MECHANICAL ENGINEERING SECTION

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME

Mechanical Engineering Section, University Polytechnic

DIPLOMA IN MECHANICAL ENGINEERING

INCHARGE:

Dr. SHAHNAWAZ MOHSIN

w.e.f. 2013
updated:
2019

UNIVERSITY POLYTECHNIC, AMU, ALIGARH, UP, INDIA

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

I SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U.,ALIGARH

Name of the Branch (es):- **Mechanical / Production / RAC / Plastic Tech**

Semester :- **First**

THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Duration of end sem exam	Evaluation Scheme			
						Max Marks			
			L	P	Hrs.	Course Work	Mid Sem Exam	End Sem Exam	Total
1	BMA-101	Applied Maths-I	5	0	3	10	15	75	100
2	BPH-101	Applied Physics-I	2	0	2	5	10	35	50
3	BCH-101	Applied Chemistry-I	2	0	2	5	10	35	50
4	BEE-103	Electrical Engg	3	0	3	10	15	75	100
5	BME-101	Production Engg-I	4	0	3	10	15	75	100
6	BME-102	Engg. Drawing-I	0	6	3	50	15	35	100
		Total	**16**	**6**		**90**	**80**	**330**	**500**

PRACTICAL COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Duration of end sem exam	Course Work	Mid Sem Exam	End Sem Exam	Total
1	BME-191	Workshop Practice-I	0	6	3	100	--	50	150
2	BPH-191	Applied Physics Lab-I	0	2	3	30	--	20	50
3	BCH-191	Applied Chemistry Lab-I	0	2	3	30	--	20	50
4	BEE-192	Electrical Engg Lab.	0	2	3	30	--	20	50
		Total	**0**	**12**		**190**	**---**	**110**	**300**
		Grant Total	**16**	**18**		**280**	**80**	**440**	**800**

Period per week= 16+18= 34

★ **Note:- Definition**

Course Work : - Theory Courses: Assignment & Class Work

Lab Courses   :   Punctuality, Class Work Practical Report & Viva-Voce.

End Sem Exam: - Lab Course   :   Viva-Voce & Practical Performance

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
5	0	3	10	15	75	100

UNIT	CONTENT	%age
I	**ALGEBRA:** Introduction: Partial fraction of a proper fraction and related problems. Sequence and Series, Arithmetic progression, Arithmetic mean, Geometric progression and Harmonic progression, sum of infinite G.P Recurring decimals as infinite G.P problems on A.P. G.P and H.P.Binomial Theorem, properties of Binomial theorem and its applications, Determinates, Method for calculating the value of determinant: Definition of minors and cofactors, properties of determinants and its applications. Solution of linear equations by Cramer's Rule.	20
II	**TRIGONOMETRY:** Trigonometrical ratios of the sum and difference of two angles. Trigonometrical ratios of multiple and submultiples angle.Conditional Trigonometrical identities. Trigonometrical equations.	20
III	**COORDINATE GEOMETRY-I** Point, Cartesian and Polar co-ordinates and their conversion, Distance between two points. Internal and external division. Formulae, Area of triangle, conditions of collinearity of three points.Locus.Equation of a straight line in various standard forms, Angle between Straight-lines, perpendicular distance formula.	20
IV	**COORDINATE GEOMETRY-II** Equation of circle in a standard form, center and radius, conditions for a circle on a given diameter and problems. Definition conics, standard equation of parabola and ellipse.	20
V	**COMPLEX NUMBERS** Introduction, standard form of complex number, conjugate complex,Number, square root and cube root of unity, triangular inequality De Moivre's theorem.	20

REFERENCE BOOKS:

1.Applied Mathematics by Prof. V.K. Parashar

2. Applied Mathematics (Vol-1 & II) by R.D. Sharma
3. Engg. Mathematics, by H.K. Das

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
2	-	2	5	10	35	50

UNIT	CONTENTS	%age
I	Scalar and vector quantities. Type of vectors,. zero vector, unit vector, equal vectors .Resolution of vectors. . Vector expressed in terms of position vectors. Multiplication of a vector by scalar. Scalar and Vector products of two vectors. Applications of scalar and vector products in mechanics and electrodynamics. Rigid body, rotational motion of a rigid body. Moment of inertia and radius of gyration. Kinetic energy of rotating body, theorems of moment of inertia, calculation of moment of inertia of a thin uniform rod and a circular disc.	25
II	Postulates of kinetic theory of gases, derivation of expression for pressure exerted by a perfect gas. Kinetic interpretation of temperature, mean transnational kinetic energy. Specific heat of gases, relation between Cp and Cv, concept of heat and temperature. Zeroth law of thermodynamics. First law of thermodynamics, statements of second law of thermodynamics. Heat engine. Thermal conductivity and measurement of thermal conductivity of a good conductor in laboratory.	25
III	Molecular structure of material. Elasticity. Stress, strain, Hooke's law. Young's modulus of elasticity. Bulk modulus, Shear modulus or modulus of rigidity. Poisson's ratio. Relation between elastic constants (without proof). Tensional rigidity. Determination of Young's modulus of elasticity in laboratory.	25
IV	Nature of light, interference of light, Young's double slit experiment, expression for fringe width, conditions for maxima and minima. Diffraction of light, two classes of diffraction. Polarization of light. Method of getting polarized light. Brewster's Law. Optical fibres, monomode and multimode fibers. Applications of optical fibres	25

REFERENCE BOOKS:
01. Fundamental of Physics,
    D-Halliday, R.Rasnick and J.Walker.
02. Physics for class XI, N.K. Bajaj.
03. ABC Physics for class XI
04. Applied Physics, by R K. Gaur.
05. Physics for class XI
06. Physics for class XI,NCERT

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
2	-	2	5	10	35	50

UNIT	CONTENTS	%age
I	**ORGANIC CHEMISTRY** Origin and growth of organic chemistry, catenation, homologous series, functional groups, isomerism, hydrocarbons and their classification, nomenclature of organic compounds by IUPAC system, preparation and properties of alkanes, alkenes and alkynes.(Addition reaction, substitution reaction and elimination reaction)	25
II	**ELECTROCHEMISTRY** Metallic and electrolytic conductivity, Arrhenius' theory of ionization, distinction between atom and ion, ionization and dissociation, electrolysis, mechanism of electrolysis, mechanism of molten sodium chloride using carbon electrodes, electrolysis of aqueous solution of sulphuric acid, sodium hydroxide, copper sulphate . Faraday's laws of electrolysis, numerical problems based on these laws, industrial applications of electrolysis (electroplating, electro refining, electrometallurgy, electrotyping and manufacture of chemicals .)	25
III	**pH VALUE OF BUFFER SOLUTION** **A**: Hydrogen ion concentration, Ionic product of water, concept of pH, importance of pH values as applied to engineering, numerical problems based on pH value. **B**: Buffer solutions, types of buffer solution, buffer action, mechanism of buffer action in the buffer solution of the single compounds as well as in the acidic and basic buffer solutions. numerical problems based on the buffer solution.	25
IV	**ENVIRONMENTAL CHEMISTRY** Environmental chemistry: definition and scope, environment, environmental segments, atmospheric regions, chemical species and particulates present in the atmosphere, radiation balance, lapse rate and temperature immersion, green-house effect and global warming, formation and depletion of ozone in the atmosphere, acid rain, air pollution, types of air pollutants, their sources and effects on human health, water pollution, types of water pollutants, sewage, testing of sewage, Biochemical Oxygen Demand(BOD) and Chemical Oxygen Demand (COD)	25

REFERENCE BOOKS:
01. Polytechnic chemistry by V.P Mehta,
02. Environmental chemistry by B.K. Sharma
03. Text-book of Engg. Chemistry by S.S Dara
04.   New course chemistry by S.N. Dhawan, P.N. Kapil and S.C Kheterpal

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
3	-	3	10	15	75	100

UNIT	CONTENT	%age
I	**INTRODUCTION TO ELECTRICITY** *(09) Periods* Modern Electron Theory, Resistance, Ohm's law, Resistance in Series & Parallel. Kirchhoff's Current law & Voltage law, Network theorem for D C. Thevenin's, Norton's Maximum Power Transfer Theorem. **MAGNETISM & ELECTROMAGNETISM** Magnetism & its effects, Law's of Magnetic force, Magnetic lines of force, Magnetic flux, Magnetic Flux Density, Magnetic Field Strength, Permeability,Right hand Gripping Rule, Maxwell's Corkscrew Rule,Force on a current carrying conductor lying in a magnetic field, Fleming's Left Hand Rule,MMF, Reluctance, Permeance, Comparison between Electric & Magnetic circuit.	20
II	**ELECTROMAGNETICINDUCTION** *(09) Periods* Production of Induced Emf & Current ,Faraday's Law of Electromagnetic Induction ,Fleming's Right Hand Rule, Lenz's Law,Dynamically Induced Emf, Statically Induced Emf: Self Inductance and Mutual Inductance **A.C. FUNDAMENTALS** Generation of Alternating Voltage & Current, Important Terms: Cycle, Time Period, Frequency, Amplitude, RMS Value, Average value, Form factor, Peak factor,A.C. through resistance, Inductance & Capacitance, Generation of Polyphase Current & Voltage, Star & Delta Connections: Voltage, Current and Power Relations ,Applications of the Three Phase System	20
III	**ELECTRICAL INSTRUMENTS & MEASUREMENTS** *(08) Periods* Essential Features of Instruments-Deflecting Torque, Controlling Torque & Damping Torque, PMMC Instruments, Moving-Iron Instruments, Ammeter and Voltmeter: Advantages, Disadvantages & Applications. **D.C. GENERATOR** Generator Principle, Simple Loop Generator, Practical Generator: Constructional Features, Types of Generator,Generated EMF	20
IV	**D.C MOTOR** *(09) Periods* Motor Principle,Comparison of Generator & Motor Action,Significance of Back Emf, Applications of D.C. Motors **TRANSFORMER** Working Principle of a Transformer, Transformer Construction, Elementary Theory of an Ideal Transformer, Voltage Transformation Ratio,Losses in Transformer,Auto transformer.	20
V	**INDUCTION MOTOR** *(07) Periods* General Principle of Induction Motor, Advantages, Disadvantages & Applications of single Phase Induction Motor. **INDUSTRIAL APPLICATIONS OF ELECTRIC MOTOR** Classification of Individual Drives, Advantages of Individual Drives, Selection of Motor, Motors for different Drives.	20

REFERENCE BOOKS"
- *Fundamentals of Electrical Engg : By Ashfaq Husain*
- *Electrical Technology: By B.L. Theraja*

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Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**Carpentry & Pattern making** Introduction, Kinds of timber, Preservation & seasoning of timber. Diseases & defects in timber. Carpentry tools, Types of Joints. Types of patterns, Materials used for patterns and allowances, Colour coding.	20
II	**Moulding:** Introduction of Moulding. Moulding tools and equipment, Types of Moulds, Types of Moulding sands, composition and properties of moulding sand. Casting Defects and their remedies. Brief description of sand casting.	20
III	**Smith Forging:** Introduction, application, Forging tools, Forging operations, Drawing upsetting, swaging, bending etc. Forging defects, their causes and remedies, safety precautions, forgeable materials, advantage and disadvantage of hot working over cold working .	20
IV	**Forming and Shaping:** Introduction, Sheet metal tools and equipment, Cold working processes, shearing, drawing, extrusion, rolling, Advantage & limitation of Sheet metal working; Introduction to sheet metal joints, General Principle of Sheet Metal press working, deep drawing of sheets, sheet metal spinning.	20
V	**FITTING:** Introduction, Classification of Fitter's tools, Files, chisels, hammers, hacksaw, drills, taps, dies, die stock, wrenches, pliers, spanners, screw drivers and keys, Surface plate, try square combination set, dial gauge fillet and radius gauge. Marking methods.	20

REFERENCE BOOKS:
1. *Workshop Technology Vol-I : By S.K Hajra Chandhry.*
2. *Workshop Technology Vol-I : By B.S. Raghuwanshi*

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	6	3	50	15	35	100

UNIT	CONTENTS	%age
I	• Introduction to technical drawing, drawing instruments, size and layout of standard sheets, different types of lines as per BIS specification • Printing of letters, single stroke straight/capital and italic/inclined lettering, free hand lettering (alphabet, numerals and roman) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5,5,7,10 and 15 mm height, double stroke lettering of 35 mm height in the ratio of 7:4. • Necessity of dimensioning, terms and notation, methods and principles, dimensioning of small components, dimensioning of over all sizes, circles, threaded holes, chamfered surface, tapered surface, holes equally spaced on PCD, counter sunk hole, counter bore, cylindrical parts, narrow space and gaps, radii, curve and arches, chain and parallel dimensioning.	20
II	• Need & importance of scale, definition of representative fraction, find RF of a given scale, types of scales, construction of plane, diagonal and chords scales.	20
III	• Dividing of line and angle, drawing perpendicular and parallel lines tangent & normal and construction of plane figure, construction of ellipse by different methods i.e. intersecting arc, concentric circle, rectangle/oblong and directrix focus and involutes of different shapes i.e. polygon and circle	20
IV	Construction of parabola and hyperbola by directrix and rectangle method, helix on cylinder, archimedian spiral, cycloid, epicycloids and hypocycloid.	20
V	• Free hand sketching of simple machine parts. • Single and double line plan of single storey building of two rooms set showing position of doors, windows, ventilation with electric wiring using symbols.	20

REFERENCE BOOKS
1. *Engineering Drawing: By N.D. Bhatt.*
2. *Engineering Drawing: By R.K. Dhawan.*
3. *Engineering Drawing: By P.S. Gill*

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	6	3	100	-	50	150

FITTING SHOP: Safety Precautions to be served in the shop.

Introduction to fitting, common materials used in fitting shop, identification of materials.

Description and demonstration of various types of fitting tools.

Exercise on
- Filing a dimensional rectangular /square pieces from a mild flat steel flat.

Introduction to various tools for chipping and hack sawing. Demonstration of chipping and hack sawing operations.

Different types of blades, uses of blades, methods of fittings of blades.
- Making a cut out from a square rectangular piece-using hacksaw.
  Description and demonstration of various types of drills, tap, and dies. selection of dies for   tapping and dyeing operations
- Production of a utility job involving all the above operations.

CARPENTARY SHOP: Safety Precautions to be served in the shop

Introduction to various types of wood by demonstration and their identification. Demonstration, function and use of commonly used hand tools. Care and maintenance of tools, safety measures to be observed.

Exercises on
- Marking, sawing and planning practice.
- Extensive planning practice and chiseling practice.
  Introduction to carpentry joints ,their relative advantages and uses
- Preparation of a half lap joint
- Preparation of Mortise and tennon joint/ dovetail and glued joint / Mitre joint
 Note: Any two jobs to be completed in one semester

SMITHY SHOP: Safety Precautions to be served in the shop

-Demonstration and detailed explanation of tools and equipments used. Forging operations

Bending operations, drawing out and preparation, tools used

Exercises on

Description and specification of blowers, anvils, swage blocks and hammers

Demonstration and description of tongs, fullers, swages
- Upsetting at ends only.
- Forging a square headed bolt.
- To forge a L-hook
- To forge square on one/both ends of a circular rod.
- Forge welding, defects in forging and inspection
- To forge a ring (by forge welding) out of a round MS bar.

Note: Any three jobs to be completed in one semester

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SHEET METAL SHOP: Safety Precautions to be served in the shop

Exercises on

- Introduction & demonstration of tools used and operations in Sheet metal shop.
- Cutting, shearing and bending of sheet.
- To prepare a soap case by the metal sheet.
- To make a funnel with thin sheet and to solder the seam of the same.
- To make a cylinder and to solder the same.
- Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.

Note: Any two jobs to be completed in one semester

PLUMBING SHOP: Safety Precautions to be served in the shop

Introduction to pipes and pipe fittings, their specification. Demonstration and study of function and use of plumber's tool and equipments.

Exercises on

- Practice on threading(external and internal).
  Demonstration of various joints by the instructions.
- Preparation of right angled pipe joints.

Demonstration and study of function and use of Bib cock, Pillar cock, stop cock, gate valve, cistern etc.

Exercises on

- Practice on threading external and internal. threading on pipes.
- Demonstration of various joints by the instruction.

PAINTING SHOP: Safety Precautions to be served in the shop

Exercises on

- Preparation of surface.
- Application of primer coat
- Polishing on wood items
- Painting on wooden items
- Painting steel items
- Painting jobs by brush, roller and spray.

FOUNDARY SHOP Safety Precautions to be served in the shop

Introduction to foundry, tool and equipments used in foundry shop, sands used for moulding. Basic idea of mould and various types of moulding processes. Demonstration of various types of patterns and their uses.

Exercises on

- Preparation of a simple mould
  Introduction gating and risering systems and related tools.
- Exercise on making moulds for different types of patterns complete with gating and risering. Demonstration of melting furnace.

Note:

1. *Number of Exercises per semester depend upon the availability of equipment and time.*
2. *Half of the work is to be complete in I semester and remaining in II semester.*

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	30	--	20	50

01.   (a) To determine the volume of the material contained in a given cylinder by Vernier Callipers.

(b) To determine the density of the material of the given wire by screw gauge and Physical Balance.

02. To determine the coefficient of friction between wood and glass and to plot a graph between frictional   force(F) and normal reaction(R).

03. To find the weight of a given body using the law of parallelogram of vectors.

04. To verify the Boyle's law and to plot a graph between P and 1/V.

05. To study the variation of time period (T) with length (L) of a simple pendulum and hence to determine the value of g at Aligarh by plotting L-T^2 graph.

06. To determine the refractive index of the material of the prism by angle of minimum deviation method.

07. To determine the refractive index of the glass with the help of a travelling microscope.

08. To determine the focal length of a convex lens by two-pin method.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)
I-SEMESTER
APPLIED CHEMISTRY-I   LAB
(COURSE NO: BCH-191)

13

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	30	--	20	50

01. Preparation of standard solution.

02. Determination of normality and strength of sodium hydroxide solution by titrating it with standard oxalic acid solution (Acid-Base Titration)

03.   Preparation of urea- formaldehyde and resorcinol formaldehyde and find out their yields

1. (a) To control one lamp with one switch.
   (b) To control two lamps in series, two lamps in parallel and one alone
2. (a) Study of stair case lighting system using two-way switch.
   (b) Study of Intermediate switch and its application in corridor lighting system.
3. To make connections for gallery lighting.
4. (a) To make connection for 230V bell.
   (b) To make connection for 6V bell using 230/6V transformer.
   (c) To make connection for bell with indicator.
5. Study of various types of wires and cables used in domestic wiring.
   (a) Measurement of SWG of the wires.
   (b) Practice in making 'T' and Mesh joint.
6. Practice in making Plastic Casing-Capping wiring for one point.
7. Practice in making P.V.C conduit wiring for one point.
8. Testing of following faults of electrical installation by Megger.
   (i) Open circuit fault
   (ii) Short circuit fault.
   (iii) Earth leakage test.

II SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U.,ALIGARH

Name of the Branch (es):- **Mechanical / Production / RAC**

Semester :- **Second**

THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Duration of end sem exam	Evaluation Scheme			
						Max Marks			
			L	P	Hrs.	Course Work	Mid Sem Exam	End Sem Exam	Total
1	BMA-201	Applied. Maths-II	5	0	3	10	15	75	100
2	BPH-201	Applied Physics-II	2	0	2	5	10	35	50
3	BCH-201	Applied Chemistry-II	2	0	2	5	10	35	50
4	BEN-201	English Communications Skills	4	0	3	10	15	75	100
5	BME-201	Applied Mechanics	4	0	3	10	15	75	100
6	BME-202	Engg. Drawing -II	0	6	3	50	15	35	100
		Total	**17**	**6**		**90**	**80**	**330**	**500**

PRACTICAL COURSES:

1	BME-291	Workshop Practice -II	0	6	3	100	--	50	150
2	BPH-291	Applied Physics Lab-II	0	2	3	30	--	20	50
3	BCH-291	Applied Chemistry Lab-II	0	2	3	30	--	20	50
4	BME-292	Applied Mechanics Lab	0	2	3	30	--	20	50
		Total	**0**	**12**		**190**	**--**	**110**	**300**
		Grant Total	**17**	**18**		**280**	**80**	**440**	**800**

Period per week:17+18=35

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
5	0	3	10	15	75	100

UNIT	CONTENTS	%age
I	**DIFFERENTIAL CALCULUS-I** Basic concept of theory of limit in order to clarify the concept of continuity which would lay the foundation for study of differentially and differentiation of functions and differentiation of functions. First principle of differentiation, fundamental rule for differentiation, which allows us to find derivatives of functions directly without using definition. Differentiation of implicit functions, logarithmic differentiation of infinite series, differentiation of parametric functions.	20
II	**DIFFERENTIAL CALCULUS-II** Application of derivatives, derivatives as a rate measurer, differentials, errors, and approximations, slope of a line i.e. geometrical meaning of dy/dx at a point and equations of tangent and normal at a point of the curve. Maximum and Minimum values of a function (in its domain).	20
III	**INTEGRAL CALCULUS:** Indefinite integral (inverse process of differentiation), fundamental integration, formulas and standard rules of integration. **METHOD OF INTEGRATION:** (i) Integration by substitution (ii) Integration by parts.	20
IV	**INTEGRATION** Integration of rational algebraic functions by using partial fractions. Evaluation of Integral of various types by using standard formulae. Type 1. $\int \frac{dx}{ax^2+bx+c}$ 2. $\int \frac{dx}{\sqrt{ax^2+bx+x}}$ And $\int \sqrt{(ax^2+bx+c)dx}$ 3. $\int \frac{dx}{a\sin x + b\cos x}$ $\int \frac{dx}{a+b\sin x}$ $\int \frac{dx}{a+b\cos x}$	20
V	**DEFINITE INTEGRALS & AREA:** Definite integrals and application of Gamma function to evaluate integrals. Application of Simpson's rule.	20

REFERENCE BOOKS:
1.Applied Mathematics by Prof. V.K. Parashar
2. Applied Mathematics (Vol-1 & II) by R.D. Sharma
3. Engg. Mathematics, by H.K. Das

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Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
2	-	2	5	10	35	50

UNIT	CONTENTS	%age
I	Matter and charge, conservation of charges, quantization of charge, Coulomb law. Electric field **E** (definition, units and representations by lines of forces), **E** due to an isolated charge. Flux of electric field. Gauss's law of electrostatics, derivation of Coulomb's law from Gauss's law, Determination of **E** due to an infinite line of charges using Gauss's law. Electric dipole. Definition of electric potentials V and its derivation at a point due to an isolated charge, general relation between **E** and V, electrical potential energy.	25
II	Electromagnetism. Definition of magnetic flux, flux of magnetic induction, Magnetic field B, unit of B, Ampere's law ($\oint$ **B.dl**= μ_o I), magnetic field of a current. Flux density near a long straight current carrying conductor (Biot Savart law). Definition of Ampere. Magnetic field of a flat circular coil, magnetic field due to a straight current carrying conductor. Force between two parallel current carrying conductors. Lorentz force **F**=q(**E+V**x**B). ** Magnetic moment of a magnet and Tangent law	25
III	Rutherford atomic model, Failure of Rutherford atomic model. Bohr's theory of hydrogen atom, expression for energy of electron in different states. Excitation and ionization energies and potentials. Structure of solids, crystalline and amorphous solids, idea of lattice, packing in crystals, conductors, insulators, semi-conductors. p and n type semi conductors, superconductors. Mechanism of production of X-rays, continuous and characteristics X-rays, Duane and Hunt rule. Applications of X-rays.	25
IV	General properties of nucleus. Rutherford's scattering experiment. Radius of nucleus, density of nucleus, nature of nuclear forces. Natural radioactivity and disintegration laws, half life and mean life. Nuclear reaction and artificial radio activity. Binding energy .Atomic mass unit Fission and fusion, nuclear reactor, energy generation in sun and stars.	25

REFERENCE BOOKS:
01. Fundamental of Physics,
    D-Halliday, R.Rasnick and J.Walker.
02. Physics for class XII, N.K. Bajaj.
03. ABC Physics for class XII
04. Applied Physics, by R K. Gaur.
05. Physics for class XII by Gogia, Pradeep Prakashan.
                        06. Physics for class XII NCERT

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
2	-	2	5	10	35	50

UNIT	CONTENTS	%age
I	**WATER** Introduction, occurrence of water, sources of natural water, uses of water, impurities in natural water, soft and hard water, types of hardness in water, bad effects of hard water used for domestic purposes, bad effect of hard water for industrial purposes, disadvantages of hard water used for generating steam in boilers, scale/sludge formation, removal and prevention of scale/sludge, priming, foaming caustic embitterment, methods of treatment of hard water: Boiling, Clark's method, washing soda method, lime-soda method (Intermittent and continuous process), zeolite or permutit method, ion-exchange method, degree of hardness, numerical problems based on lime Soda methods and degree of hardness.	25
II	**CORROSION** Introduction, magnitude of corrosion problem, Theories of corrosion (Atmospheric corrosion and immersed corrosion), Galvanic cell action, protection of metals and alloys from corrosion, methods of applying metallic coating (spraying, hot dipping, Sheardizing, tinning, calorizing, electroplating)	25
III	**ALLOYS AND FUELS** **A. ALLOYS**: Introduction, preparation of alloys, purpose of making alloys, general properties of alloys, classification of alloys, composition, properties and engineering applications of brass, bronze, gun-metal, constantan, solders, duralumin and wood, metal. **B.FUEL:** Definition and uses, classification of fuels, essential properties of fuels: Ignition temperature, flash point, calorific value, units of calorific values, experimental determination of calorific value of solid and liquid fuels (Bomb calorimeter method) Coal, origin of coal, types of coal.	25
IV	**POLYMERS** Introduction, monomer and polymer, classification of polymers, polymerization, modes of polymerization (addition and condensation polymerization), plastic and resins, constituents of plastics, preparation, properties and uses of polythene, polystyrene, Teflon, PVC & bakelite. Rubber, types of rubber, vulcanization of rubber, preparation, properties and uses of Buna-S and Buna-N rubber.	25

REFERENCE BOOKS:
01. POLYTECHNIC CHEMISTRY BY V.P. MEHTA
02. BASIC APPLIED CHEMISTRY BY P.C. JAIN AND MONICA JAIN

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)
I/ II SEMESTER
ENGLISH AND COMMUNICATION   SKILL
(COURSE NO: BEN-101/201)

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**VOCABULARY** Word Formation:-roots and affixes, affixation, derivation Compounding. Noun to Adjectives, Noun to Verb	20
II	**GRAMMAR** Verb/Tense/Articles/Prepositions. Phrase Structure/Clause Structure Sentences: Basic Sentence Pattern: Simple, complex, compound, affirmative, negative, interrogative and exclamatory. Transformations**.**	20
III	**READING** Local & Global Comprehension, Unseen passages/General Texts etc. Book reading**.**	20
IV	**WRITING** (a) Factual description-Objects/Places (b) Report Writing. (c) Paragraph writing (d) Letter/Application / C.V.Tips regarding interview	20
V	*COMMUNICATIONS* Dialogues:- Introducing a Guest-A Speaker, An Event - Meeting a Stranger - Asking the way - At the post office - At the Bank Counter etc. Group discussion & debate, Communication: Its Importance, types of communication, barriers to communication**.**	*20*

REFERENCE BOOKS:
1. Short Stores for creative language classrooms.
   Joanne Collie & Stephen Slater (Cambridge Univ.Press)
2. Five minute activities. A resource book for language
   Penny Ur & Andrew Wright (Cambridge Univ.Press)
3. Crossing the line and other stories.
4. The Time Machine: H.G. Wells.
5. Indlish: The Book for Every English speaking Indian
   Jyoti Sanyal. Ed by Martin Cutts.
6. English Grammar & Composition,   S.C Gupta.

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**Introduction** Mechanics and its Utility. Concept of scalar and vector quantities. Effect of force-tension and compression. Rigid body, Principal of physical independence of force, principal of transmissibility of a force. Concept of space, time, motion, Matter, Body, Particle, Rigid Body. Branches of Mechanics, Statics and Dynamics.	15
II	**System of Forces** Concept of coplanar and non-coplanar forces including parallel forces, concurrent and non-concurrent forces, resultant force, equilibrium of forces, laws of parallelogram of forces, law of triangle of forces and its converse. Law of polygon of forces, solution of simple engineering problems by analytical and graphical methods, Determination of resultant of any number of forces in one plane acting upon a particle, condition of equilibrium of coplanar concurrent forces system.	25
III	**Moment and Couple** Concept of Varignon,s theorem. Generalised theorem of moments, application to simple problems –compound lever, steel yard, beams and wheels, lever safety valve,. Moment of couple; properties of a couple; simple applied problems-such as pulley and shaft.	20
IV	**General condition of Equilibrium** General condition of Equilibrium of a rigid body under the action of coplanar forces, statement of force law of equilibrium, moment law of equilibrium, application of above on rigid body. Definition of statically determinate and indeterminate trusses, Calculation of reaction at the support of trusses graphically/Analytically (Method of joint/ method of section), simple problems.	20
V	**Friction** Types of friction: static , limiting and dynamic friction, laws of friction, coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction , conditions of sliding and toppling.	20

Reference Books:
1. *Applied Mechanics and strength of Material: R.S.Khurmi, S.Chand Publication.*
2. *Applied Mechanics : Hemendra Dutt Gupta, Nabharat Publication.*

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	6	3	50	15	35	100

UNIT	CONTENTS	%age
I	• Principle of orthographic projection, projection of points situated in different quadrants, projection of lines inclined to one plane and parallel to the other and vice versa, projection of planes perpendicular to either of planes	20
II	• Projection of solids, such as prism, cube, cylinder and cones with axis perpendicular to horizontal plane or parallel to horizontal plane/vertical plane or both, orthographic views of the given objects	20
III	• Need for sectional views, section of solids, cutting plane method of representing sections ,drawing of full section, half section, true shape of sections, drawing of different conventions for materials in section, conventiontional breaks for shafts, pipes, rectangular, square, angle channel etc.	20
IV	• Drawing of different development of surfaces, • Orthographic and section of machine parts such as V-Book, Glands, wall brackets, keys, pins and cotter • Intersection of surfaces, interpenetration of two cylinders.	20
V	• Fundamentals of isometric projection, isometric views from the given orthographic views & oblique drawing of simple objects using of isometric scale.	20

REFERENCE BOOKS

1. *Engineering Drawing: By N.D. Bhatt.*
2. *Engineering Drawing: By R.K. Dhawan.*
3. *Engineering Drawing: By P.S. Gill*

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	6	3	100	-	50	150

FITTING SHOP: Safety Precautions to be served in the shop.

Introduction to fitting, common materials used in fitting shop, identification of materials.

Description and demonstration of various types of fitting tools.

Exercise on

• Filing a dimensional rectangular /square pieces from a mild flat steel flat.

Introduction to various tools for chipping and hack sawing. Demonstration of chipping and hack sawing operations.

Different types of blades, uses of blades, methods of fittings of blades.

• Making a cut out from a square rectangular piece-using hacksaw.

Description and demonstration of various types of drills, tap, and dies. selection of dies for   tapping and dyeing operations

• Production of a utility job involving all the above operations.

CARPENTARY SHOP: Safety Precautions to be served in the shop

Introduction to various types of wood by demonstration and their identification. Demonstration, function and use of commonly used hand tools. Care and maintenance of tools, safety measures to be observed.

Exercises on

• Marking, sawing and planning practice.

• Extensive planning practice and chiseling practice.

  Introduction to carpentry joints ,their relative advantages and uses

• Preparation of a half lap joint

• Preparation of Mortise and tennon joint/ dovetail and glued joint / Mitre joint

 Note: Any two jobs to be completed in one semester

SMITHY SHOP: Safety Precautions to be served in the shop

-Demonstration and detailed explanation of tools and equipments used. Forging operations

Bending operations, drawing out and preparation, tools used

Exercises on

Description and specification of blowers, anvils, swage blocks and hammers

Demonstration and description of tongs, fullers, swages

• Upsetting at ends only.

• Forging a square headed bolt.

• To forge a L-hook

• To forge square on one/both ends of a circular rod.

• Forge welding, defects in forging and inspection

• To forge a ring (by forge welding) out of a round MS bar.

Note: Any three jobs to be completed in one semester

SHEET METAL SHOP: Safety Precautions to be served in the shop

Exercises on

• Introduction & demonstration of tools used and operations in Sheet metal shop.

- Cutting, shearing and bending of sheet.
- To prepare a soap case by the metal sheet.
- To make a funnel with thin sheet and to solder the seam of the same.
- To make a cylinder and to solder the same.
- Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.

Note: Any two jobs to be completed in one semester

PLUMBING SHOP: Safety Precautions to be served in the shop
Introduction to pipes and pipe fittings, their specification. Demonstration and study of function and use of plumber's tool and equipments.
Exercises on
- Practice on threading(external and internal).
  Demonstration of various joints by the instructions.
- Preparation of right angled pipe joints.
Demonstration and study of function and use of Bib cock, Pillar cock, stop cock, gate valve, cistern etc.
Exercises on
- Practice on threading external and internal threading on pipes.
- Demonstration of various joints by the instruction.

PAINTING SHOP: Safety Precautions to be served in the shop
Exercises on
- Preparation of surface.
- Application of primer coat
- Polishing on wood items
- Painting on wooden items
- Painting steel items
- Painting jobs by brush, roller and spray.

FOUNDARY SHOP Safety Precautions to be served in the shop
Introduction to foundry, tool and equipments used in foundry shop, sands used for moulding.
Basic idea of mould and various types of moulding processes.
Demonstration of various types of patterns and their uses.
Exercises on
- Preparation of a simple mould
  Introduction gating and risering systems and related tools.
- Exercise on making moulds for different types of patterns complete with gating and risering.
  Demonstration of melting furnace.

Note:

3. *Number of Exercises per semester depend upon the availability of equipment and time.*
4. *Half of the work is to be complete in I semester and remaining in II semester.*

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	30	--	20	50

01. To find the radius of curvature of a concave mirror by Spherometer and to verify the result by one pin method.

02. To determine the moment of inertia of an irregular body with the help of inertia table.

03. To determine the value of Young's modulus of elasticity of the material of the given a wire by Sealer's Apparatus.

04. To determine the coefficient of thermal conductivity of the material of the cylinder by Searle's Apparatus.

05. To determine the frequency of the tuning fork by sonometer.

06. To determine mechanical equivalent of heat (J) by Searle's friction cone method.

07. To determine the specific resistance of the material of given wire using post office Box.

08. To study the variation of resistance with temperature of the given semi-conductor.

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	30	--	20	50

01.   Determination of normality and the strength in grams per litre of KMNO4 solution by   titrating it with standard oxalic acid solution (Redox- titration)

02.   To separate the mixture of blue and red-ink by paper chromatography.

03.   Estimation of hardness of water by soap titration method.

04.   To identify the given organic compounds for their functional groups.

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	30	-	20	50

Practical Exercises on the following.

1. To verity the law polygon of forces.

2. To verity the law of parallelogram and triangle of forces.

3. To verity the law of principle of moments.

4. To find the reaction at supports of a simply supported beam carrying point loads only.

5. To find the forces in the jib & tie of a jib crane.

6. To find the forces in the members of a loaded roof truss. (King /Queen post truss).

7. To find out centre of gravity of regular lamina.

8. To find out centre of gravity of irregular lamina.

9. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines.

    - Simple wheel & axle.

    - Differential wheel & axle.

    - Differential pulley block.

    - Simple Screw jack.

    - Simple Worm & worm wheel.

    - System of pulleys (any type)

Note: Number of Experiments depends upon the availability of equipment and time.

III SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U.,ALIGARH

Name of the Branch (es) **:- Mechanical Engineering**

Semester :- **Third**

THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Duration of end sem exam	Evaluation Scheme			
						Max Marks			
			L	P	Hrs.	Course Work	Mid Sem Exam	End Sem Exam	Total
1	BMA-301	Applied Maths-III	4	0	3	10	15	75	100
2	BME-301	Metrology & Quality Control	4	0	3	10	15	75	100
3	BME-302	Thermodynamics & Heat Transfer	4	0	3	10	15	75	100
4	BME-303	Production Tech-II	4	0	3	10	15	75	100
5	BME-304	Machine Drawing-I	0	6	3	50	15	35	100
6.	BCE-306	Environmental Studies	2	0	2	5	10	35	50
		Total	**18**	**6**		**95**	**85**	**370**	**550**

PRACTICAL COURSES:

1	BME- 391	Workshop Practice-III	0	4	3	60	--	40	100
2	BME-392	Thermodynamics & Heat	0	2	3	30	--	20	50
3	BME-393	Metrology Lab	0	4 (2*2)	3	60	--	40	100
		Total	**0**	**10**		**150**		**100**	**250**
		Grant Total	**18**	**16**		**245**	**85**	**470**	**800**

Period per week:18+16=34

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	0	3	10	15	75	100

UNIT	CONTENTS	%age
I	**MATRICES:** Types of matrices, Addition and subtraction of matrices. Multiplication of matrices and problems. Adjoint of square matrices and related problems. Inverse of a matrix, inverse matrix with the help of adjoint of matrix and problems. Solution of simultaneous linear equations by matrix method, application of inverse matrix and problems.	20
II	**DIFFERENTIAL EQUATIONS:** Definition of differential equation, order and degree of differential equations, problems. Solution of differential equation, differential equation of first order and first-degree problems. Variable separable form.	20
III	**HOMOGENEOUS & LINER DIFFERENTIAL EQUATIONS:** Homogeneous differential equation, reducible to homogeneous form. Linear differential equation and equations reducible to linear. $dy/dx + Py = Qy^n$ form and problems.	20
IV	**EXACT DIFFERENTIAL EQUATIONS:** Exact differential equations and equations reducible to exact form and problems. Simple application and related problems.	20
V	**LAPLAC'TRANSFORM:** Definition and notations, important formulae, properties of Laplac's transformation, shifting theorems, Inverse Laplac's transformation.	20

REFERENCE BOOKS:

1 .Applied Mathematics by Prof. V.K. Parashar

2. Applied Mathematics (Vol-1 & II) by R.D. Sharma

3. Engg. Mathematics, by H.K. Das

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**INTRODUCTION** Meaning & Scope of Metrology. Units and Standards of Measurement. Meaning of Precision, Accuracy, range, sensitivity, and readability, Criteria for selection of Instruments, interchange ability, Basic concept of Limits, fits & Tolerance; Classification of Fits: clearance fit, transition fit, & interference fit, GO & NOT-GO gauges; Brief description of snap, Plug & ring gauges; Taylor's principle of Gauge Design.	20
II	**MEASUREMENT** Classification of measuring instruments, Linear Measurement, Slip Gauges; Surface Plate; Comparators: mechanical, electrical, & Optical (Description of any one of each type). Introduction to Interferometry: Principle of interference and its use in measurements. Angle Measurement; Instruments Used for angle measurement; Bevel Protractor; Since Bar, Sine-Centre, Auto-Collimator. Measurement of Straightness, Square-ness, & Parallelism (By any one method).	20
III	**SCREW THREAD MEASUREMENT** Introduction, Measurement of Minor & Major diameter, Flank angle, measurement of external threads only by any one method, Instruments used for above. **GEAR MEASUREMENT**: Introduction, Measurement of Concentricity, tooth thickness by any one method Instruments used for the above. (measurement of spur glass only) **MEASUREMENT OF SURFACE FINISH** Types of surface irregularities, methods of measuring surface finish (direct and indirect).	25
IV	**QUALITY CONTROL** Introduction, types of inspection, Statistical Quality Control (SQC), Control Charts (Control charts for attributes, & control charts for variables), applications of control charts, Sample Inspection, Single & double sampling plans.	20
V	**QUALITY STANDARD & CODES** Introduction to ISO: 900 and ISO: 14000; Basic concept of Total Quality Management (TQM), Quality Circle, and Quality Assurance.	15

REFERENCE BOOKS:
1. Production Engg Sciences : By P.C.Pandeya & C.K. Singh.
2. Engineering Metrology : By K.J. Hume.
3. Engineering Metrology : By R.K.Rajput.
4. Engineering Metrology : By R.K. Jain
5. Workshop Technology Vol-I : By S.K Hajra Chaudhry.
6. Precision Measurements :By A.W. Judge

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**BASIC CONCEPTS AND DEFINITIONS** Definitions of Thermodynamics and thermodynamics systems – their types. Thermodynamics properties – Extensive and Intensive. Thermodynamic state and thermodynamic process. Flow and Non-flow, Reversible and Irreversible Processes. Statement, concept and applications of Zeroth Law, First Law and Second Law of thermodynamics. Two specific heats of gases and their relation. Concept of internal energy, Flow work, Enthalpy and Entropy. Description of Isobaric, Isochoric, Isothermal, Adiabatic and Polytrophic processes. Related Numerical problems.	30
II	**STEAM FORMATION AND PROPERTIES OF STEAM** Process of steam formation. Conditions of steam generated i.e Wet, Dry & Saturated and Superheated steam. Dryness fraction and degree of superheat. Use of Steam table and chart – estimation of properties of steam.	10
III	**STEAM GENERATORS (BOILERS)** Definition and classification of steam generators. Essentials of a good steam generator and selection criteria. Boilers for low and high pressure steam generation. Fire tube and water tube boilers. Detail study of La- Mont, Benson, Stirling, Loeffler and Babcock and Wilcox boilers. Thermal performance of steam generators – Actual evaporation and equivalent evaporation and boiler efficiency. Simple numerical problems.	15
IV	*HEAT TRANSFER* Introduction to heat transfer. Temperature gradient and heat flux. Different modes of heat transfer. **Conduction :** Mechanism, basic laws and equations of conduction heat transfer. Heat conduction through a plane wall, composite wall. Conduction heat transfer through a thick walled hollow cylinder, tube, hollow sphere and spherical shell. **Convection :** Mechanism, basic laws and equations of convection heat transfer. Convective heat transfer coefficient. Types of heat convection – Free and Forced convection. Laminar and Turbulent flow in convective heat transfer. Heat exchange between two fluids separated by a sold surface. Over all heat transfer coefficient. **Radiation:** Mechanism of radiation heat transfer. Radiation properties (reflectivity, absorptivity etc) and emissive power of a surface. Concept of black and real bodies. Laws of radiation heat transfer such as Plank's distribution, Kirchhoff's, Stefan-Boltzman and wien's displacement laws. Numerical problems.	30
V	Types of fuels. Requirement of a good fuel. Calorific values of a fuel. Determination of calorific value – Bomb calorimeter and Boy's gas calorimeter. Combustion products analysis by mass and by volume. Determination of air required for combustion of a fuel and excess air. Orsat flue gas analyzer.	15

REFERENCE BOOKS

1. *Heat Engineering- Vasandhani & Kumar.*
2. *Basic Engineering Thermodynamic- Raynar Joel.*
3. *Engg. Thermodynamics. P.K. Nag.*
4. *Engg. Heat Transfer. J.P. Holman*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	Introduction, features of Machine Tool, Elements of Cutting Process, Geometry of single Point Cutting Tool, Types of Chips, Wear of tools and tool life. Concept of Machinability, Cutting tool materials, Cutting fluids: Introduction, function, types and application.	15
II	**LATHE** Introduction, Working principle, specification, and classification of lathe. Brief description of Centre Lathe Parts: bed, headstock, tailstock, carriage, feed mechanism and back gears. Brief description of lathe accessories: chucks, faceplate, mandrels, centres, angle plates, lathe dogs, rests (steady and follower). Lathe operations: taper turning, thread cutting, cutting speed, feed, and depth of cut, simple problems on taper turning and thread cutting.	25
III	**SHAPER, PLANER AND SLOTTER** Working principle of each machine, quick return mechanism of shaper, basic parts their description and functions, drive mechanism (hydraulic, mechanical), various tools, work holding devices, operations, speed, feed and machining time.	20
IV	**WELDING** Weld edge preparation, Introduction to various welding processes with procedure equipments and applications such as Gas welding, Electric arc welding, Resistance welding-Spot welding, Flash butt, Thermit welding, Carbon arc welding, Metal-Inert-Gas welding (MIG), Tungsten inert gas welding (TIG), Atomic Hydrogen arc welding, Stud welding, Laser Beam, Electron Beam Welding, Explosion Welding, Ultrasonic Welding, Under water welding, Submerged Arc welding, various types of electrodes used in various processes. Selection of electrode from catalogue, current and voltage setting from welder's hand book. **TESTING OF WELDS** (a) Destructive methods. (b) Non destructive methods-visual, X-ray, Gamma-ray, Magnetic particles, flaw detection, fluorescent, dye penetration and ultrasonic testing.	25
V	**DRILLING MACHINES** Introduction, Types of drilling machines, description of redial. Drilling machine, drilling tool, drill, reamer, operations performed on drilling machines. **BORING MACHINES** Introduction, types of boring machines, description of horizontal boring machine, operations, tools, and attachments.	15

REFERENCE BOOKS:

1. *Workshop Technology Vol-II: By S. K. Hajra Chaudhry.*
2. *Production Engg Sciences: By P.C. Panday & C. K. Singh*
3. *Mfg Engg & Technology: By Kalpakjian*
4. *Mfg Engg: By P.C. Sharma 5. Welding Technology: By O.P.Khanna*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	6	3	50	15	35	100

UNIT	CONTENTS	%age
I	• Planning of drawing sheet, selection of scale on the drawing sheet. • Conventional symbols used in machine drawing (*one sheet*). • Sectioning: Different types of sectioning (*two sheets*) • Pipe Fittings: Different types of pipe fittings and symbols (*one sheet*)	20
II	**Forms of Screw Threads:** Screw thread nomenclature, Forms of threads, Right hand and left hand threads. (*one sheet*) **Nuts And Bolts:** Different assembled views of hexagonal and square headed nuts and bolts, Types of Studs and Nuts. (*one sheet*) **Set Screws:** Sketches of different forms set-screws. (*one sheet*) **Locking Devices:** Sketches of various types of locking devices like Castle nut, locking by split pin, swan Nut, locking plate, screws etc. (*two sheets*) **Rivet heads**: Types of structural and general purpose rivet heads (*one sheet*) **Riveted Joints:** Lap, butt, single riveted, double riveted, single cover, double cover (*one sheet*)	30
III	**Detail and Assembly Drawing:** Drawing exercise on the following **Pipe Joints**: (*three sheets*) • Socket & Spigot Joints. • Flanged Joint. • Piping Drawing. **Keys, Cotter Pin Joints: (***two sheets***)** • Socket & spigot joints • Knuckle Joint **Couplings: (***three sheets***)** • Box or Muff Coupling. • Split muff coupling • Protective type flange coupling *Note: Number of sheets depend upon the availability of time.*	50

REFERENCE BOOKS
1. *Machine Drawing by N.D Bhatt.*
2. *Machine Drawing by R.K.Dhawan (S.Chand Publishers)*
3. *Machine Drawing by Narayana, Kannaiah. (Willey Publications)*

Pds./Week		Duration of Exam.	Max. Marks			
L	P	Hours	Course Work	Mid-Sem. Exam.	End-Sem. Exam	Total
2	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	Definitions of Environmental Science, Environmental Engineering and Environmental Management, Concepts of Ecology, Food chain, Food Web.	20
II	Types of Pollutants, Air Pollution, Water Pollution, Land Pollution: Classification, sources, effects and control measures, Noise Pollution, Odour Pollution. Water conservation and reuse.	20
III	Composition of atmosphere, Hydrological cycle, Green House Effect, Global Warming, Acid Rain, Ozone depletion, deforestation and desertification.	20
IV	Role of Non- Conventional sources of energy for environmental pollution control. Concept of waste reduction, recycling and reuse.	20
V	Basic concepts of Environmental Impact Assessment (EIA), EIA Objectives. Environmental awareness, public participation, Environmental case studies. Environmental Audit, Concept of sustainable development.	20

Reference Books:-

1. Benny Joseph, 2009, Environmental Studies, Tata McGraw Hill Companies, New Delhi.
2. Suresh K. Dhameja, 2012, Environmental Studies, Katson books, New Delhi.
3. Masters, G.M., 1991, *Introduction to Environmental Engineering and Science*, Prentice-Hall International Inc., Englewood Cliffs, NJ.

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	4	3	60	-	40	100

PATTERN MAKING
- Demonstration and study of Tools & equipments.
- Study of Pattern allowances and Materials
- Preparation of single piece pattern.
- Preparation of two piece pattern.

MACHINE SHOP
- Safety Precautions in machine shop.
- Study of lathe & shaper.
- Grinding of single point cutting tool.
- Exercise on plane turning/step turing and facing.
- Shaping and sizing of CI block on shaper.

WELDING SHOP
- Safely precautions in welding.
- Study of welding equipments.
- Study welding joints.
- Practice of arch welding.
- Preparation of edges and welding a lap pint by arch welding.

FITTING SHOP
- Study of measuring tools.
- Preparation of an assembly of Male, Female mating parts.

Note: Number of Experiments depend upon the availability of equipment and time.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECHANICAL /PRODUCTION /R.A.C ENGINEERING/ PLASTIC TECH
III-SEMESTER
THREMODYNAMCIS & HEAT TRANSFER LAB
(COURSE NO : BME-392)

35

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	30	-	20	50

Practical Exercises on the following

1. Nestlér Boiler / Different Model of Boilers.

2. Study on Diesel Engines

3. Study on Petrol Engines

4. Thermal conductivity of Metal Rod.

5. Thermal conductivity by composite wall apparatus.

6. Heat Exchanger (Parallel & Counter flow)

Note: Number of Experiments depend upon the availability of equipment and time.

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	4	3	60	-	40	100

Practical Exercises on the following

To perform practical exercises on the following:

1. Measurement of diameter of the given job with the help of vernier caliper.
2. Measurement of required height of different shapes of the given job with the help of vernier height gauge.
3. Measurement of required outside & inside diameter of the given job with the help of outside micrometer & inside micrometer.
4. Measurement of required inside diameter of the given job with the help of Bore micrometer and to check the circular shape of the hole i.e. ovality check.
5. Measurement of depth of a hole cavity in the given job with the help of depth gauge and depths micrometer.
6. Measurement of the required angle of the given job with the help of Bevel protector.
7. Measurement of the internal diameter of a hole in the given job at the various section with the help of Bore Gauge and check the ovality and taper effect.
8. Measurement of the included angle of given taper plug gauges with the help of sine bar:
     Taper plug gauge of small-included angle.
     Taper plug gauge of large included angle.
9. Measurement of angle of taper and diameters at both ends of a taper plug gauge using rollers and micrometer.
10. Measurement of included angle and diameter of taper ring gauge at both ends with balls, depth gauge and height gauge.
11. Measurement of the effective diameter of a thread by:
(a) Screw thread micrometer.
(b) Three wire method.
12. Study of flatness of slip gauges and micrometer anvil faces using optical flat.
13. Study of mechanical comparator and determine that the given pieces are within specified limits of tolerances.
14. Study of tool marker's microscope and to measure the following:
(a) Pitch of a thread.
(b) Angle of thread.
15. Measurement of gear tooth thickness (Chordal thickness).
16. Study of gear tooth form by constant chord method.
17. Measurement and study of surface finish of given pieces and to assess it by the method of comparison/surface roughness tester.

Note: Number of Experiments depend upon the availability of equipment and time.

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

IV SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U.,ALIGARH

Name of the Branch (es) **:- Mechanical / Production / RAC**

Semester :- **Fourth**

THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Duration of end sem exam	Evaluation Scheme			
						Max Marks			
			L	P	Hrs.	Course Work	Mid Sem Exam	End Sem Exam	Total
1	BME-401	Strength of Materials	4	0	3	10	15	75	100
2	BME-402	Materials Science	4	0	3	10	15	75	100
3	BME-403	Theory of Machines	4	0	3	10	15	75	100
4	BME-404	Machine Drawing-II	0	6	3	50	15	35	100
5	BEE-405	Industrial Electronics & Instrumentation	3	0	3	10	15	75	100
		Total	**15**	**6**		**90**	**75**	**335**	**500**

PRACTICAL COURSES:

S.No	Course No	Course Title	L	P	Hrs.	Course Work	Mid Sem Exam	End Sem Exam	Total
1	BME-491	Workshop Practice-IV	0	4	3	80	--	40	120
2	BME-492	CAD Lab-I	0	2	3	40	--	20	60
3	BME-493	Strength of Materials Lab	0	2	3	40	--	20	60
4	BEE-495	Electronics Lab.	0	2	3	40	--	20	60
		Total	**0**	**10**		**200**	**--**	**100**	**300**
		Grant Total	**15**	**16**		**290**	**75**	**435**	**800**

Period per week: 15+16=31

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**Stress Strain and Mechanical Properties of Materials** *(11 Pds)* Concept of Stress and strains. Definition of tension, compression, shear, bending, torsion, volumetric strain and lateral strain, poisons ratio. Definitions and detail analysis of stress strain curves for mild steel, cast Iron and rubber. Properties of materials; ductility, brittleness, tenacity, toughness, hardness. Determination of stresses and elongation of bars and columns subjected to direct external load only, equivalent modulus and stresses in compound bars. Temperature stresses in compound bars .Simple problems Concept of compound stresses, Principal stress and principal planes under direct and shear stresses. Graphical determination by Mohr's circle.	20
II	**Shear Force and Bending Moment** *(12 Pds)* Shear force and bending moment diagrams and relations for concentrated and uniformly distributed loads on simply supported beams, cantilever and overhanging beams. Theory of simple Bending; Examples of components subjected to simple bending such as beam, axle, carriage spring etc. Assumptions made in the theory of simple bending, derivation of bending formula. Moment of Inertia, Definitions; neutral axis, section modulus, Bending stresses at different layers from neutral axis for various beam sections.	20
III	**Strain Energy** *(12 Pds)* Definitions/ concept of strain energy, resilience, proof resilience, modulus of resilience, impact/ shock load. Strain energy in a material subjected to un-axial tension and uniform shear stresses. Torsion; Strength of solid and hollow circular shafts, torsion equation, polar modulus of section, Advantage of hollow shaft over solid shaft for same strength.	20
IV	**Columns and Struts** *(10 Pds)* Definitions of long and short columns, slenderness ratio, equivalent length, critical load, collapsing load, end conditions of columns. Application of Euler's and Rankines formula with simple problems. (no derivation)	20
V	**Thin Cylindrical and spherical shells** *(11 Pds)* Difference between thick and thin shells, cylindrical and spherical shell, thin spherical shells subjected to internal pressure , longitudinal stresses, circumferential or hoop stresses, and volumetric strains	20

Reference Books:

1. *SOM by R.K. Rajput, S. Chand Publications*
2. *Applied Mechanics and strength of Material: R.S.Khurmi, S.Chand Publication*
3. *Strength of Material, S.S.Ratan, Tata Mc.Graw Hill,ND-2008*
4. *Strength of Material, S.Ramamurthan, Dhanpat Rai Publication*.

Courtesy: *Dr. Shahnawaz Mohsin*, University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**INTRODUCTION TO ENGINEERING MATERIALS.** Classification: Metal and non metal. Ferrous and non ferrous metals and alloys. Properties of materials. (Basic Concept only) Mechanical properties: Strength, Elasticity, Plasticity, toughness, stiffness, ductility, Malleability, brittleness, hardness fatigue and creep. Thermal conductivity and insulating properties. Electrical conductivity and insulating properties. Practical considerations for selection of material for industrial use. Relation of structure of metals to their properties. Basic idea of arrangement of atoms in metals. Types of crystal structure, crystal lattice. Formation of grains: Dendritic solidification of metals, grain and grain boundary, effect of grain size on properties of metals.	20
II	**FERROUS METALS AND ALLOYS** Classification of ferrous metals. Flow diagrams for the manufacture of ferrous metals (Pig Iron, Wrought iron, Cast Iron and steel) from their ores. Steels: Definition and classification of steels. Composition, Properties and uses of plain carbon steels. Effects of alloying elements (such as Al, Cr, Ni, V, W, Mo, Si, Mn, S and P, and Cu) on the properties of steels. Alloy steels: Definition and classification of alloy steels, composition properties and uses of HSS stainless steels, heat resistant steels and spring steels.	20
III	**HEAT TREATMENT** Allotropic forms of iron, Principal micro constituents of steel, Iron-carbon phase diagram useful for heat treatment purpose. Time-temperature- transformation (TTT) diagram or S- curve, Purpose and Principle of heat treatment. Brief description of principal heat treatment processes: Annealing, Normalizing, Hardening, Tempering, Carburising, Nitriding, Cyaniding and their applications. Examples in heat treating engineering components, Quenching media and Heat treating furnaces (Brief introduction)	20
IV	**NON- FERROUS METALS AND ALLOYS** Important properties and application of Aluminium. Copper, Zinc, Lead and Tin. Composition, Properties and uses of copper Alloys: Brasses: Cartridge Brass, Muntz metal, Navel Brass and free cutting brass. Bronzes: Phospher Bronze, Al-Bronze. Mn bronze and Gun Metal. Al-Alloys: Duralumin, Yellow metal, Magnalium and Hindalium. lead and Tin Alloys: Solder, Babbitt metal. Bearing metals: Requirements of Bearing metals their composition, properties and uses in brief. Nickle and Nickle alloys: Inconel, Monel, and Nichrome. Metals for nuclear energy and refractory metals (Zr, Be, W, Ta): their special properties and uses in brief.	20
V	**MISCELLANEOUS MATERIALS** Plastics: Definition, Characteristics and classification, Properties and applications of major thermo set and thermoplastic materials. Ceramics: Introduction and classification, Properties and applications of ceramics, like Clay, Oxides, Carbides and Nitrides. Composites:- Introduction and classification. Reinforcing fibbers and Matrix materials, properties and uses of Metal-Polymer, Ceramic-Polymer, Metal Ceramic, Polymer to polymer and Metal to Metal Composites (at least one example of each) Insulating Materials: Essential properties and classification of Heat insulating, Electrical insulating materials.	20

REFERENCE BOOKS

1. *Workshop Technology Vol-I: S.K.Hajra Chandhry.*
2. *Workshop Technology Vol-I:B.S.Raghuwanshi.*
3. *Material Science : By K.M.Gupta*
4. *Material Science : By G.K. Narula & V.K.Gupta.*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**SIMPLE MECHANISMS** Simple Mechanism: Introduction: Definition of theory of Machines, Kinetics, Kinematics, Dynamics, Links, Kinematic pairs, lower and higher pairs, Kinematic Chains, Constrained motion, Mechanisms, Inversions of mechanism (four bar mechanism, single slider crank mechanism and double slider crank mechanism).	20
II	**CLUTCHES, BRAKES AND DYNAMOMETER** Friction: Definition and its necessity. Clutches: Introduction Single Plate clutch-its construction and working Equation of maximum torque (uniform wear and uniform pressure), Multiple pate clutch-its construction and working, Equation of torque (Derivation), single problems on above types. Description of Centrifugal clutch. Brakes: Introduction, types, single block brake, Double block brake, Simple problems (without derivation), Simple band brake, Differential band brake, Conditions for self locking, Simple problems on above types. Dynamometer: Description and types, Description of Pony brake dynamometer and Rope dynamometer.	20
III	**POWER TRANSMISSION DEVICES** Belt Drives: Flat and V-belt drive, Types of flat belt drives, Velocity ratio, Slip of belts, Length of Belts, Ratio of tension power transmitted condition for maximum power transmission simple problems on above topics. Gear trains: Simple and Compound gear trains, velocity ratio, train value.	20
IV	**FLYWHEEL AND GOVERNOR** Flywheel : Definition, its purpose and need, Coefficient of fluctuation of speed, Energy stored in a flywheel (with derivation), Simple problems. Governor: Definition and its function, Description, working, simple problems on watt, porter and Hartnell Governor. Terms related to governor-stability, sensitiveness, isochronism and hunting, Differentiation between Flywheel and Governor.	20
V	**LUBRICATION AND BEARINGS** Lubrication: Types of Lubrications, Details of Hydrodynamic, Boundary and Hydrostatic lubrications. Lubricating oils, Greases and their characteristics . Bearing: Function and Classification, Journal bearing,. Various terms used, Bearing characteristics, Bearing friction and Bearing modulus. Rolling Contact bearing- types, Bearing life, rating life, Basic load rating, Advantages and disadvantages	20

REFERENCE BOOK
1. Joshph Edward Shigley.
2. R.S.Khurmi, J.K.Gupta

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	6	3	50	15	35	100

UNIT	CONTENTS	%age
I	**CAM PROFILE** *(Two Sheets)* Cam profiles of the following cases: Profile of a disc cam with knife-edge follower and their displacement diagram Profile of the cam for Roller follower Profile of the cam for offset Roller follower and its displacement diagram Limits, Fit and Tolerances: symbols for representing limits, fits, tolerances in hole basis and shaft basis system on the drawing. Calculation of limits, fits and tolerance for given basic size for common assemblies like H_7/g_6, H_7/m_6 and H_8/u_7.	20
II	**GEAR PROFILE** *(Two Sheets)* Gear profiles of the following cases: In volute gear profile of a spur gear by approximate method of construction. In volute gear profile of a spur gear using Base circle method of construction Rack & Pinion Surface Roughness *(one Sheets)*: surface roughness, machining and welding symbols used in machine drawing-	20
III	Details and Assembly Drawing: Practical exercises on drawing from details to assembly of the following: *(eight sheets)* • Connecting Rod End • I C Engine Piston • Non-Return Valves • Stop Valve • Plummer Block • Tail Stock • Screw Jack • Tool head of a shaper *Note: Number of sheets depend upon the availability of time.*	60

REFERENCE BOOKS
 1. *Machine Drawing by N.D Bhatt.*
 2. *Machine Drawing by R.K.Dhawan (S.Chand Publishers)*
 3. . *Machine Drawing by Narayana, Kannaiah. (Willey Publications)*

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
3	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**CONCEPTS & PRINCIPLES OF ELECTRONIC DEVICES** *(09) Periods* • Semiconductor Diode- PN junction, Diode-Symbol, Forward and Reverse Bias Working, Types of Diode and Characteristics, Zener Diode. • Transistors – Symbol, PNP, NPN, Characteristics & Working. • UJT, SCR, DIAC & TRIAC- Symbol, characteristics & working. • Applications of SCR: Speed & Temperature control circuits.	20
II	**POWER SUPPLIES** *(08) Periods* • Rectifiers- Half wave, Full wave & Bridge type. • Filters- L, C, L-C, and π type. AMPLIFIERS • CE, CB and CC configuration of Transistor, Frequency response and Characteristics. • Single stage Amplifier: Circuit and work. • Applications.	20
III	**OSCILLATORS** (*08) Periods* • Barkhausans Criteria. • RC Oscillator, Phase Shift Oscillator, LC Oscillators. • Application of Oscillators. OPERATIONAL AMPLIFIERS • Ideal Operational Amplifier- Characteristics. • Inverting, Non-Inverting, Amplifiers. • Applications: Summing Amplifier, Subtractor, Integrator, Differentiator	20
IV	**INTRODUCTION TO MEASUREMENT TECHNIQUES** (*09) Periods* • Measurement, Significance of Measurement. • Range, resolution, Precision, Accuracy. • Bridge Measurement- Wheatstone Bridge, Maxwell Bridge, Wien Bridge. RECORDING SYSTEM • Voltage Recording Instruments. • X-Y' Recorder. CRO: CRT Block Diagram, Application of CRO.	20
V	**TRANSDUCERS** (10*) Periods* • Mechanical Parameter Sensors: LVDT, Strain Gauges. • Hydraulic and Pneumatic Sensors: Pressure, Level, Flow. • Temperature Sensors: Thermistors, Thermocouples.	20

Reference Books:- 1. Electronic devices and circuits by S.K Sahdev
   2. Electrical and Electronic measurements &instrumentation by A.K. Sawhney
   3. Electronics Engineering B.L.Theraja

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECH/ PRODUCTION/R.A.C ENGG/PLASTIC TECH
IV-SEMESTER
WORKSHOP PRACTICE-IV
(COURSE NO: BME-491)

43

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	4	3	80	-	40	120

PATTERN MAKING
- Demonstration and study of wood working machines
- Preparation of two piece split pattern.
- Preparation of self core pattern.

MACHINE SHOP
- Study of slotter and radial drilling machine.
- Exercise on taper turning/thread cutting/knurling/ drilling.
- Preparation of V-Block on shaper.
- Cutting of a key way by slotter.

WELDING SHOP
- Study of resistance welding equipments.
- Preparation of edges for butt and T joint & corner joint.
- Preparation of butt joint and corner joints.
- Demonstration of spot welding, flash butt welding.

FITTING SHOP
- Study and demonstration of tap and dies.
- Making internal and external thread by tapping and dieing.
- Preparation of a utility job involving various operations.

Note: Number of Experiments depend upon the availability of equipment and time.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECH/ PRODUCTION/R.A.C ENGG/PLASTIC TECH
IV-SEMESTER
STRENGTH OF MATERIALS LAB
(COURSE NO: BME-493)

45

LIST OF EXPERIMENTS

1. Tensile Test

2. Compression Test

3. Hardness Test

4. Impact Value Test

5. Bending Moment

6. Deflection of Beam

    (a) Simply Supported Beam

    (b) Fixed Beam

7. Three Hinge Arches

8. Portal Frame

9. Influence Line Diagrams

List of Experiments

1. Determination of efficiency and voltage regulation of a single – phase transformer for O.C. and S.C. test.

2. Phasing of three phase transformer and measurement of voltage for Star/Star, Delta /Star, Delta / Delta and Star /Delta connections.

3. Determination of following characteristics of 3-phase induction motor.

    (a) Load current versus speed.

    (b) Load current versus percentage slip.

4. (a) Determination of no load characteristic of D.C. shunt motor i.e. speed versus field current.

    (b) Determination of no load characteristics of D.C. shunts motor speed versus resistance in armature circuit.

5. Determination of efficiency load curve of the D.C. shunt generator its prime- mover having an efficiency of 90 % and determination of its voltage regulation.

6. To measure the resistance and impedance of a given coil.

7. (i)To study the construction of fluorescent lamp, starter and choke.

    (ii)To measure the power consumed by lamp, the voltages across supply, choke and lamp and current drawn by the circuit.

    (iii) Improvement of power factor of the circuit with the help of capacitor.

8. Extension of range of given voltmeter.

9. To verify the following network theorems;

    (i)Super position theorem.

    (ii)Thevenin's theorem

    (iii)Norton's theorem.

V SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U.,ALIGARH

Name of the Branch (es) **:- Mechanical Engineering**

Semester:- **Fifth**

THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Duration of end sem exam	Evaluation Scheme			
						Max Marks			
			L	P	Hrs.	Course Work	Mid Sem Exam	End Sem Exam	Total
1	BME-501	Industrial Engineering	4	0	3	10	15	75	100
2	BME-502	Hydraulics & Pneumatics	4	0	3	10	15	75	100
3	BME-503	Applied Thermodynamics	4	0	3	10	15	75	100
4	BME-504	Refrigeration & Air	4	0	3	10	15	75	100
5	BME-505	Production Technology -III	4	0	3	10	15	75	100
		Total	**20**	**0**		**50**	**75**	**375**	**500**

PRACTICAL COURSES:

Period per week: 20+13=33

1	BME-591	Workshop Practice -V	0	6	3	80	--	40	120
2	BME-592	CAD Lab-II	0	2	3	50	--	30	80
3	BME-593	Applied Thermodynamics Lab	0	2	3	50	--	30	80
4	BME-594	Project	0	3	3	80	--	40	120
		Total	**0**	**1**		**260**	**--**	**140**	**400**
		Grant Total	**20**	**1**		**310**	**75**	**515**	**900**

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**Introduction to Industrial Engg.:** Definition, Application and Industry Classification. **Production and Productivity:** Definition, Production system, its characteristics, Product Life Cycle, Factors influencing productivity and measurement of productivity. **Plant Location**: Introduction, Factors affecting plant location. **Plant Layout:** Definition, Types of layouts, advantages and disadvantages of different layouts. **Material Handling:** Introduction, Material handling equipments, their types, functions and selection.	20
II	**Method Study:** Definition, objectives and need of method study, Pre-requisites of conducting method study, Role of method study in improving productivity, Procedure of conducting method study, Recording techniques-Process charts and diagrams, Process chart symbols, (Flow process chart, Multi-activity chart, Right and Left hand chart and flow diagram), Examples. **Principles of Motion Economy:** Principles governing motion study, Introduction to Therbligs, Micro-motion study and their applications through examples	20
III	**Time Study:** Definition, Objectives and procedure of conducting time study, System of performance rating, various allowances, Calculation of standard time. **Ergonomics:** Definition, objectives and applications, Design of work place layout Basic parameters and principles of work design, Man-Machine system, Role of work environment on human performance.	20
IV	**Planning and Control:** An introduction to production, planning and control, its need and objectives, comparison between production planning and production control, Concept of Scheduling, Routing, Dispatching and Expediting, Techniques/methods of PPC like CPM and PERT, terminology related with CPM and PERT, Simple problems on them. **Break Even Analysis:** Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them.	20
V	**Forecasting:** Introduction to sales forecasting, definition, types, applications, need and limitations. **Inventory Control:** Introduction, types, objectives, need, terminology used in inventory control, Economic Order Quantity (EOQ), Lot size of production for minimum cost, simple problems on EOQ.	20

Books for References:

1. *Industrial Engineering and Production Management by Martand Telsang (S.Chand Pub.)*
2. *Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)*
3. *Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)*
4. *Industrial Engineering by N.J. Manek (Laxmi Pub.)*
5. *Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.).*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECHANICAL/ PRODUCTION / RAC ENGG / PLASTIC TECH
V-SEMESTER
HYDRAULICS & PNEUMATICS
(COURSE NO : BME-502)

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**Introduction:** Fluid, types of fluids, Difference between fluid mechanics and hydraulics. **Properties of Fluid:** Mass density, weight density (specific weight), specific volume, specific gravity, viscosity, kinematic & dynamic viscosity, surface tension, and their units. Intensity of pressure, pressure bead, center of pressure, total pressure on horizontal & vertical flat surfaces (without proof) and simple problems on them. **Pressure Measurement:** Pressure (Atmospheric, Gauge, Absolute, Vacuum), Pascal's law and its paradox. **Pressure Measuring Devices:** Piezometic tube, simple manometer, differential manometer, inverted differential manometer, simple problems on them.	25
II	**Flow of fluids:** Types of fluid flow, steady & unsteady, uniform & non-uniform, laminar & turbulent flows, rate of flow & its units, continuity equation for I-D steady flow, Reynolds no & its significance, Energy of liquid in motion total energy, velocity head, pressure head, potential head, Bernoulli's theorem (Statement & proof), its applications & assumptions, discharge measurement with the help of venturimeter, problem on the same.	20
III	**Flow through Orifices:** Types of orifices, hydraulic coefficients, relationship between Cc, Cv & Cd, Vena-contracts. **Flow through Pipes:** Minor & major losses, loss of head in pipes due to sudden enlargement, sudden contraction, obstruction in flow path and pipe fitting (without proof), problems, water hammering in pipes & surge tanks.	15
IV	**Hydraulic Machines:** Concept of hydraulic pumps, construction and working of centrifugal pumps and reciprocating pumps, Selection of pumps. Concept of hydraulic Turbines- Classification, construction & description of main components of Pelton, Francis & Kaplan Turbines. Description and application of hydraulic ram, hydraulic accumulator and hydraulic press.	20
V	**Pneumatic System:** Basic elements of pneumatic system and their functions such as- Air Compressor (Types & selection), generation of compressed air, Air-filters, Pressure regulators and Lubricators, their necessity in pneumatic circuits, Application of Pneumatics, Characteristic / features of pneumatic system. Pneumatic valves, pneumatic actuators (Brief idea only), pneumatic system safety, cleanliness and preventive maintenance.	20

Books of References :
1. *A text book of Fluid Mechanics and Hydraulic Machines by R.K Rajut (S.Chand Publishers).*
2. *Fluid Mechanics & Hydraulics by Jagdish Lal .(Metropolitan Publishers).*
3. *Fluid Mechanics and Hydraulic Machines by S.S. Rattan,(Khanna Publishers).*
4. *Pneumatic Systems Principles and maintenance by S.R Majumar.(Tata Mc Graw Hill Publications.*
5. *Hydraulic and Pneumatic- A Technician's and Engineer's Guide by Andrew Parr, (Jaico Publication House).*
6. *Hydraulic & Hydraulic Machines by Bansal.*
7. *A text book of Hydraulics by Bawa*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**INTERNAL COMBUSTION ENGINE** Heat Engines, Introduction and classification of I.C. engines, Basic terminology, Working principles of two stroke and four stroke cycles. Petrol and diesel engines and their comparison. Quality of good fuel. Detonation in S.I. engine and octane number of fuel. Knocking in C.I. engine and cetane number of fuel. Measurement of indicated power and brake power, Performance parameters, Morse test and Heat balance sheet.	20
II	**AIR COMPRESSORS** Industrial uses of compressed air. Classification of air compressors. Description of single reciprocating compressors. Effect of clearance, work done and volumetric efficiency. Description of multi-stage compressors. Advantages of multistage compression. Condition for maximum efficiency. Problems. Introduction to rotary compressors. Description of root blower and centrifugal compressor.	20
III	**STEAM NOZZLES AND CONDENSERS** Steam nozzles: Introduction. Steady Flow Energy Equation concept. Types of nozzles, effect of friction, velocity of steam at exit of the nozzle, mass of steam discharge through nozzle, condition of maximum discharge through a nozzle, maximum discharge through a nozzle. Problems Steam condensers: Functions of condenser in a steam power plant. Types of condenser. Comparison of jet and surface condenser. Condenser efficiency. Quantity of cooling water required. Effects of air leakage in condenser. Problems.	20
IV	**GAS POWER AND VAPOUR POWER CYCLES** Gas power cycles: Air standard efficiency, Description of Otto cycle, Diesel cycle and Dual combustion cycles. Air standard efficiency of Otto cycle and Diesel cycle (without derivation). Problems. Vapour power cycles: Carnot cycle and Rankine cycle. Comparison of Rankine cycle with Carnot cycle. Use of Mollier diagram, Problems.	20
V	**STEAM TURBINES AND GAS TURBINES** Steam Turbines: Principal of operation of impulse and reaction turbines. Pressure, Velocity and Pressure-velocity compounding, their advantages. Gas Turbines: Descriptive treatment of gas turbines, operation of gas turbine, open and closed gas turbine cycles. Performance and efficiency. Gas turbine versus reciprocating engines. Problems.	20

REFERENCE BOOKS

1. D. S. Kumar, Engineering Thermodynamics, S. K. Kataria and Sons Publishers, New Delhi.
2. R. Joel, Basic Engineering Thermodynamics, Pearson's Education, New Delhi.
3. R. Basu, Thermal Engineering- Heat Power, Dhanpat Rai & Co. Pvt. Ltd., New Delhi.
4. T. Roy Choudhary, Basic Engineering Thermodynamics, Tata McGraw Hill Publishing Company Limited, New Delhi.

Pds/week		Duration of Exam	Max Marks			
L	**P**	**Hrs**	**Course Work**	**Mid-Sem Exam**	**End-Sem Exam**	**Total**
4	**-**	**3**	**10**	**15**	**75**	**100**

UNIT	CONTENTS	%age
I	Principles of refrigeration. Air refrigeration systems - Reversed Carnot and Bell Coleman cycles. Vapour compression Refrigeration system and analysis of its cycle. Effect of subcooling and superheating. Vapour absorption refrigeration system. Working principles of refrigeration components and controls such as Compressors, Condensers, Evaporator, Throttling Valve and Thermostat etc	**20**
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-12, R-502, R-134a and NH_3. Effect of CFC refrigerants on environment such as Ozone layer depletion and global warming. Alternate refrigerants.	**20**
III	Psychrometric properties of air. Gibbs – Dalton Law. Psychrometric processes – their representation on psychometric chart. By pass factor. Mixing of air streams. Brief idea of Metabolism in human body. Introduction to human comfort and comfort air-conditioning. Psysiological requirements of human body, Effective temperature and comfort charts.	**20**
IV	Cooling and heating load calculation. Description of various types of loads – Sensible and latent heat load. Sensible heat factor. Apparatus dew point. Supply air and re-circulated air. HVAC, Air conditioning systems – Room air conditioner central air 51conditioning. Round the year system. Air distribution.	**20**
V	Simple description of filters, dampers, fans, blowers, air register (grilles) and diffusers and strip heaters. Detailed study of Domestic refrigerator, water coolers, deep freezer and desert coolers. Layout and working of Ice plant and Cold storage	**20**

REFERENCE BOOKS
1. *Refrigeration & Air Conditioning . C.P. Arora.*
2. *Refrigeration & Air Conditioning. Arora & Domkundwar.*
3. *Principles of Refrigeration. Dossat, Roy, J*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	**P**	**Hrs**	**Course Work**	**Mid-Sem Exam**	**End-Sem Exam**	**Total**
4	**-**	**3**	**10**	**15**	**75**	**100**

UNIT	CONTENTS	%age
I	**GRINDING MACHINES** Introduction; Classification of Abrasives; Basic concept of Bond, Grit, Structure and Grade of Abrasives; Selection of grinding wheel; Trueing and Dressing of Grinding wheel; Specification of grinding wheels; Grinding Machines: Brief description of Cylindrical grinder, Centre-less grinder; Surface grinder, Tool and Cutter grinder.	**20**
II	**JIGS AND FIXTURES:** Introduction; Difference between a jig and a fixture; Important considerations in jig and fixture design; Main elements of jigs and fixtures. Clamping & locating devices types of jigs. Brief idea of milling & grinding fixture	**20**
III	**CAPSTAN AND TURRET LATHES** Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout. **BROACHING AND BROACHING MACHINES** Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching.	**20**
IV	**NUMERICAL CONTROL MACHINE TOOLS:** Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming. **ROBOTS:** Introduction; Main components of a robot; Applications of robot.	**20**
V	**UNCONVENTIONAL METHODS OF MACHINING** Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining. **POWDER METALLURGY:** Brief description; Applications, advantages and disadvantages of powder metallurgy	**20**

REFERENCE BOOKS:
1. *Workshop Technology Vol-II: By S. K. Hajra Chaudhry.*
2. *Production Engg Sciences: By P.C. Panday & C. K. Singh*
3. *Mfg Engg & Technology: By Kalpakjian*
4. *Mfg Engg: By P.C. Sharma*
5. *CNC machines : By M. Adithan*
6. *Production, Automation and computer integrated manufacturing: By Groover.*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	6	3	80	-	40	120

LIST OF EXPERIMENTS

MACHINE SHOP
Demonstration and study of lathe and shaper.
1. Step turning, parallel Turning, Taper turning and Grooving.

WELDING SHOP
1. Study of various Gas cutting and welding equipments:-Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., various electrodes and filler metals and fluxes.
2. Tig Welding practice of Non-Ferrous metals, like Copper, Brass and Aluminium.
3. Practice of Gas cutting manually.
4. Practice of MIG welding
5. Practice of stud welding
6. Practice of gas welding.
7. Practice of Arc cutting.
Note: Any three jobs to be completed

FOUNDRY SHOP
1. **Making sands moulds** of different forms with different types of pattern using- (i) Floor Moulding. (ii)Three Box (or more) Moulding.
2. Making and setting of cores of different types.
3. Casting practice of Non ferrous metals.

CNC MACHINE TOOLS LAB
1. Study and sketch of CNC lathe and milling machine.
2. Study of G codes and M codes.
3. Part programming, for different operations.
4. Programme editing & simulation on CNC lathe and milling machine.

Note: Number of Experiments depend upon the availability of equipment and time.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECH. ENGG.
V-SEMESTER
CAD LAB-II
(COURSE NO: BME-592)

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	50	-	30	80

Practical Exercises on the following

1. Ruston Diesel Engine / Harvest Diesel Engine.

2. Morse test on Petrol Engine.

3. Energy Balance sheet on Petrol Engine.

4. Reciprocating Air Compressor

5. Mechanical Heat Pump

6. Refrigeration Tutor

7. Air Conditioning Tutor

8. Vapour Absorption System

9. Ice Plant Tutor

Note: Number of Experiments depend upon the availability of equipment and time.

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	3	3	80	-	40	120

1) Students based on their subject of choice should devote themselves to make a project which preferably should be a working model of their thoughts.

2) The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester.

3) The project shall be finalized by the students before the start of the V semester and shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.

4) The assessment of performance of students should be made at least twice in each semester i.e. V and VI and each internal assessment shall be for 100 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.

5) The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the at least two internal examiner & one external examiner passed by Board of studies. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

6) Not more than five students would form a group for such industrial training/ project submission.

VI SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

Name of the Branch (es) **:- Mechanical Engineering**

Semester:- **Sixth**

THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Duration of end sem Exam	Evaluation Scheme			
						Max Marks			
			L	P	Hrs.	Course Work	Mid Sem Exam	End Sem Exam	Total
1	BME-601	Industrial Management & Entrepreneurship Development	4	0	3	10	15	75	100
2	BME-602	Machine Design	4	0	3	10	15	75	100
3	BME-603	Automobile Engineering	4	0	3	10	15	75	100
4	BME-604	Machine Tools & Maintenance	4	0	3	10	15	75	100
5	BME-605	Elective:-	3	0	3	10	15	75	100
		Total	**19**	**0**		**50**	**75**	**375**	**500**

PRACTICAL COURSES:

1	BME-691	Workshop Practice-VI	0	6	3	80	--	40	120
2	BME-692	Automobile Lab	0	2	3	50	--	30	80
3	BME-693	Hydraulics & Pneumatics Lab	0	4	3	50	--	30	80
4	BME-694	Project	0	3	3	80	--	40	120
		Total	**0**	**15**		**260**	**--**	**140**	**400**
		Grant Total	**19**	**15**		**310**	**75**	**515**	**900**

Period per week: 19+15=34

- ↟ **Electives:-** **1.. Non-Conventional Energy Sources**

  2.. Total Quality Management.

  3.. Environmental Science & Management

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**INTRODUCTION TO INDUSTRIAL MANAGEMENT:** Definition and necessity of industrial management, Management of men material and machines, Scientific management, Principles of scientific management, Classification of management, Functions of management, Structure of industrial organization, Types of organization structure and applications.	20
II	**INDUSTRIAL OWNERSHIP:** Definition and concept, Types of ownership, Partnership organization, Joint Stock Company, Private Limited Companies, Public Limited Companies, Private sector and Public sector organization, Concept of heavy, medium, small scale, cottage and village industries.MOTIVATION AND LEADERSHIP: Definition of motivation, Methods for improving motivation, Definition of leadership, Functions of leadership, Manager as a leader.	20
III	**FINANCIAL MANAGEMENT:** Sources of finance, Elements of costs, Prime cost, Factory cost, Other overheads, Total cost, Selling price and problems on them Depreciation, Classification and methods of providing depreciation, Problems. **WAGES AND INCENTIVES:** Job evaluation and merit ratings, Definition and objectives, Ranking and point rating methods, Introduction to wages, Types of wages, Introduction to incentives, Types of incentives, Problems based on Halsey and Rowan systems.	20
IV	**HUMAN RESOURSE MANAGEMENT:** Objectives of HRM, Staff development, Training strategies and methods.LABOUR AND INDUSTRIAL LAWS**:** Importance and necessity, Types of Labour laws and disputes, Brief description of the Acts such as Factories Act 1948, Workmen's Compensation Act 1923, Minimum wage Act 1948, Employee's provident fund Act 1952.ACCIDENTS: Introduction, Classification, Causes and Effects of accidents, Types of industrial hazards.	20
V	**ENTREPRENUERSHIP DEVELOPMENT:** Concept of entrepreneurship, Characteristics of entrepreneur, Role of Entrepreneur, Role of entrepreneurs in Economic Development; Entrepreneurship in India, Entrepreneurship – its Barriers, Preparation of project report, Steps of planning a small to medium enterprises (SMEs).	20

Books for References:
1. *Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)*
2. *Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)*
3. *Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.).*
4. *Industrial Management by H.S.Bawa*
5. *Industrial Management by Mittal*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**INTRODUCTION** Design: Definition, type of designs, necessary of design Design procedure. Practical Examples related with design procedure. Characteristics of a good designer. Design terminology: Stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit. General design considerations, codes and standards. Selection of materials	20
II	**DESIGN OF SHAFT** Design of shaft: Types of shaft materials, types of loading, effect of keyway on shaft strength, design of shaft under various types of loading.	20
III	**DESIGN OF KEYS AND COUPLINGS** Design of keys: Types, Materials, function and design of keys. Necessity, advantages and types of couplings, design of Oldham and flanged couplings (Protected and unprotected)	20
IV	**DESIGN OF JOINTS** Types of joints, Temporary and permanent, utility of joints, design of simple cotter and Knuckle joint. Welded Joints: Types of welded joints, strength of parallel and transverse fillet welds, strength of combined parallel and transverse welds under axial loading. Riveted Joints: Leak proofing of riveted joints caulking and fullering Different modes of failure of riveted joint. Design of riveted joints: lap and butt joints. Design of boiler joints .i.e circumferential and longitudinal joints	20
V	**SPRINGS** Introduction, Types of spring, Material for helical spring, standard size of spring wire, Terms used in compression spring, end connection for compression helical springs, end connection for tension helical springs, stresses in helical springs of circular wire, energy stored in helical string of circular wire, stress & defection in helical spring of non-circular wire, construction of leaf spring, eqvalved stresses in spring levers (Nipping) length of leaf spring leaves, simple problems	20

REFERENCE BOOKS:-
1. *Machine Design by S.K. Bhandari*
2. *Machine Design by R.S. Khurmi*

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTNETS	%age
I	**INTRODUCTION** Detailed description of main units of an automobile, Frame- Necessity and construction, automobile engines and their classification, Components of an engine, their materials and functions. Description of V-type, radial, transverse and OHC engines. Suspension system, its classification. Function and working of shock absorber, Air suspension and independent suspension.	20
II	**ELECTRICAL SYSTEM** Concept of ignition, working of condenser, ignition coil, distributor, spark plug, C.B. point, principle of firing order, construction and function of storage battery, battery charging and testing, starter motor, Bendix drive (brief description), Function of magneto-ignition system, dynamo, alternator, cut-out and control of voltage and current. Common electrical faults.	20
III	**TRANSMISSION AND BRAKING SYSTEM** Clutches and their classifications, Types of gear box, working of sliding mesh, constant mesh, synchromesh gear box. Working of propeller shaft, universal joint, differential and rear axle. Function and requirements of wheel, Type of tyres. Wheel Alignment for checking camber, caster angle, toe-in and toe out. Steering gears- types and working, power steering. Concept and requirement of brakes. Classification of brakes, working of mechanical, hydraulic, vacuum assisted brakes, disc brakes. Bleeding of brakes.	20
IV	**Petrol engine fuel feed system:** Description of mechanical fuel pump, S.U. electric fuel pump, types of carburetor. Working of simple carburetor. Multi-point fuel injection (MPFI) and Gasoline Direct Injection (GDI). **Diesel engine fuel feed system:** Description of mechanical fuel pump, injector and fuel filter. Description of common rail injection systems. **Emission Control System:** Automobile pollution and controls such as Catalytic converters, Exhaust Gas Recirculation (EGR) and Positive Crankcase ventilation	20
V	**Cooling System:** Necessity of engine cooling system and its types. Radiator, water jacket, water pump, fan, thermostat (brief description). Coolants used in modern cars. **Lubrication**: Engine lubricated parts, factors affecting lubrication, oil pump, oil filters, grade of lubricating oil, car lubrication system. **Modern Vehicles:** Hybrid vehicles, Stratified charged/learn burn engines, battery vehicles and Magnetic track vehicles.	20

REFERENCE BOOKS

1. P.S. Gill, "A Textbook of Automobile Engineering Vol. I, II & III", S.K. Kataria & Sons.
2. William H. Crouse and Donald L. Anglin, "Automotive Mechanics", Tata McGraw Hill.
3. Joseph Heitner, "Automobile Mechanics: Principles and Practices", Van Nostrand Publishers.
4. T. R. Banga and Nathu Singh, "A Text Book on Automobile Engineering", Khanna Publishers.
5. Kirpal Singh, "Automobile Engineering Vol. I and II", Standard Publishers.

Courtesy: *Dr. Shahnawaz Mohsin,* University Polytechnic, AMU Aligarh, India

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
4	-	3	10	15	75	100

UNIT	CONTENTS	MARKS
I	**MILLING MACHINE** (*11 Periods*) Introduction, classification and specifications. Description of main parts of column & Knee type, Horizontal and vertical spindle milling machines. Milling cutters: types and specifications. Operations performed on milling machines.	15
II	**INDEXING:** (*11 Periods*) Dividing Head, common methods of indexing. Simple, compound and differential indexing giving suitable examples. **Manufacture of Gears**: Application of milling, hobbling, hot rolling hot forging and casting. **Micro Finishing Processes**: Principle and application of lapping and honing. Polishing, Superfinishing, Burnishing, Galvanizing, Anodizing and Tin Plating.	15
III	**INSTALLATION AND TESTING OF MACHINES** (*14 Periods*) Introduction, Reading of information manual, Location, Foundation for machine tools, Different types of machine foundations, Factors affecting the type and size of foundation, Foundation plan (Erection drawing), Preparing the foundation, Damping and isolation of vibration, Erection and transportation, Levelling and aligning. Introduction, Sites for testing, Measuring instruments used for alignment test, Alignment test on lathe machine, drilling machine and milling machine.	18
IV	**RELIABILITY ENGINEERING** (*(8 Periods)*) Basic concept and importance of reliability, failure rate, mean time to failure (MTTF), mean time between failures (MTBF), System reliability, Reliability analysis, Reliability improvement, availability and maintainability of mechanical system; Types and causes of failure. Failure analysis	12
V	**MAINTENANCE** (*14 Periods*) Maintenance objectives and types, Role of maintenance engineer, Maintenance procedure, Need of planned maintenance, recent developments in maintenance engineering, maintenance of various machine parts (belt drive, chain drive, gear drive and shaft coupling). Maintenance stages of Pipes and pipe joints, pumps and lathe machine, Maintenance records, Computerization of maintenance. Reasons of equipment replacement, group replacement, replacement in anticipation of failure. Guidelines in replacement studies and methods of replacement studies.	15

REFERENCE BOOKS

1. *B. S. Raghuwanshi, A Course in Workshop Technology Vol. II Machine Tools, Dhanpat Rai and Co. (P) Ltd. Delhi.*
2. *M. Y. Khan, Installation, Testing and Maintenance, S. K. Kataria and Sons Publishers, New Delhi.*

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
3	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	**Conventional and Non-conventional energy Sources** The need of Non-Conventional Energy Sources. Introduction to various renewable energy sources. Comparison of NCES with the conventional sources – their merits and demerits. Advancements made in recent time.	20
II	**Nuclear Power Reactors** Introduction to Nuclear Energy. Nuclear Reactions – Fission and Fusion. Chain reactions. Nuclear power reactor. Various elements of nuclear reactor. Nuclear fuels, control devices and shielding materials etc. Types of nuclear reactors- Pressurized water reactor, boiling water reactor, liquid metal reactors. Their comparative merits and de -merits.	20
III	*Solar Energy* Introduction to solar energy and solar radiation. Solar radiation at the earth's surface – beam and diffused radiation. Measurement of solar radiation. Physical principles of the conversion of solar radiation into heat. Solar thermal collectors – Flat Plate and Concentrator. Applications of solar energy.	20
IV	**Wind and Tidal Energy** Introduction and basic principles of wind energy conversion. Wind data and energy estimation. Wind energy conversion systems. Site selection considerations. Application of wind energy Basics principles of tidal energy, components of tidal power plants, site requirements, Advantages and limitations of tidal power generation.	20
V	**Geothermal Energy and MHD Systems** Introduction and estimation of Geothermal Energy. Nature of geothermal fields and applications of geothermal energy Principles of MHD power generation. MHD systems and their applications. Materials for MHD systems.	20

REFERENCE BOOKS
1. Non-Conventional Energy sources. G.D.Rai.
2. Solar Engineering of thermal processing . Duffie & Beckman.
3. Solar Energy. S.P.Sukhatme & J.K Natak

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECH / PROD / RAC / PLACTIC
(SEM – VI)
INDUSTRIAL POLLUTION & CONTROL
BCE-605 (B)

63

Pds./Week		Duration of Exam.	Max. Marks			
L	P	Hours	Course Work	Mid-Sem. Exam.	End-Sem. Exam	Total
3	-	3	10	15	75	100

UNIT	CONTENTS	%age
I	Characterization of liquid waste, industrial waste survey, sampling and material balance, segregation and equalization; Disposal of waste in environment, effects on land and receiving waters, disposal standards.	20
II	Wastewater treatment, physical, chemical, and biological processes Wastewater reclamation, and reuse in industry.	20
III	Pollution abatement in major industries: Textile, Paper and Pulp, Steel, Sugar, Distillery, Petroleum Refinery, Agro based industries, Food Processing Industries, Slaughterhouses, Tanneries.	20
IV	Attached and suspended growth Aerobic and Anaerobic wastewater treatment processes their basic process design, mass balance. Nitrification and denitrification processes.	20
V	Industrial solid waste: Sources, Classification and Characteristics, Management of Industrial solid waste, Material and energy recovery, Hazardous Solid waste, Methods of Disposal of Hazardous wastes: Incineration and Pyrolysis.	20

Reference Books:-

1. S.P.Mahajan , Pollution control in industries, Tata McGraw Hill Company.

2. Rao & Dutta, Wastewater Treatment, Oxford & IBH Publishers.

3. Wark & Warner, "Air Pollution- origin and control, Harper and Collins.

4. S.C. Bhatia, 2003, Managing Industrial Pollution, McMillan India Ltd.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECH / PROD / RAC / PLACTIC
(SEM – VI)
TOTAL QUALITY MANAGEMENT
BME-605 (C)

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	6	3	80	-	40	120

LIST OF EXPERIMENTS

MACHINE SHOP
1. ' Threading, Drilling & Knurling on lathe machine
2. Angular machining on Shaper.
3. Key Way Cutting boring on slotting machine
4. To Grind Lathe Tools (All Angles), Shaper/Planer Tools and drill bit.
5. Spur Gear Cutting on milling machine.

WELDING SHOP
1. Practice of Welding pipe joints, Pipes
2. Study of Welding defects.
3. Inspection and Tests of welded joints.

FOUNDRY SHOP
1. Moulding and casting practice
2. Cleaning, inspection and non destructive testing:
   - Dye penetration test for casting
   - Magnetic flaw detection test/Ultra sound flaw detection test for castings.

CNC MACHINE TOOLS LAB
Program feeding, editing, Simulation and execution for different operations.
1. Linear interpolation and circular interpolation on milling machine.
2. Point to point drilling process on milling.
3. Grooving and threading on CNC lathe machine.

Note: Number of Experiments depend upon the availability of equipment and time.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECHANICAL ENGINEERING
VI-SEMESTER
AUTOMOBILE LAB
(COURSE NO : BME-692)

66

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	50	-	30	80

Practical Exercises on the following

1. Electrical System of a Petrol Car

2. Synchromesh Gear Box

3. Carburettor

4. Differential Gear Box

5. Ignition system of Petrol Engine

6. Fuel system of Diesel Engine

7. Mechanical Fuel Pump

8. Chassis of Diesel Engine

9. Chassis of Petrol Car Engine

10. Hydraulics Brake System & Disc Brake System

Note: Number of Experiments depend upon the availability of equipment and time.

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	4	3	50	-	30	80

Practical Exercises on the following

1. Bernoulli's Theorem

2. Orifice Meter /Venturi Meter.

3. Sudden Expansion & Contraction.

4. Coefficient friction of Pipe Line.

5. Reynolds Experiments.

6. Mouth piece.

7. Easy & Sharp bend.

8. Rectangular / Triangular Notch.

9. Impact of Jet.

10. Pelton Turbine.

11. Francis Turbine.

12. Centrifugal Pumps.

13. Reciprocating Pump.

14. Hydraulic Ram.

15. Pneumatic Bench.

Note:
1. *Number of Experiments depend upon the availability of equipment and time.*
2. *Any eight experiments to be completed in Production/ R.A.C / Plastic Tech*

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH
DIPLOMA IN MECHANICAL ENGINEERING
VI-SEMESTER
PROJECT
COURSE NO: BME-694

68

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	3	3	80	-	40	120

1) Students based on their subject of choice should devote themselves to make a project which preferably should be a working model of their thoughts.

2) The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester.

3) The project shall be finalized by the students before the start of the V semester and shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.

4) The assessment of performance of students should be made at least twice in each semester i.e. V and VI and each internal assessment shall be for 100 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.

5) The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the at least two internal examiner & one external examiner passed by Board of studies. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

6) Not more than five students would form a group for such industrial training/ project submission.