machines: CNC AND DNC; Transfer machines and their types.

Text Books:

1. A Textbook of Production Engineering by PC Sharma, S Chand Publisher, New Delhi
2. Textbook of Production Engineering By P. C. Pandey, C. K. Singh, Balbir Singh, Standard Publishers Distributors, New Delhi

References books

1. Manufacturing Process by HS Shan, Cambridge University Press, New Delhi
2. Manufacturing Science by Amitabha Ghosh and AK Mallik, East-West Press, New Delhi
3. Production Technology: Manufacturing Processes, Technology and Automation by RK Jain, Khanna Publishers, New Delhi
4. Manufacturing Science-I by Saadat Ali Rizvi, Wajahat Ali, S.K. Kataria & Sons Publisher of Engineering & Computer Books, New Delhi-110002
5. Manufacturing Science-II by Saadat Ali Rizvi, Wajahat Ali, S.K. Kataria & Sons Publisher of Engineering & Computer Books, New Delhi-110002
6. Manufacturing Engineering and Technology 4th Edition by Serope Kalpakjian, Pearson publication, New Delhi
7. Manufacturing Technology: Foundry, Forming and Welding, 4e (Volume 1), by PN Rao, Tata McGraw-Hill Education, New Delhi
8. Manufacturing Technology: Metal Cutting and Machine Tools, 4e (Volume 2), by PN Rao, Tata McGraw-Hill Education, New Delhi

ESTIMATING AND COSTING

DME-503

Unit-I

Definition and importance of Estimating and Costing, Estimating Procedure Elements of Cost: Direct material, direct labour, direct expenses, Overhead expenses. Ladder of Cost: Prime cost, production cost, factory cost, ultimate cost, selling price. Exide and Variable Cost: Fixed cost, depreciation and interest, operations, charges, supervisory charges. Variable cost, power /fuel consumed tooling (for machine tools), consumable stores and spares. Calculation of hourly cost of running and maintenance of machines. Machines tools, Numerical problems.

Unit-II

Cycle time unit time and total time, set up time, operation time and tear down time. Operational allowances for calculation of standard time (personal, fatigue, tool sharpening of changing, checking and allied operations) machining time calculation for all lathe operations, drilling, shaping planning, milling and grinding. Numerical problems.

Unit-III

Welding (Electric arc welding and gas welding) Estimation of gas welding and cutting cost, Estimation of arc- welding cost, factors affecting welding cost electrodes Consumed, Power consumed, gas consumed calculation of welding charges.

Forging: Forging operations and losses Estimation of net weight Estimation of losses (e.g. tong loss, scale loss, flash loss, shear loss sprue loss) Estimation time. Simple problem related to forging operation and cost.

Unit-IV

Salvage value of different machine tools and equipmentø To draw detailed dimensioned/views (full and sectional for Common mechanical devices such as M/c vice, Screw jack Spur gear, engine parts (fuel injector, fuel pump and simple jet carburettor) Production M/c parts (tail stock, tool post etc.) Specifications of material for these parts.

Unit-V

Depreciation: Definition methods, Salvage value, Price, Determination of salvage value reserve price machinery and equipmentø

AUTOMOBILE ENGINEERING

DME-504

Unit-I

Introduction: Classification of vehicles on the basis of load, drive, fuel used position of engine, axles, steering, transmission, suspension and body. Layout of an automobile chassis. Function of major Components of a vehicle and introduction to their different systems such as frame, Clutch, gear box, braking system, front axle, steering and suspension system, final drive.

Power Plants: Performance parameters and characteristics-engine power mean effective pressure, efficiencies, torque, specific fuel consumption, mean piston speed, specific output, A/F ratio etc. Engine performance characteristics (RPM Vs Horse Powers, mean effective pressure, fuel consumption)

Multi-cylinder Engine: Firing order, power balance charts.

Engine components ó Piston , Connecting rod , Crank shaft, Bearing and Journals , Flywheel ,Cam shaft, Valve gear, Cylinder Block, Cylinder head, Manifold , Ignition System, Spark Ignition engines and related components, Injection system of diesel engine, engine lubrication

Unit-II

Transmission System: Resistances affecting the movement of a vehicle, wind, gradient, rolling, resistance, tractive effort. Single plate and multi plate clutches, Gear box and its types-sliding mesh & constant mesh gear boxes, synchronizing unit, fluid coupling, brief introduction to automatic transmission. Overdrive and torque converter.

Final Drive: Function and working of universal joints, propeller shaft final drive and differential, rear axle

Unit-III

Electrical System: lighting system , Dash board instrument Horn, charging circuits line diagram of electrical system of a car, function and working principle of a self-starter or cranking motor, drives: bendix drive & overrunning clutch drive, dynamo., alternator, battery function and storage of cells .

Braking system: Function and principle of braking system, classification of brakes:-mechanical brakes, hydraulic brakes, internal expanding brake shoes, brake drum, disc brakes, braking materials, wheel cylinder, master cylinder. Bleeding and adjustment of hydraulic brake.

Unit-IV

Steering System: Introduction, layout of steering system, steering gear box and linkages. Ackermann's steering mechanism, factors affecting steering, Introduction to power steering. Wheel alignment & steering geometry: Castor, Camber, king pin inclination, included angle, toe-in & toe-out. Under steering & over-steering.

Unit-V

Frame & suspension: Frame and frame-less construction, description of suspension system as leaf springs, coil springs and torsion bar, function and working of shock absorber (telescopic).Front axle-Live and dead front axle, stub axle: Elliot and Lamoin stub axle .

Tyres and Tubes : Tyres-Types, specification, and causes of wear and their remedies.

Renewable Energy Sources DME-505

UNIT-I

Energy resources and their utilization:

Indian and global energy sources, Energy exploited, Energy planning, Energy parameters (energy intensity, energy-GDP elasticity)

Solar radiations:

Solar radiation on earth, Extra terrestrial radiation, Spectral distribution, Solar constant, clarity index, Measurement of solar radiations, Solar radiation geometry, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle, Local apparent time, Apparent motion of sun, Day length, computation of average daily solar radiation, and angle of incidence, simple numerical problems

UNIT-II

Solar energy:

Introduction, Solar Thermal collectors, Flat plate collector, Parabolic Trough collector, Parabolic Dish collector, Heliostats, Solar Central receiver, limitation of solar energy, Applications of solar energy Solar still (single and double slope, Water heater, Cookers, Dryers.

Solar photovoltaic system:

Introduction to Photo-Voltaic system, merits & demerits of P-V system, Principle of P-V cell, V-I characteristics of a solar cell, Efficiency of solar cells, PV hybrid system.

UNIT-III

Biomass:

Introduction, Raw materials, Biomass conversion techniques, Biomass resource development in India.

Biogas:

Introduction to biogas generation, Classification of Biogas digesters, KVIC digester, Bio gas applications

Wind energy:

Introduction, Properties of wind, Availability of wind energy in India, Merits and limitations of wind energy, Wind machine fundamentals, Three blade Horizontal axis wind turbine, and Vertical axis Darrieus rotor wind turbine, Selection of a wind mill

UNIT-IV

Magneto-hydrodynamics (MHD) Energy:

Introduction, Basic Principles of MHD generation, advantages of MHD generation

Fuel cells power plants:

Introduction, Principle and operation of fuel cell, acidic and alkaline electrolyte fuel cells, Advantages and disadvantages of fuel cell

Hydrogen Energy:

Properties of hydrogen in respect of it's use as source of renewable energy, Sources of hydrogen, Production of hydrogen, Storage and transportation, Problems with hydrogen as fuel

UNIT-V

Geothermal energy:

Introduction, Geo thermal resources, Principal of working, Types of geothermal station with schematic representation.

Tidal power:

Introduction, Tides and waves as sources of energy, Fundamentals of tidal power, Use of tidal energy, Limitations of tidal energy conversion systems

Ocean energy;

Introduction, Principle of ocean thermal energy conversion, open cycle OTEC, closed cycle OTEC

Text Books

1. S. Rao, B. B. Parulekar, "Energy Technology" Khanna Publishers New Delhi
2. BansalKeemann, Meliss, "Renewable energy sources and conversion technology", Tata Mc Graw Hill.
3. Rai G.D, "Non-Conventional energy Sources", Khanna Publishers New Delhi.
4. Ashok V. Desai, "Nonconventional Energy", New Age International Publishers Ltd

MANUFACTURING PROCESS-II LAB DME-512

PRACTICAL EXERCISES / PRACTICE MACHINE SHOP

LATHE - Exercise on Lathe involving taper turning by swiveling compound rest and tail stock off set, exercise on making V- Threads, exercise on profile turning, Knurling, exercise on form turning.

SHAPER ó Introduction to parts and operations of shaper, shaper tools, job holding methods and safety precautions, Exercise on shaping horizontal and vertical surfaces, Make a hexagon from round bar.

SLOTTER - Introduction to parts and operations of slotter, tools and job holding methods and safety precautions, Exercise involving cutting of keyways and slots.

PLANER ó Introduction to parts and operations of a planer, Exercise involving planning of casting.

DRILLING - Introduction to parts and operations of drill machine, drills, job holding methods and safety precautions, Exercise involving different diameters holes in a given MS flats.

GRINDING PRACTICE ó Introduction to parts and operations of a cylindrical surface grinder, tool and cutter grinder, grinding a job to close tolerances on surface grinder, grinding milling cutter on tool and cutter grinder.

WELDING SHOP - Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions. A/C welding and gas welding. Edge preparation of lap joint/butt joint. Practice on electric arc welding, oxy acetylene gas welding, spot welding, seam welding, MIG welding.

Note:

* An expert may be invited from an industry to deliver expert lecture.

** Relevant industrial visit may be planned.

*** Making a record of exercises / job completed by the student is a part of the work for Internal evaluation.

AUTO CAD LAB

DME- 513

1. Fundamentals of AutoCAD
2. Dimension & annotations
3. Use of Layers
4. Working with constraint in dimension
5. Creating assembly
6. Axisymmetrical parts
7. Creating surface features

Drawing of the following using AUTOCAD: (Any two)

1. Projection of solids
2. Nut & bolt and Fasteners
3. Cotter joint
4. Expansion joint
5. Shaft coupling

Text Books:

1. Machine Drawing with AutoCAD by Goutam Pohit and Goutam Ghosh, Pearson Education
2. Machine Drawing includes AutoCAD by Ajeet Singh, Tata MacGraw Hill

Reference Books:

1. Engineering Drawing and Graphics using AUTOCAD by T.Jayapoovan, Vikas Publishing
2. Engineering Drawing and Graphics + AutoCAD by K.Venugopal, New Age International

AUTOMOBILE ENGINEERING LAB DME-514

LIST OF EXPERIMENTS

1. Study of 4 Stroke Cycle Petrol Engine.
Identify various parts & study their functions
Working cycle & P-V diagram (Otto Cycle)
Actual & theoretical valve timing diagram and comparison.
2. Study of 4 Stroke Cycle diesel Engine.
Identify various parts & study their functions
Working cycle & P-V diagram (Diesel Cycle)
Calculation of cooperation ratio
3. Study of 2 Stroke Cycle Petrol Engine.
Identify various parts, stock, and port & study their functions,
Port timing diagram
Petro-oil system
Splash system
4. Study of Battery Ignition system for 4 Cylinder SI engine
5. Study of Cooling system in IC Engine
Air cooled engine, Water cooled engine
6. Study of Lubricating System in 4 stroke Cycle I.C. engine.
Pressure feed system and splash system
7. Study of Clutch
Single plate clutch
8. Study of Synchromesh and sliding mesh 4 speed Gear Box
Determination of speed ratios in 1st, 2nd, 3rd gears
9. Study of Differential in vehicles
10. Study of different type of Brakes: Mechanical and Hydraulic

**RENEWABLE ENERGY SOURCES LAB
DME-515**

LIST OF EXPERIMENTS:

1. Measurement of solar radiation on horizontal and inclined surfaces.
2. To determine the overall heat transfer coefficient for a fluid flowing through a cylindrical tube and verify it with the value determined by formula.
3. To find the transient variation in plate temperature in a flat-plate solar collector.
4. To find the efficiency and characteristic curve of a flat-plate solar collector in outdoor condition.
5. To study the heat and mass transfer for single slope solar still under outdoor condition.
6. To study the heat and mass transfer for distillation under outdoor conditions for a double slope solar still arrangement.
7. To study the performance of solar still coupled with flat-collector (active solar still).
8. To study the transient performance of a built in storage water heater.
9. To study the transient performance of solar water heater: forced circulation method.
10. To determine I-V characteristics of a solar cell.
11. To study the I-V characteristics of two solar photo voltaic (SPV) modules individual, connected in series and then in parallel under shaded and un-shaded conditions.
12. To determine the following pollutants in atmosphere: SPM, RSPM, NOX, SOX and CO.

INDUSTRIAL MANAGEMENT

DME-601

UNIT-I

Management, Industrial Management, Different functions of Management, Planning, Organizing, Co-ordination, Controlling, Structure of an Industrial Organization, Functions of different departments, Human relations and performance in organizations.

UNIT-II

Trade Union, Grievances, Handling of grievances, Agitations, Lockouts. Labour welfare. Workers participation in management. Labour laws and disputes. Wages: types of wages, wage & incentive plans .Factory act 1948, Payment of wages act 1936. Industrial dispute act 1947.

UNIT- III

Business ethics, Managerial ethics, Codes of ethics. Causes of accidents, Safety consciousness, Safety measures, Factors causing pollution, Effect of pollution on human health. Noise pollution.

UNIT-IV

Entrepreneurship Development, Entrepreneur, Modern concept of entrepreneur, Entrepreneurship, Qualities to become entrepreneur, Classifications of Entrepreneurs. EDP training. Small scale industry, Characteristics of small scale industries. Classifications of small scale industries. Project report guidelines, Content of project report, Project appraisal. Market survey. Preparation of project report. Role of financial institutions.

UNIT-V

Types of Production, Job, Batch, Mass production. Concept of Total Quality Management, six Sigma concept Just in Time (JIT), ISO-9000 and ISO-14000 series. Concept of intellectual property right and patents. Breakeven analysis, Marketing management, Price Analysis, Determination of Economic order Quantity

MACHINE DESIGN

DME-602

UNIT- I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads, Design against Static Load Modes of failure, Factor of safety, Principal Stresses, Stresses due to bending and torsion, Theories of failure.

UNIT- II

Bolted joints- Types of threads, types of screw fasteners, failure of bolted joints, Eccentric loaded bolted joints, Design of cotter and knuckle joint

Unit-III

Riveted Joints- Types of riveted joints, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints

Welded joints- Types of welded joints design of welded joints, Eccentric loaded welded joint.

UNIT- IV

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity

UNIT- V

Keys and Couplings

Types of keys, Strength of sunk key, Couplings-, Materials, Function and their design. Design of rigid and flexible couplings

Text books

1. Machine Design-Sharma and Agrawal, S.K. Katara& Sons
2. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co
3. Machine Design- R.S.Khurmi, S.Chand

References books:

1. Mechanical Engineering Design ó Joseph E. Shigely, McGraw Hill Publications
2. Design of Machine Memebers-Alex Valance and VI Doughtie, McGraw Hill Co.
3. Machine design-M.F. Spott, Prentice Hall India
4. Machine Design-Maleev and Hartman, CBS
5. Machine design -Black & Adams, McGraw Hill

POWER PLANT ENGINEERING

DME-603

Unit-I

Introduction

Power and Power plant, Concept of power plant, Classification of power plants, Selection of power plant, Introduction to Power Corporation in India.

Power plant cycles: Rankine cycle, Reheat cycle, Regenerative cycle, Binary vapour cycle, Reheat-regenerative cycle, simple numerical

Unit-II

Economics of power generation

Introduction, cost analysis, estimation and prediction of load, factors affecting the economy and generation and distribution of power, Terms and definitions: Maximum demand, demand factor, diversity factor, load curve, load factor, capacity factor, utilization factor ,tariffs, Simple numerical

Unit-III

Steam power plant

General layout of a steam power plant, Coal handling system: belt conveyor, screw conveyor
Pulverizing mills: Principle of impact mill, ball mill, roller mill, pulverized coal firing system,

Ash handling system: Pneumatic conveyor system and hydraulic system,

Dust collection system: Principle of electrostatic precipitator (ESP) Feed water treatment

Condensers: surface condenser, simple numerical on condenser efficiency, vacuum efficiency, and requirement on cooling water, Safety methods

Unit-IV

Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, Comparative study of diesel power plant with steam, Safety methods

Gas turbine power plant

Introduction, general layout, Basic principle of open cycle and closed cycle gas turbine plants, cogeneration, combined cycle power plants, Safety methods

Unit-V

Nuclear power plant

Introduction, nuclear fission, nuclear fusion, nuclear chain reaction, Basic components of nuclear reactor, PWR, BWR, FBR, Nuclear waste disposal, Safety methods Importance of safety precautions.

Hydro electric station

Introduction, layout of hydro-electric plants, essential components of hydro-electric plants, safety measures in hydro plants

Pollution and Control Methodology: Identification of various pollutants and control methods

Text books

1. Power Plant Technology El-Vakil, McGraw Hill.
2. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
3. Power Plant Engineering A. K. Raja, Amit Prakash Srivastava, Manish Dwivedi, New Age International (P) publishers, New Delhi
4. An Introduction to Power Plant Technology G. D. Rai, Khanna Publishers Pvt. Ltd.

Metrology and Measurements

DME-604

Unit-I

Introduction: Introduction to instrumentation and measurement, Definition of terms calibration, standards, generalised measurement systems, static and dynamic performance characteristics, Analysis of experimental data, concept of error, sources of error.

Devices and systems, Signal Display & Recording Devices, Concept of feedback; Open and closed loop control systems,

Unit -II

Sensors and Transducers:

Types of sensors, types of transducers and their characteristics, Transducers and devices for engineering applications, Measurement of pressure: Gravitational, direct acting, elastic and indirect type pressure transducers, Measurement of very low pressures, Measurement of displacement, Measurements of force and torque.

Unit-III

Strain measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

Temperature measurement: Thermometers, bimetallic thermocouples, thermistor and pyrometers

Vibration: Seismic instruments, vibration pick ups and decibel meters, vibrometers, accelerometers

Unit-IV:

Standards of linear measurement, line and end standards.

Limit fits and tolerances. Interchangeability and standardisation,

Linear and angular measurements devices, Limit gauges classification, Taylor's Principle of Gauge Design.

Unit-V

Measurement of geometric forms like straightness, flatness, roundness.

Tool makers microscope, profile project autocollimator.

Interferometry: principle and use of interferometry, optical flat.

Measurement of screw threads and gears.

Surface texture: quantitative evaluation of surface roughness and its measurement.

Text books

1. Beckwith Thomas G., Mechanical Measurements, Narosa Publishing House, N. Delhi.
2. Doeblein E.O., Measurement Systems, Application Design, McGraw Hill, 1990.
3. Kumar D.S., Mechanical Measurements and Control, Metropolitan, N. Delhi.
4. Hume K.J., Engineering Metrology, MacDonald and Co. 1963
5. Gupta, I.C., Engineering Metrology, Dhanpat Rai & Sons, New Delhi, 1994
6. Sirohi, Mechanical Measurement, New Age Publishers
7. Jain, R.K., Engineering Metrology, Khanna Publishers
8. Jain, R.K., Mechanical Measurement, Khanna Publishers

Refrigeration & Air Conditioning

DME-605

Unit-I

Principals of refrigeration: Meaning of refrigeration, Refrigeration methods, Unit of refrigeration. Reversed cannot cycle and Bell Coleman Cycle. Heat Pump, coefficient of performance. Rating of refrigeration machines, refrigeration systems. Air refrigeration cycle, applications and its limitations, vapour compression cycle. P-H. Chart, effect of sub cooling and super heating, Effect of varying condensing and suction temperature on COP, Simple mathematical calculation with pressure enthalpy chars. Vapour absorption cycle and its applications.

Unit-II

Introduction to refrigerants and their desirable properties, primary and secondary refrigerants Nomenclature of refrigerants. Important properties of some common refrigerants such as R-11, R-22, R-502 R-134a. NH₃ and brine. Environmental effects of refrigerants and need for alternatives refrigerants

Refrigeration Components and Controls. Function, type, Specifications and Constructional details of components and controls such as compressor, Condensers, throttling device evaporator, oil separator, accumulator, spray ponds, cooling towers Solenoid valve, thermostat low pressure and high pressure cut out. Solenoid valve etc.

Unit-III

Psychometry: Gibbs Dalton's law of partial pressure, psychometric Properties, Enthalpy of moist air, psychometric processes, (e.g. Mixing of airstreams) representation of psychometric processes on psychometric chart. Solution of simple problems based on Psychometric Chart.

Metabolism in human body, Introduction to human comfort and comfort air conditioning, physiological requirements of human body, Effective temperature. Applications of air-conditioning, factors affecting optimum effective temperature.

Unit IV

Description of various types of loads, Sensible and latent heat loads. Cooling and heating load calculations, Sensible heat factor (SHF) and by pass factor (BPF) of cooling and heating coil. Efficiency of cooling and heating coil, Apparatus dew point (ADP) Supply air and recirculated air, Air conditioning systems, Summer and winter A/C systems, Room air conditioner, Automobile A/C round the year system, Air distribution system, Simple description of filters, dampers, fans, blowers air ducts, air register (grilles) diffusers and strip heaters.

Unit-V

Miscellaneous: Principle of evaporative cooling, desert coolers, layout and working of ice plant and cold storage plant. Domestic Refrigerator, water cooler (Storage type), Deep freezer, Thermal insulating materials such as puffed glass wool etc.

Effect of moisture in a refrigeration system, Different methods of defrosting, Methods of removing moisture from the refrigeration system.

Text books:

1. Refrigeration and Air-conditioning By R.K. Rajpoot
2. Refrigeration and Air-conditioning By C.P. Arora
3. Refrigeration and Air-conditioning By Dr. S.S. Thipse
4. Refrigeration and Air-conditioning By S. Domkundwar

Metrology and measurement Lab DME-614

List of Experiments:

Minimum 8 out of following (or such experiments)

1. Measurement of effective diameter of a screw thread using 3 wire method.
2. Measurement of angle using sinebar & slip gauges, Study of limit gauges.
3. Study & angular measurement using level protector
4. Adjustment of spark plug gap using feeler gauges.
5. Study of dial indicator & its constructional details.
6. Use of dial indicator to check a shape run use.
7. Study and understanding of limits, fits & tolerances
8. Study of Pressure & Temperature measuring equipment.
9. Strain gauge measurement.
10. Speed measurement using stroboscope.
11. Flow measurement experiment
12. Vibration/work measuring experiment.
13. Experiment on Dynamometers.

Refrigeration and Air-conditioning Lab DME-615

List of Experiments

1. Study of a vapour compression refrigeration system with the help of given machine.
2. Study of Water dispenser with the help of given model/machine.
3. To study the storage type water cooler.
4. To study the domestic refrigerator.
5. To determine theoretical, actual, relative and Carnot COP of the machine with the help of window A.C trainer.
6. To determine the EPR of a given heat pump trainer.
7. To study the gas charging in the Refrigeration and AC machines.
8. To determine psychometric properties of moist air with the help of sling psychrometer.
9. To study different psychometric processes using window A/C trainer.
10. To study Refrigeration controls with the help of cut sections.
 - a. Thermostate
 - b. HP/LP cutout.
 - c. Solenoid Valve.
 - d. Expansion Valve and Relay.

PROJECT DME-620

Any one of the following Projects can be identified by a student or a group of students

1. Manufacturing /fabrication

2. Service sector

Specifications, Process, Methods, Summary, Estimating & Costing of the Project

Report contains information requirements, working capital, and cost of land running cost, manpower requirement and marketing methodology

INDUSTRIAL TRAINING & VISITS

DME-630

Industrial Training aims at exposing the students to field practices, size and scale of operation and work culture at practical sites. For this purpose students at the end of fourth semester are required to complete training on their own for a period of 4 weeks to any industry.

Each student is supposed to study the material and technology used at site and prepares a detailed report of the observation of process seen by him/her the students will submit the report along with report to the department. The teachers along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following.

- | | |
|---------------------------------------|-----|
| a) Punctuality and regularity | 15% |
| b) Initiative in learning new things. | 15% |
| c) Relationship with workers | 15% |
| d) Industrial training report. | 55% |