

# MECHANICAL ENGINEERING SECTION

## STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME



Mechanical Engineering Section, University Polytechnic



**DIPLOMA IN MECHANICAL ENGINEERING (PRODUCTION ENGINEERING)**

**INCHARGE:**

**Dr. SHAHNAWAZ MOHSIN**

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updated:

**2019**

**UNIVERSITY POLYTECHNIC, AMU, ALIGARH, UP, INDIA**

DIPLOMA IN ENGINEERING (PRODUCTION)			
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# 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		Evaluation Scheme				
					Duration of end sem exam	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
		<b>Total</b>	<b>16</b>	<b>6</b>		<b>90</b>	<b>80</b>	<b>330</b>	<b>500</b>

### PRACTICAL COURSES:

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
		<b>Total</b>	<b>0</b>	<b>12</b>		<b>190</b>	<b>---</b>	<b>110</b>	<b>300</b>
		<b>Grant Total</b>	<b>16</b>	<b>18</b>		<b>280</b>	<b>80</b>	<b>440</b>	<b>800</b>

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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH  
DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**

**I- SEMESTER**

**APPLIED MATHEMATICS**

**(COURSE NO : BMA-101)**

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	<b>ALGEBRA:</b> 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	<b>TRIGONOMETRY:</b> Trigonometrical ratios of the sum and difference of two angles. Trigonometrical ratios of multiple and submultiples angle. Conditional Trigonometrical identities. Trigonometrical equations.	20
III	<b>COORDINATE GEOMETRY-I</b> 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	<b>COORDINATE GEOMETRY-II</b> 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	<b>COMPLEX NUMBERS</b> 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

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**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**I-SEMESTER**  
**APPLIED PHYSICS-I**  
**(COURSE NO : BPH-101)**

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 translational kinetic energy. Specific heat of gases, relation between $C_p$ and $C_v$ , 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

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**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**I-SEMESTER**  
**APPLIED CHEMISTRY-I**  
**(COURSE NO : BCH-101)**

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	<b>ORGANIC CHEMISTRY</b> 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	<b>ELECTROCHEMISTRY</b> 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	<b>pH VALUE OF BUFFER SOLUTION</b> <b>A:</b> 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>B:</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	<b>ENVIRONMENTAL CHEMISTRY</b> 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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL ENGINEERING (PRODUCTION/R.A.C)/PLASTIC TECH**  
**I-SEMESTER**  
**ELECTRICAL ENGINEERING**  
**(COURSE NO:BEE-103)**

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	<b>INTRODUCTION TO ELECTRICITY (09) Periods</b> 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. <b>MAGNETISM &amp; ELECTROMAGNETISM</b> 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	<b>ELECTROMAGNETIC INDUCTION (09) Periods</b> 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 <b>A.C. FUNDAMENTALS</b> 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	<b>ELECTRICAL INSTRUMENTS &amp; MEASUREMENTS (08) Periods</b> Essential Features of Instruments-Deflecting Torque, Controlling Torque & Damping Torque, PMMC Instruments, Moving-Iron Instruments, Ammeter and Voltmeter: Advantages, Disadvantages & Applications. <b>D.C. GENERATOR</b> Generator Principle, Simple Loop Generator, Practical Generator: Constructional Features, Types of Generator, Generated EMF	20
IV	<b>D.C MOTOR (09) Periods</b> Motor Principle, Comparison of Generator & Motor Action, Significance of Back Emf, Applications of D.C. Motors <b>TRANSFORMER</b> Working Principle of a Transformer, Transformer Construction, Elementary Theory of an Ideal Transformer, Voltage Transformation Ratio, Losses in Transformer, Auto transformer.	20
V	<b>INDUCTION MOTOR (07) Periods</b> General Principle of Induction Motor, Advantages, Disadvantages & Applications of single Phase Induction Motor. <b>INDUSTRIAL APPLICATIONS OF ELECTRIC MOTOR</b> 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*

**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 /R.A.C ENGG/PLASTIC TECH**  
**I- SEMESTER**  
**PRODUCTION TECHNOLOGY-I**  
**(COURSE NO: BME-101)**

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

UNIT	CONTENTS	%age
I	<b>Carpentry &amp; Pattern making</b> 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	<b>Moulding:</b> 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	<b>Smith Forging:</b> 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	<b>Forming and Shaping:</b> 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	<b>FITTING:</b> 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. Raghuvanshi*



**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION /R.A.C ENGINEERING/ PLASTIC TECH**  
**I-SEMESTER**  
**ENGINEERING DRAWING-I**  
**(COURSE NO: BME -102)**

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	<ul style="list-style-type: none"> <li>Introduction to technical drawing, drawing instruments, size and layout of standard sheets, different types of lines as per BIS specification</li> <li>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.</li> <li>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.</li> </ul>	20
II	<ul style="list-style-type: none"> <li>Need &amp; importance of scale, definition of representative fraction, find RF of a given scale, types of scales, construction of plane, diagonal and chords scales.</li> </ul>	20
III	<ul style="list-style-type: none"> <li>Dividing of line and angle, drawing perpendicular and parallel lines tangent &amp; 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</li> </ul>	20
IV	Construction of parabola and hyperbola by directrix and rectangle method, helix on cylinder, archimedian spiral, cycloid, epicycloids and hypocycloid.	20
V	<ul style="list-style-type: none"> <li>Free hand sketching of simple machine parts.</li> <li>Single and double line plan of single storey building of two rooms set showing position of doors, windows, ventilation with electric wiring using symbols.</li> </ul>	20

**REFERENCE BOOKS**

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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECH/PRODUCTION/ R.A.C ENGG/PLASTIC TECH**  
**I/II-SEMESTER**  
**WORKSHOP PRACTICE-I / II**  
**(COURSE NO: BME-191/291)**

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:*

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.

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**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**I-SEMESTER**  
**APPLIED PHYSICS-I LAB**  
**(COURSE NO: BPH-191)**

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<sup>2</sup> 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.

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**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**I-SEMESTER**  
**APPLIED CHEMISTRY-I LAB**  
**(COURSE NO: BCH-191)**

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

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**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**I-SEMESTER**  
**ELECTRICAL ENGINEERING LAB**  
**(COURSE NO: BEE-192)**

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		Evaluation Scheme				
					Duration of end sem exam	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
		<b>Total</b>	<b>17</b>	<b>6</b>		<b>90</b>	<b>80</b>	<b>330</b>	<b>500</b>

### 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
		<b>Total</b>	<b>0</b>	<b>12</b>		<b>190</b>	<b>--</b>	<b>110</b>	<b>300</b>
		<b>Grant Total</b>	<b>17</b>	<b>18</b>		<b>280</b>	<b>80</b>	<b>440</b>	<b>800</b>

Period per week:17+18=35



**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**

**II- SEMESTER**

**APPLIED MATHEMATICS**

**(COURSE NO: BMA-201)**

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	<b><u>DIFFERENTIAL CALCULUS-I</u></b> 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	<b><u>DIFFERENTIAL CALCULUS-II</u></b> 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	<b><u>INTEGRAL CALCULUS:</u></b> Indefinite integral (inverse process of differentiation), fundamental integration, formulas and standard rules of integration. <b><u>METHOD OF INTEGRATION:</u></b> (i) Integration by substitution (ii) Integration by parts.	20
IV	<b><u>INTEGRATION</u></b> 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	<b><u>DEFINITE INTEGRALS &amp; AREA:</u></b> 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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**II-SEMESTER**  
**APPLIED PHYSICS-II**  
**(COURSE NO : BPH-201)**

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 <b>E</b> (definition, units and representations by lines of forces), <b>E</b> 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 <b>E</b> due to an infinite line of charges using Gauss's law. Electric dipole. Definition of electric potentials <b>V</b> and its derivation at a point due to an isolated charge, general relation between <b>E</b> and <b>V</b> , electrical potential energy.	25
II	Electromagnetism. Definition of magnetic flux, flux of magnetic induction, Magnetic field <b>B</b> , unit of <b>B</b> , Ampere's law ( $\oint \mathbf{B} \cdot d\mathbf{l} = \mu_0 I$ ), 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 $\mathbf{F} = q(\mathbf{E} + \mathbf{V} \times \mathbf{B})$ . 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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH  
DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**

**II-SEMESTER**

**APPLIED CHEMISTRY-II**

**(COURSE NO : BCH-201)**

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	<b>WATER</b> 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	<b>CORROSION</b> 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	<b>ALLOYS AND FUELS</b> <b>A. ALLOYS:</b> 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>B.FUEL:</b> 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	<b>POLYMERS</b> 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:**

- POLYTECHNIC CHEMISTRY BY V.P. MEHTA
- 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)**  
**II SEMESTER**  
**ENGLISH AND COMMUNICATION SKILL**  
**(COURSE NO: BEN-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	<b>VOCABULARY</b> Word Formation:-roots and affixes, affixation, derivation Compounding. Noun to Adjectives, Noun to Verb	20
II	<b>GRAMMAR</b> Verb/Tense/Articles/Prepositions. Phrase Structure/Clause Structure Sentences: Basic Sentence Pattern: Simple, complex, compound, affirmative, negative, interrogative and exclamatory. Transformations.	20
III	<b>READING</b> Local & Global Comprehension, Unseen passages/General Texts etc. Book reading.	20
IV	<b>WRITING</b> (a) Factual description-Objects/Places (b) Report Writing. (c) Paragraph writing (d) Letter/Application / C.V.Tips regarding interview	20
V	<b>COMMUNICATIONS</b> 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.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION/ R.A.C ENGINEERING**  
**APPLIED MECHANICS**  
**II-SEMESTER**  
**(COURSE No: BME-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	<b>Introduction</b> 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	<b>System of Forces</b> 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	<b>Moment and Couple</b> 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	<b>General condition of Equilibrium</b> 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	<b>Friction</b> 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.*

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION /R.A.C ENGINEERING/ PLASTIC TECH**  
**II-SEMESTER**  
**ENGINEERING DRAWING-II**  
**(COURSE NO: BME -202)**

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	<ul style="list-style-type: none"> <li>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</li> </ul>	20
II	<ul style="list-style-type: none"> <li>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</li> </ul>	20
III	<ul style="list-style-type: none"> <li>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, conventional breaks for shafts, pipes, rectangular, square, angle channel etc.</li> </ul>	20
IV	<ul style="list-style-type: none"> <li>Drawing of different development of surfaces,</li> <li>Orthographic and section of machine parts such as V-Block, Glands, wall brackets, keys, pins and cotter</li> <li>Intersection of surfaces, interpenetration of two cylinders.</li> </ul>	20
V	<ul style="list-style-type: none"> <li>Fundamentals of isometric projection, isometric views from the given orthographic views &amp; oblique drawing of simple objects using of isometric scale.</li> </ul>	20

**REFERENCE BOOKS**

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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL ENGINEERING (PRODUCTION )**  
**II-SEMESTER**  
**WORKSHOP PRACTICE- II**  
**(COURSE NO: BME-291)**

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

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



#### 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:*

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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**II-SEMESTER**  
**APPLIED PHYSICS-II LAB**  
**(COURSE NO: BPH-291)**

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.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**II-SEMESTER**  
**APPLIED CHEMISTRY –II LAB**  
**(COURSE NO : BCH-291)**

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  $\text{KMnO}_4$  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.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECH/ PRODUCTION /R.A.C ENGG**  
**II-SEMESTER**  
**APPLIED MECHANICS LAB**  
**(COURSE NO: BME-292)**

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 verify the law polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify 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) :- Production / RAC

Semester :- **Third**

### THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Evaluation Scheme				
					Duration of end sem exam	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-303	Production Tech-II	4	0	3	10	15	75	100
4	BME-304	Machine Drawing-I	0	6	3	50	15	35	100
5	BME-306	Applied Thermal Engg.	4	0	3	10	15	75	100
6.	BCE-306	Environmental Studies	2	0	2	5	10	35	50
		<b>Total</b>	<b>18</b>	<b>6</b>		<b>95</b>	<b>85</b>	<b>370</b>	<b>550</b>

### PRACTICAL COURSES:

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

Period per week:18+16=34

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN ENGINEERING (COMMON TO ALL BRANCHES)**  
**III/IV- SEMESTER**  
**APPLIED MATHEMATICS-III**  
**(COURSE NO : BMA-301/401)**

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	<b><u>MATRICES:</u></b> 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	<b><u>DIFFERENTIAL EQUATIONS:</u></b> 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	<b><u>HOMOGENEOUS &amp; LINER DIFFERENTIAL EQUATIONS:</u></b> 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	<b><u>EXACT DIFFERENTIAL EQUATIONS:</u></b> Exact differential equations and equations reducible to exact form and problems. Simple application and related problems.	20
V	<b><u>LAPLAC'TRANSFORM:</u></b> 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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL / PRODUCTION / R.A.C ENGINEERING**  
**III-SEMESTER**  
**METROLOGY & QUALITY CONTROL**  
**(COURSE NO : BME-301)**

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	<b>INTRODUCTION</b> 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	<b>MEASUREMENT</b> 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; Sine Bar, Sine-Centre, Auto-Collimator. Measurement of Straightness, Square-ness, & Parallelism (By any one method).	20
III	<b>SCREW THREAD MEASUREMENT</b> Introduction, Measurement of Minor & Major diameter, Flank angle, measurement of external threads only by any one method, Instruments used for above. <b>GEAR MEASUREMENT:</b> Introduction, Measurement of Concentricity, tooth thickness by any one method Instruments used for the above. (measurement of spur gear only) <b>MEASUREMENT OF SURFACE FINISH</b> Types of surface irregularities, methods of measuring surface finish (direct and indirect).	25
IV	<b>QUALITY CONTROL</b> 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	<b>QUALITY STANDARD &amp; CODES</b> 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



**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION /R.A.C ENGG/PLASTIC TECH**  
**III- SEMESTER**  
**PRODUCTION TECHNOLOGY-II**  
**(COURSE NO: BME-303)**

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	<b>LATHE</b> 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	<b>SHAPER, PLANER AND SLOTTER</b> 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	<b>WELDING</b> 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. <b>TESTING OF WELDS</b> (a) Destructive methods. (b) Non destructive methods-visual, X-ray, Gamma-ray, Magnetic particles, flaw detection, fluorescent, dye penetration and ultrasonic testing.	25
V	<b>DRILLING MACHINES</b> Introduction, Types of drilling machines, description of radial. Drilling machine, drilling tool, drill, reamer, operations performed on drilling machines. <b>BORING MACHINES</b> 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*

**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**  
**MACHINE DRAWING-I**  
**(COURSE NO : BME-304)**

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	<ul style="list-style-type: none"> <li>Planning of drawing sheet, selection of scale on the drawing sheet.</li> <li>Conventional symbols used in machine drawing (<i>one sheet</i>).</li> <li>Sectioning: Different types of sectioning (<i>two sheets</i>)</li> <li>Pipe Fittings: Different types of pipe fittings and symbols (<i>one sheet</i>)</li> </ul>	20
II	<p><b>Forms of Screw Threads:</b> Screw thread nomenclature, Forms of threads, Right hand and left hand threads. (<i>one sheet</i>)</p> <p><b>Nuts And Bolts:</b> Different assembled views of hexagonal and square headed nuts and bolts, Types of Studs and Nuts. (<i>one sheet</i>)</p> <p><b>Set Screws:</b> Sketches of different forms set-screws. (<i>one sheet</i>)</p> <p><b>Locking Devices:</b> Sketches of various types of locking devices like Castle nut, locking by split pin, swan Nut, locking plate, screws etc. (<i>two sheets</i>)</p> <p><b>Rivet heads:</b> Types of structural and general purpose rivet heads (<i>one sheet</i>)</p> <p><b>Riveted Joints:</b> Lap, butt, single riveted, double riveted, single cover, double cover (<i>one sheet</i>)</p>	30
III	<p><b>Detail and Assembly Drawing:</b> Drawing exercise on the following</p> <p><b>Pipe Joints:</b> (<i>three sheets</i>)</p> <ul style="list-style-type: none"> <li>Socket &amp; Spigot Joints.</li> <li>Flanged Joint.</li> <li>Piping Drawing.</li> </ul> <p><b>Keys, Cotter Pin Joints:</b> (<i>two sheets</i>)</p> <ul style="list-style-type: none"> <li>Socket &amp; spigot joints</li> <li>Knuckle Joint</li> </ul> <p><b>Couplings:</b> (<i>three sheets</i>)</p> <ul style="list-style-type: none"> <li>Box or Muff Coupling.</li> <li>Split muff coupling</li> <li>Protective type flange coupling</li> </ul> <p><i>Note: Number of sheets depend upon the availability of time.</i></p>	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)

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN (PRODUCTION /R.A.C ENGINEERING)/ PLASTIC TECH**  
**III-SEMESTER**  
**APPLIED THERMAL ENGINEERING**  
**(COURSE NO : BME-306)**

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	<b>THERMODYNAMICS</b> Definition of thermodynamic system, properties, state, path, process and cycle. Types of thermodynamic processes. Simple problems. Thermodynamic concept of work and heat. Joule's law and mechanical equivalent of heat. Specific heats, relations between two specific heats of a gas. Statement, concept and applications of Zeroth law, First law and Second law of thermodynamics. Simple problems. Concept of enthalpy and entropy.	20
II	<b>HEAT TRANSFER AND HEAT EXCHANGERS</b> Introduction and Modes of heat transfer. Steady and unsteady state heat transfer. <u>Conduction</u> : Mechanism and basic laws. Conduction through a plane wall, composite wall, hollow cylinder. <u>Convection</u> : Mechanism and basic laws. Convective heat transfer coefficient, Free and forced convection. Heat exchange between two fluids separated by a solid surface. <u>Radiation</u> : Mechanism of radiative heat transfer, Radiation properties of a surface. Concept of black body and real bodies. Laws of heat radiation. <u>Heat Exchangers</u> : Classifications of heat exchangers, Parallel, Counter and Mixed flow Heat Exchanger. Thermal design aspects. Temperature distribution and LMTD.	25
III	<b>STEAM AND STEAM GENERATORS</b> <u>Steam</u> : Process of steam formation, Conditions of steam generated, Dryness fraction and degree of superheat, Properties of steam. Use of steam tables. Simple problems. <u>Steam Generators</u> : Classification of steam generators, Essentials of a good steam generator and selection criteria. Description of Locomotive boiler and Bob & Wilcox boiler. Functions of various mountings and accessories.	20
IV	<b>INTERNAL COMBUSTION ENGINES AND AIR COMPRESSORS</b> <u>Engines</u> : Heat Engines, Introduction and classification of I.C. engines. Working principles of two stroke and four stroke cycles. Comparison of petrol and diesel engine. Definition of engine performance parameters. <u>Air compressor</u> : Types, working principle and flow control, starting, shut down, safety procedures, types of prime movers, cooling and lubrication.	20
V	<b>REFRIGERATION AND AIR-CONDITIONING</b> <u>Refrigeration</u> : How to produce cooling, unit of refrigeration, coefficient of performance (COP), Energy Efficiency Ratio (EER). Description of vapour compression and vapour absorption refrigeration systems. <u>Air-conditioning</u> : Introduction, Comfort and industrial air conditioning. Cooling and heating load calculation of a small building.	15

**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. A. 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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN (PRODUCTION /R.A.C ENGINEERING)/ PLASTIC TECH**  
**III-SEMESTER**  
**ENVIRONMENTAL STUDIES**  
**(COURSE NO : BCE-306)**

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.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECH/ PRODUCTION/R.A.C ENGG/PLASTIC TECH**  
**III-SEMESTER**  
**WORKSHOP PRACTICE-III**  
**(COURSE NO: BME-391)**

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 turning 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 joint 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)**

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.*

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION/ R.A.C ENGG**  
**III-SEMESTER**  
**METROLOGY LAB**  
**COURSE NO: BME-393**

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:
  - (i) Taper plug gauge of small-included angle.
  - (ii) 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.*



# 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		Evaluation Scheme				
					Duration of end sem exam	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
		<b>Total</b>	<b>15</b>	<b>6</b>		<b>90</b>	<b>75</b>	<b>335</b>	<b>500</b>

### PRACTICAL COURSES:

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
		<b>Total</b>	<b>0</b>	<b>10</b>		<b>200</b>	<b>--</b>	<b>100</b>	<b>300</b>
		<b>Grant Total</b>	<b>15</b>	<b>16</b>		<b>290</b>	<b>75</b>	<b>435</b>	<b>800</b>

Period per week: 15+16=31

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION/R.A.C ENGINEERING**  
**STRENGTH OF MATERIALS**  
**II-SEMESTER**  
**(COURSE NO: BME-401)**

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	<b>Stress Strain and Mechanical Properties of Materials (11 Pds)</b> Concept of Stress and strains. Definition of tension, compression, shear, bending, torsion, volumetric strain and lateral strain, Poisson's 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	<b>Shear Force and Bending Moment (12 Pds)</b> 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	<b>Strain Energy (12 Pds)</b> 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	<b>Columns and Struts (10 Pds)</b> Definitions of long and short columns, slenderness ratio, equivalent length, critical load, collapsing load, end conditions of columns. Application of Euler's and Rankine's formula with simple problems. (no derivation)	20
V	<b>Thin Cylindrical and spherical shells (11 Pds)</b> 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.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION /R.A.C ENGINEERING/PLASTIC TECH**  
**IV-SEMESTER**  
**MATERIAL SCIENCE**  
**(COURSE NO: BME-402)**

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

UNIT	CONTENTS	%age
I	<b>INTRODUCTION TO ENGINEERING MATERIALS.</b> Classification: Metal and non metal. Ferrous and non ferrous metals and alloys. Properties of materials. (Basic Concept only) <ul style="list-style-type: none"> <li>Mechanical properties: Strength, Elasticity, Plasticity, toughness, stiffness, ductility, Malleability, brittleness, hardness fatigue and creep.</li> <li>Thermal conductivity and insulating properties.</li> <li>Electrical conductivity and insulating properties.</li> </ul> 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	<b>FERROUS METALS AND ALLOYS</b> 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	<b>HEAT TREATMENT</b> 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	<b>NON- FERROUS METALS AND ALLOYS</b> Important properties and application of Aluminium. Copper, Zinc, Lead and Tin. Composition, Properties and uses of copper Alloys: <ul style="list-style-type: none"> <li>Brasses: Cartridge Brass, Muntz metal, Navel Brass and free cutting brass.</li> <li>Bronzes: Phosphor Bronze, Al-Bronze. Mn bronze and Gun Metal.</li> </ul> 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	<b>MISCELLANEOUS MATERIALS</b> 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.*

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL/PRODUCTION/R.A.C ENGINEERING**  
**III-SEMESTER**  
**THEORY OF MACHINES**  
**(COURSE NO : BME-403)**

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	<b>SIMPLE MECHANISMS</b> 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	<b>CLUTCHES, BRAKES AND DYNAMOMETER</b> Friction: Definition and its necessity. Clutches: Introduction Single Plate clutch-its construction and working Equation of maximum torque (uniform wear and uniform pressure), Multiple plate 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	<b>POWER TRANSMISSION DEVICES</b> 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	<b>FLYWHEEL AND GOVERNOR</b> 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	<b>LUBRICATION AND BEARINGS</b> 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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION /R.A.C ENGG/PLASTIC TECH**  
**IV-SEMESTER**  
**MACHINE DRAWING-II**  
**(COURSE NO: BME-404)**

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	<b>CAM PROFILE (Two Sheets)</b> 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	<b>GEAR PROFILE(Two Sheets)</b> 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) <ul style="list-style-type: none"> <li>• Connecting Rod End</li> <li>• I C Engine Piston</li> <li>• Non-Return Valves</li> <li>• Stop Valve</li> <li>• Plummer Block</li> <li>• Tail Stock</li> <li>• Screw Jack</li> <li>• Tool head of a shaper</li> </ul> <p><i>Note: Number of sheets depend upon the availability of time.</i></p>	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)

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL ENGINEERING (PRODUCTION /R.A.C)/ PLASTIC TECH**  
**IV-SEMESTER**  
**INDUSTRIAL ELECTRONICS & INSTRUMENTATION**  
**(COURSE NO : BEE-405)**

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	<b>CONCEPTS &amp; PRINCIPLES OF ELECTRONIC DEVICES</b> (09) Periods <ul style="list-style-type: none"> <li>Semiconductor Diode- PN junction, Diode-Symbol, Forward and Reverse Bias Working, Types of Diode and Characteristics, Zener Diode.</li> <li>Transistors – Symbol, PNP, NPN, Characteristics &amp; Working.</li> <li>UJT, SCR, DIAC &amp; TRIAC- Symbol, characteristics &amp; working.</li> <li>Applications of SCR: Speed &amp; Temperature control circuits.</li> </ul>	20
II	<b>POWER SUPPLIES</b> (08) Periods <ul style="list-style-type: none"> <li>Rectifiers- Half wave, Full wave &amp; Bridge type.</li> <li>Filters- L, C, L-C, and <math>\pi</math> type.</li> </ul> <b>AMPLIFIERS</b> <ul style="list-style-type: none"> <li>CE, CB and CC configuration of Transistor, Frequency response and Characteristics.</li> <li>Single stage Amplifier: Circuit and work.</li> <li>Applications.</li> </ul>	20
III	<b>OSCILLATORS</b> (08) Periods <ul style="list-style-type: none"> <li>Barkhausans Criteria.</li> <li>RC Oscillator, Phase Shift Oscillator, LC Oscillators.</li> <li>Application of Oscillators.</li> </ul> <b>OPERATIONAL AMPLIFIERS</b> <ul style="list-style-type: none"> <li>Ideal Operational Amplifier- Characteristics.</li> <li>Inverting, Non-Inverting, Amplifiers.</li> <li>Applications: Summing Amplifier, Subtractor, Integrator, Differentiator</li> </ul>	20
IV	<b>INTRODUCTION TO MEASUREMENT TECHNIQUES</b> (09) Periods <ul style="list-style-type: none"> <li>Measurement, Significance of Measurement.</li> <li>Range, resolution, Precision, Accuracy.</li> <li>Bridge Measurement- Wheatstone Bridge, Maxwell Bridge, Wien Bridge.</li> </ul> <b>RECORDING SYSTEM</b> <ul style="list-style-type: none"> <li>Voltage Recording Instruments.</li> <li>X-Y' Recorder.</li> </ul> <b>CRO: CRT Block Diagram, Application of CRO.</b>	20
V	<b>TRANSDUCERS</b> (10) Periods <ul style="list-style-type: none"> <li>Mechanical Parameter Sensors: LVDT, Strain Gauges.</li> <li>Hydraulic and Pneumatic Sensors: Pressure, Level, Flow.</li> <li>Temperature Sensors: Thermistors, Thermocouples.</li> </ul>	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

**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)**

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**  
**CAD LAB-I**  
**(COURSE NO: BME-492)**

Pds/week		Duration of Exam	Max Marks			
L	P	Hrs	Course Work	Mid-Sem Exam	End-Sem Exam	Total
-	2	3	40	-	20	60



**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) :- **Production Engineering**

Semester:- **Fifth**

### THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Evaluation Scheme				
					Duration of end Sem Exam	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	BPE-501	Automation & CAM	4	0	3	10	15	75	100
4	BPE-502	Tools Design	4	0	3	10	15	75	100
5	BME-505	Production Technology -III	4	0	3	10	15	75	100
		<b>Total</b>	<b>20</b>	<b>0</b>		<b>50</b>	<b>75</b>	<b>375</b>	<b>500</b>

### PRACTICAL COURSES:

1	BME-591	Workshop Practice -V	0	6	3	80	--	40	120
2	BPE-591	Industrial Engineering Lab	0	2	3	50	--	30	80
3	BME-594	Project	0	3	3	80	--	40	120
4	BME-595	Hydraulic Lab	0	2	3	50	--	30	80
		<b>Total</b>	<b>0</b>	<b>13</b>		<b>260</b>	<b>--</b>	<b>140</b>	<b>400</b>
		<b>Grant Total</b>	<b>20</b>	<b>13</b>		<b>310</b>	<b>75</b>	<b>515</b>	<b>900</b>

Period per week: 20+13=33

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION / R.AC ENGG**  
**V -SEMESTER**  
**INDUSTRIAL ENGINEERING**  
**(COURSE NO: BME -501)**

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	<b>Introduction to Industrial Engg.:</b> Definition, Application and Industry Classification. <b>Production and Productivity:</b> Definition, Production system, its characteristics, Product Life Cycle, Factors influencing productivity and measurement of productivity. <b>Plant Location:</b> Introduction, Factors affecting plant location. <b>Plant Layout:</b> Definition, Types of layouts, advantages and disadvantages of different layouts. <b>Material Handling:</b> Introduction, Material handling equipments, their types, functions and selection.	20
II	<b>Method Study:</b> 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. <b>Principles of Motion Economy:</b> Principles governing motion study, Introduction to Therbligs, Micro-motion study and their applications through examples	20
III	<b>Time Study:</b> Definition, Objectives and procedure of conducting time study, System of performance rating, various allowances, Calculation of standard time. <b>Ergonomics:</b> 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	<b>Planning and Control:</b> 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. <b>Break Even Analysis:</b> Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them.	20
V	<b>Forecasting:</b> Introduction to sales forecasting, definition, types, applications, need and limitations. <b>Inventory Control:</b> 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.).

**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	<b>Introduction:</b> Fluid, types of fluids, Difference between fluid mechanics and hydraulics. <b>Properties of Fluid:</b> Mass density, weight density (specific weight), specific volume, specific gravity, viscosity, kinematic & dynamic viscosity, surface tension, and their units. Intensity of pressure, pressure head, center of pressure, total pressure on horizontal & vertical flat surfaces (without proof) and simple problems on them. <b>Pressure Measurement:</b> Pressure (Atmospheric, Gauge, Absolute, Vacuum), Pascal's law and its paradox. <b>Pressure Measuring Devices:</b> Piezometric tube, simple manometer, differential manometer, inverted differential manometer, simple problems on them.	25
II	<b>Flow of fluids:</b> 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	<b>Flow through Orifices:</b> Types of orifices, hydraulic coefficients, relationship between $C_c$ , $C_v$ & $C_d$ , Vena-contracts. <b>Flow through Pipes:</b> 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	<b>Hydraulic Machines:</b> 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	<b>Pneumatic System:</b> 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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION ENGINEERING**  
**V SEMESTER**  
**AUTOMATION AND CAM**  
**(COURSE NO :BPE -501)**

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	<b>AUTOMATION</b> Introduction to Automation; Reasons for Automating; Automation Principles and strategies; Automation Migration Strategy; Levels of Automation; Types of Automated Manufacturing Systems.	20
II	<b>NUMERICAL CONTROL</b> Introduction to Numerical control of Machines; Computerized Numerical Control (CNC) and Direct Numerical Control (DNC); Advantages and Disadvantages of CNC Machines; Parts suitable for CNC Machines; Basic Components of Numerical Control System; Classification of Numerical Control Machines.	20
III	<b>NUMERICAL CONTROL PART PROGRAMMING</b> Manual Part Programming and Computer Aided Part Programming; Advantages of Computer Aided Part Programming over Manual Part Programming.	20
IV	<b>CNC MACHINES</b> Construction details of CNC Machines; Tooling for CNC Machines; Maintenance of CNC Machines.	20
V	<b>CAM and FMS:</b> Concept of CAD, CAM, FMS, CIM, Computer Aided Process Planning (CAPP), JIT and Group Technology (GT), and their advantages. <b>ROBOTICS:</b> Definition; Different Types of configuration; Basic robot motions; Degrees of freedom; Main parts of robot; Applications of Robots in different manufacturing processes, Advantages of robots.	20

**REFERENCE BOOKS**

1. *CNC Machines* by M. Adithan.
2. *Production Automation and C I M* by Groover.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL ENGINEERING (PRODUCTION ENGG)**  
**V-SEMESTER**  
**TOOL DESIGN**  
**(COURSE NO : BPE-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	<b>BASICS OF JIGS AND FIXTURES</b> Importance of jigs & fixtures, principles of location, locating devices, v-location, conical location, principle of 6 point location & cylindrical location, support pins and jack pins, locating pins, diamond pin locators, bush locators, purpose of clamping, types of clamps i.e. lever clamp, bridge clamp, edge clamp, screw clamp, latch clamp, hinged clamp, quick acting clamp, and clamping methods, devices.	20
II	<b>DESIGN OF JIGS AND FIXTURES</b> Fundamentals principles or general consideration in the design of drill jig & fixture, location and clamping devices, clip control, bushes, types of drill jig i.e. template, plate type, swinging leaf, box, channel, index, parts/main elements of drill jig, types of bushes, different types of fixtures i.e. turning, milling, boring, grinding, welding etc	20
III	<b>INTRODUCTION OF POWER PRESS TOOLS</b> Introduction to press cutting operations, cutting action in punch and die operations, die clearance, angular clearance, cutting force, bending force, drawing force, blank development, elements of press tool, die sets, introduction of different types of press tools ie blanking, piercing, compound, progressive, combination, drawing, inverted etc, different types of operations.	20
IV	<b>DESIGNING OF POWER PRESS TOOLS</b> Requirement of press tool design, die & punch clearance for different materials, designing of different types of punch, pilots, stripper plate, pressure pads, punch and die mountings, dowel pins, die block & punch, strip layout, methods of reducing cutting force, calculation of blank development, blanking force, bending force, bending methods, bending tools, springback, bend allowance, forming and drawing force, .	20
V	<b>MOULDING ( PLASTIC DIES)</b> Types of moulds for processing the thermosetting and thermoplastic materials, criteria for selection of processing methods, materials of mould parts, elementary ideas of construction of different types of moulds used for plastic components, layout of product, development of core, cavity, parting line, runner, sprue, gate, cooling of mould, ejector pin system of product. <b>DIE CASTING</b> Know how about die casting, elements of die casting tools and their description, material for die casting tools, designing of parting line, draft, fillet and corner radii shrinkage allowance, die wear allowance, cavities, flash, die inserts, cooling system in tool, ejection system of product.	20

**REFERENCE BOOKS:-**

1. *Production Engg. Science* : by PC Pandey & C.K.Singh
2. *Tool Design* : by Cyril Donaldson
3. *Jigs & Fixture* : by P.H. Joshi

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION /R.A.C ENGG/PLASTIC TECH**  
**V- SEMESTER**  
**PRODUCTION TECHNOLOGY-III**  
**(COURSE NO: BME-505)**

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	<b>GRINDING MACHINES</b> 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	<b>JIGS AND FIXTURES:</b> 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	<b>CAPSTAN AND TURRET LATHES</b> Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout. <b>BROACHING AND BROACHING MACHINES</b> Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching.	20
IV	<b>NUMERICAL CONTROL MACHINE TOOLS:</b> Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming. <b>ROBOTS:</b> Introduction; Main components of a robot; Applications of robot.	20
V	<b>UNCONVENTIONAL METHODS OF MACHINING</b> Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining. <b>POWDER METALLURGY:</b> 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.*



**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECH/ PRODUCTION/R.A.C ENGG**  
**V-SEMESTER**  
**WORKSHOP PRACTICE-V**  
**(COURSE NO: BME-591)**

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 MECHANICAL ENGG/ PRODUCTION ENGG**  
**V-SEMESTER**  
**INDUSTRIAL ENGG LAB**  
**(COURSE NO: BPE-591)**

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.

**List of Experiments**

1. To verify that when random samples are taken from a universe with a certain percentage of defectives, the same percentage of defectives tend to appear in the random samples (by using a lot of glass balls having certain percentage of defectives).
2. To construct  $\bar{x}$  - R chart for the given data of variables & conclude your results.
3. To construct p-chart for attribute for constant sample size & state your conclusion.
4. To construct c-chart for attributes for a given data & conclude your results.
5. To construct left hand & right hand process chart for an assembly of Nut & Bolt with two washers.
6. To draw flow process Chart for an activity of your own choice & hence, draw the flow diagram using suitable scale.
7. To carry out time study (T-S) for a simple job on a lathe machine for at least 10 cycles & compute the standard time.
8. To draw "Frequency Distribution/Normal Distribution Curve" for a mass production item & to compare the area with standard data (using Normal Distribution Curve).

**Case-I: To draw a chart of man working on a single machine for an activity of your choice.**

**Case-II: To draw a chart of man working on two machines simultaneously for an activity of your choice.**

*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 ENGG/ PRODUCTION ENGG**  
**V-SEMESTER**  
**PROJECT**  
**COURSE NO: BME-594**

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.
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- 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.
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**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL /PRODUCTION/ R.AC. ENGG/PLASTIC TECH**  
**V/VI-SEMESTER**  
**HYDRAULICS LAB**  
**COURSE NO : BME- 595**

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

# VI SEMESTER

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

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

Semester:- **Sixth**

## THEORY COURSES:

S.No	Course No	Course Title	Study Scheme Pds./ wk		Evaluation Scheme				
					Duration of end Sem Hrs.	Max Marks			
			L	P		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	BPE-601	Manufacturing Technology	4	0	3	10	15	75	100
4	BME-604	Machines Tools & Maintenance	3	0	3	10	15	75	100
5	BPE-602	▲ Elective	4	0	3	10	15	75	100
		<b>Total</b>	<b>19</b>	<b>0</b>		<b>50</b>	<b>75</b>	<b>375</b>	<b>500</b>

## PRACTICAL COURSES:

1	BME-691	Workshop Practice-VI	0	6	3	80	--	40	120
2	BPE-691	Tools Engg. Lab	0	2	3	50	--	30	80
3	BME-694	Project	0	3	3	80	--	40	120
4	BME-695	CAD Lab-II	0	2	3	50	--	30	80
		<b>Total</b>	<b>0</b>	<b>13</b>		<b>260</b>	<b>--</b>	<b>140</b>	<b>400</b>
		<b>Grant Total</b>	<b>19</b>	<b>13</b>		<b>310</b>	<b>75</b>	<b>515</b>	<b>900</b>

Period per week: 19+13=32

- ▲ Electives:-
1. Environmental Science & Management
  2. Non-Conventional Energy Sources
  3. Total Quality Management.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN ENGINEERING (MECHANICAL/PRODUCTION/RAC/PLASTIC)**  
**VI- SEMESTER**  
**INDUSTRIAL MANAGEMENT AND ENTREPREURSHIP DEVELOPMENT**  
**(COURSE NO : BME-601)**

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	<b>INTRODUCTION TO INDUSTRIAL MANAGEMENT:</b> 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	<b>INDUSTRIAL OWNERSHIP:</b> 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. <b>MOTIVATION AND LEADERSHIP:</b> Definition of motivation, Methods for improving motivation, Definition of leadership, Functions of leadership, Manager as a leader.	20
III	<b>FINANCIAL MANAGEMENT:</b> 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. <b>WAGES AND INCENTIVES:</b> 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	<b>HUMAN RESOURCE MANAGEMENT:</b> Objectives of HRM, Staff development, Training strategies and methods. <b>LABOUR AND INDUSTRIAL LAWS:</b> 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. <b>ACCIDENTS:</b> Introduction, Classification, Causes and Effects of accidents, Types of industrial hazards.	20
V	<b>ENTREPRENUERSHIP DEVELOPMENT:</b> 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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL ENGG/ PRODUCTION / R.A.C ENGG**  
**VI- SEMESTER**  
**MACHINE DESIGN**  
**(COURSE NO. BME-602)**

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	<b>INTRODUCTION</b> 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	<b>DESIGN OF SHAFT</b> 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	<b>DESIGN OF KEYS AND COUPLINGS</b> 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	<b>DESIGN OF JOINTS</b> 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	<b>SPRINGS</b> 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*

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN PRODUCTION ENGINEERING**  
**MANUFACTURING TECHNOLOGY**  
**VI-SEMESTER**  
**(COURSE NO: BPE-601)**

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	<p>Introduction: Metal working as a metal shaping method-its advantage and scope, Recrystallization process (Brief idea)</p> <p>Rolling: Elementary theory of Rolling:- Flat rolling, Roll force and power requirement (without derivation), Materials for rolling and rolls.</p> <p>Characteristics of Rolling: Draught and reduction, contact area, contact angle (without derivation) hot rolling and cold rolling, Pack rolling, defects in roll plates and sheets rolling</p> <p>Mills: Types of rolling mills, lubricants in rolling, thread rolling: flow chart of rolled stock production.</p> <p>Drawing: Wire drawing process, wire drawing dies, die materials, rod drawing, tube drawing lubricants, defects and remedies in drawing process.</p>	20
II	<p>Extrusion: Introduction, types of extrusion: direct, Indirect, hydrostatic &amp; tube extrusion (only brief idea) extrusion forces (without derivation), hot and cold extrusion, impact extrusion, die design (without derivation) die materials and lubrication, Principle, merits and demerits of hydrostatic extrusion defects, Extrusion equipments:- Presses die.</p> <p>Forging: Introduction, types of forging: open die forging, closed die forging, precision forging, coining, forging force (without derivation).</p> <p>Related forging operations: Heading Piercing hobbling forging die design and geometry (without derivation) die materials and lubrication, forging defects.</p>	20
III	<p>Foundry Technology: Introduction, Solidifications of metals, effects of cooling rates, solidification time, introduction to moulding tools.</p> <p>Types of moulds:- Expandable moulds, Permanent moulds, composite moulds, major components of sand moulds.</p> <p>Pattern Making: Introduction to cores, core boxes, and core materials, core prints and positioning of cores, Mechanism of pattern withdrawal, elements of gating system.</p> <p>Risering: Risers and its uses, types of riders.</p>	20
IV	<p>Special Moulding / Casting Process: Carbon dioxide (Co<sub>2</sub>) moulding:- Principle, working and application, advantages, and Limitations of CO<sub>2</sub> moulding.</p> <p>Investment casting:- Principle, Working and Application Advantages, Working Principle, application and advantages.</p> <p>Shell Moulding:- Principle, working applications, advantages and limitations</p> <p>Centrifugal Casting: Methods, advantage and its applications.</p> <p>Die-Casting: Hot and cold chamber die casting (Principles and working only), advantages and applications.</p>	20
V	<p>Welding Technology: Introduction, types of welding processes, advantages of welding, Gas cutting process, Thermo it welding and its applications.</p> <p>Resistance welding: working principle, seam and projection welding and their applications, Plasma arc welding, Electron beam welding, Electros lag welding, TIG and MIG welding, Atomic hydrogen welding.</p> <p>Ultrasonic Welding, Explosive welding, Laser beam welding, Elementary idea of underwater welding and cutting</p>	20

**REFERENCE BOOKS**

1. *Materials and Manufacturing Technology.* by Kalpakjian
2. *Workshop and Technology Vol-I:* by S.K Hajara

**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 ENGINEERING / PLASTIC TECH**  
**VI-SEMESTER**  
**MACHINE TOOLS & MAINTENANCE**  
**(COURSE NO : BME-604)**

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	<b>MILLING MACHINE (11 Periods)</b> 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	<b>INDEXING: (11 Periods)</b> Dividing Head, common methods of indexing. Simple, compound and differential indexing giving suitable examples. <b>Manufacture of Gears:</b> Application of milling, hobbling, hot rolling hot forging and casting. <b>Micro Finishing Processes:</b> Principle and application of lapping and honing. Polishing, Superfinishing, Burnishing, Galvanizing, Anodizing and Tin Plating.	15
III	<b>INSTALLATION AND TESTING OF MACHINES (14 Periods)</b> 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	<b>RELIABILITY ENGINEERING ((8 Periods))</b> 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	<b>MAINTENANCE (14 Periods)</b> 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.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL ENGINEERING /PRODUCTION /R.A.C**  
**VI-SEMESTER**  
**NON-CONVENTIONAL ENERGY SOURCES**  
**COURSE NO : BME- 605 (a)**

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	<b>Conventional and Non-conventional energy Sources</b> 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	<b>Nuclear Power Reactors</b> 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 demerits.	20
III	<b>Solar Energy</b> 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	<b>Wind and Tidal Energy</b> (a) Introduction and basic principles of wind energy conversion. Wind data and energy estimation. Wind energy conversion systems. Site selection considerations. Application of wind energy (b) Basics principles of tidal energy, components of tidal power plants, site requirements, Advantages and limitations of tidal power generation.	20
V	<b>Geothermal Energy and MHD Systems</b> (a) Introduction and estimation of Geothermal Energy. Nature of geothermal fields and applications of geothermal energy (b) 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 MECHANICAL / PRODUCTION ENGINEERING / PLASTIC TECH/RAC**  
**VI-SEMESTER**  
**INDUSTRIAL POLLUTION & CONTROL**  
**COURSE NO: BCE-605(b)**

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 MECHANICAL / PRODUCTION ENGINEERING / PLASTIC TECH**  
**VI-SEMESTER**  
**TOTAL QUALITY MANAGEMENT.**  
**COURSE NO : BME-602(c)**

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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECH/ PRODUCTION ENGG/PLASTIC TECH**  
**VI-SEMESTER**  
**WORKSHOP PRACTICE**  
**(COURSE NO: BME-691)**

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 ENGG/ PRODUCTION ENGG**  
**VI-SEMESTER**  
**TOOL ENGINEERING LAB**  
**(COURSE NO: BPE-691)**

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 production of the following.

1. Drill Jigs.
2. Welding Fixture.
3. Milling Fixture.
4. Grinding Fixture.

*Note: Type of Jigs and Fixtures will be decided by the teachers as per availability of materials in the workshop.*

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL ENGG/ PRODUCTION ENGG**  
**VI-SEMESTER**  
**PROJECT**  
**(COURSE NO: BME-694)**

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.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**  
**DIPLOMA IN MECHANICAL ENGG/ PRODUCTION ENGG**  
**VI-SEMESTER**  
**CAD LAB-II**  
**(COURSE NO: BME-695)**

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