Table of Content

Programme Code : **Diplloma in Mechanical Engineering**											
Course Code		: **AM 11 205**				Course Title : **Strength of Materials**					
						C / O		: **Compulsory**			
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
4	-	2	6	3Hours	2 Tests of 1 Hour each	80	20	-	-	50	150

Rationale

A mechanical engineer works with different types of materials like steel, copper, brass , aluminum , timber , bricks, stones etc. the materials are used for manufacturing machine parts, tolls or preparing jobs. Mechanical properties of the materials play a very important role in designing the various engineering components. It is therefore essential for a mechanical engineer to understand the behavior of materials under different " force of actions" and laboratory tests for determining various engineering properties of materials.

Objectives: The student will be able to

1. Understand different types of forces acting on engineering components.
2. Understand behavior of materials under different forces of actions.
3. Conduct the laboratory tests on different materials.
4. Develop the ability of interpreting the test results.
5. Understand the basic principle of behavior of materials.
6. Ascertain the strength of materials under various types of loadings

SECTION –I
(40 Marks)

Topic No	Contents	Hrs.	Marks
1	**ELASTICITY, STRAIN AND STRESS** 1.1 Definition of deformation , Rigid, elastic, plastic body , elasticity, stress and strain 1.2 Stress – strain curve for ductile materials , Hooke's law ,Elastic limit, modulus of elasticity, tensile & comp. stress, factor of Safety, working stress and safe stress. 1.3 Change in length in the bars of uniform cross section due to axial loading. 1.4 Change in length in the bars of stepped cross section due axial loading. 1.5 Stress and strain in composite sections under axial loading, simple problems. 1.6 Stress and strain developed due to temperature changes, simple problems.	06	10
2	**ELASTIC CONSTANTS** 2.1 Lateral strain, Poisson's ratio, biaxial and Tri axial Stresses. 2.2 Volumetric strain, change in volume due to axial, biaxial and tri- axial loading .Bulk modulus. 2.3 Shear load, shear stress and shear strain, modulus of rigidity & complementary shear stress 2.4 Relation between between E, K and G.	03	06
3	**STRAIN ENERGY** 3.1 Definition and Concept of Strain energy , types of loading gradual , sudden & Impact loading. 3.2 Stresses developed due to gradual , sudden & impact load. 3.3 Strain energy stored due to gradual & sudden & impact loading. 3.4 Resilience, proof resilience and modulus resilience .	03	06
4	**PRINCIPAL PLANES & PRINCIPAL STRESSES** 4.1 Concept of principal planes & stresses. Definition of principal planes, principal stresses, oblique plane and obliquity. 4.2 Different states of stresses, normal & Tangential stress on oblique plane , resultant stress. 4.3 Locating principal plane and calculating principal stresses. 4.4 Theories of failure- Maximum principal stress theory (Rankine's theory) Maximum shear stress theory (Guest's and Tresca's theory)	06	06
5	**SHEAR FORCE & BENDING MOMENT** 5.1 Types of beams, types of supports, concept and definition of Shear force (S.F). and bending moment (B.M) 5.2 S.F and B.M diagrams for simply supported ,overhang beams subjected to point load & UDL (No problem to be set for External moment or couple) 5.3 S.F and B.M diagrams for cantilever subjected to point load & UDL (No problem to be for External moment or couple)	06	10

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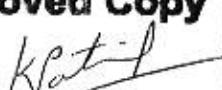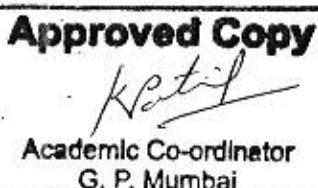
SECTION –II
(40 Marks)

Topic No	Contents	Hrs.	Marks
6	**MOMENT OF INERTIA (M I)** 6.1 M.I. for plane areas, radius of gyration, M.I for regular plane areas –rectangle , triangle, circle, semi-circle , hollow rectangular and hollow circular section 6.2 Parallel axes theorem , perpendicular axes theorem (no derivation) 6.3 M.I of symmetrical and unsymmetrical I sections, channel and angle sections and T section. 6.4 M.I of built up sections symmetrical and unsymmetrical about centroidal axis .	06	10
7	**DIRECT AND BENDING STRESSES** 7.1 Concept of direct and bending stresses, section modulus. 7.2 Eccentric loads, Core or kernel of section, middle third rule, middle fourth rule 7.3 Members of uniform sections subjected to eccentric loads with eccentricity and stress distribution at the base. 7.4 Structure subjected to horizontal,vertical loads e.g. tie bars, columns etc. 7.5 chimney of uniform cross section subjected to wind loads.	06	10
8	**AXIALLY LOADED STRUTS AND COLUMNS** 8.1 Definition of strut, tie, column and buckling 8.2 Euler's formula , limitations of Euler's formula. 8.3 Definition conditions of column and equivalent length. 8.4 Rankine's formula 8.5 Simple problems	06	08
9	**TORSION** 9.1 Assumptions in the theory of torsion 9.2 Torsion equation 9.3 Power transmitted by shaft. 9.4 Simple problems on circular solid / hollow shaft	03	06
10	**THIN WALLED PRESSURE VESSELS** 10.1 Definition of thin and thick cylinder, stresses in a thin cylinder. 10.2 Principal stresses in a thin cylinder 10.3 Change in length , thickness and volume of cylinder 10.4 Simple problems.	03	06

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Laboratory work and Term work :

The term work shall consist of

a) Journal based on any six experiments from the following in the laboratory.
1. Tensions test on Mild steel/ Aluminium specimen, plotting of stress strain curve and indicating significant point , I.S. requirement.
2. Bending test on timber
3. Izod Impact test on M.S, C.I, Copper, Aluminium and Brass to indicate importance of test.
4. Hardness Test (Brinell Hardness) on various metals.
5. Shear test – single and double shear for mild steel bar.
6. deflection test on timber/ metal specimen
7. Torsion Test on metal bar.
8. Compression test on metal.
9. Compression test on timber, rubber.

b) Two plates (Quarter size Drawing sheet) shall contain Graphical solution of problems on principal planes and principal stresses (Two diff. Cases)

c) One assignment on each topic covering at least three different problems and their solution.

d) Two plates shall contain shear force and bending moment diagrams for simply supported and cantilever beams subjected to U.D.L & point load (2+2 problems)

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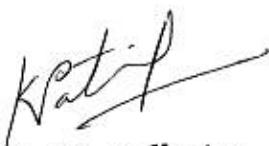
Text Books:

Sr. No	Author	Title	Publication
1	R.S.Khurmi	Strength of Materials	S. Chand & Company
2	Walavalkar	Strength of Materials	Everest Pub – House , Pune 30
3	S.S.Bhavikatti	Strength of Materials	Vikas Publishing House Pvt.Ltd.
4	S.Ramamrutham	Strength of Materials	Dhanpat Rai Publishing Co.(P)Ltd.
5	S.B. Junnarkar	Mechanics of Structure Part-I	Charotar Publishing House

Reference Books:

Sr. No	Author	Title	Publication
1	S. Timoshenko	Strength of Materials	D. Van Nostrand Company Inc.
2	Ferdinand L. Singer	Strength of Materials	Hapor & Row Publisher, New York
3	E. J. Hearn	Problems in Strength of Materials	Longmans Green & Co. Ltd.

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Govt. Polytechnic, Mumbai-51

Principal
Government Polytechnic, Mumbai-51

Programme	: Diploma in Mechanical Engineering		
Course Code	: **ME 11 207**	Course Title : **Basic Thermodynamics**	
		C / O	: **Compulsory**

| Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
3	-	2	5	3Hours	2 Tests of 1 Hour each	80	20	-	-	50	150

Rationale:

Thermodynamics is the basic science underlying the energy interaction in any thermal engineering process. The knowledge of Thermodynamics is essential from the viewpoint of designs, analysis and operation of various power plants. It also provides the means to utilize the available
energy in more effective & efficient manner.

The subject under consideration deals with fundamental concepts of thermodynamics e.g. system, process, path, thermodynamic work, heat enthalpy etc. & their application in relation with the first law of Thermodynamics.

Properties of steam & related processes are also included which are necessary for the application in any steam equipments or steam power plant.

Objectives: The student will be able to

- Understand the basic concept of thermodynamics.
- Explain the importance & application of first & second law of thermodynamics.
- Explain ideal gas & steam properties & associated processes
- Appreciate the importance of heat transfer principles & their application.
- Know various renewable sources of energy & their applications.
- Calculate properties of steam by using steam tables
- Explain construction & working of boilers, mountings & accessories.

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Section –I
(40 Marks)

Topic No	Contents	Hrs.	Marks
1	**Fundamental Concept of Thermodynamics:** 1.1 Unit and dimensions, Basic SI Unit, dimensions of various quantities. 1.2 Unit of Force, Pressure, Volume, Temperature, Work, Power (mainly S. I. Unit to be used) 1.3 Macroscopic Vs Microscopic, Thermodynamic system , boundary, surrounding, types of system-open, closed, isolated, Zeroth law of thermodynamics 1.4 Properties and state of system, extensive and intensive properties, properties like specific volume, density, pressure. 1.5 Homogeneous and heterogeneous system, thermodynamic equilibrium, quasi-static process. Net work done by a system, sp. heat and latent heat, path function and point function.	07	12
2	**First Law of Thermodynamics :** 2.1 First law for closed system undergoing a cycle, first law for closed system undergoing a change of state, energy property of system. 2.2 Different forms of stored energy I) kinetic energy II) potential energy III) Molecular internal, sp. Heat at const. volume, sp.heat at const pressure, energy of an isolated system, perpetual motion machine of first kind. 2.3 First law applied to flow processes-steady flow process, mass balance and energy balance in simple steady flow process. 2.4 Application of first law of Thermodynamics: Steady flow energy equation & its application to open system like, I) nozzle and diffuser ii) throttling device iii) turbine and compressor iv) heat exchanger(condenser)	10	16

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3	**Second law of thermodynamics:**		
	3.1 Limitations of first law of thermodynamics.		
	3.2 Qualitative difference between heat and work, cyclic heat engine, heat reservoirs.		
	3.3 Kelvin-Planck and Clausius statements.		
	3.4 Perpetual motion machine of second kind, reversibility and irreversibility, conditions for irreversibility.	07	12
	3.5 Application of second law to heat engine, heat pump and refrigerator.		
	(No-numerical)		

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Section –II

(40 Marks)

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4	**Ideal Gas & Ideal Gas Processes:**		
	4.1 Definition of an ideal gas, ideal gas laws, Equation of state or characteristic equation, specific and universal gas constants, specific heat, enthalpy & Internal energy of ideal gas.		
	4.2 Analysis of gas processes assuming const. specific heats, constant volume process, constant pressure process, reversible adiabatic processes, polytropic process, throttling process etc;	07	12
	4.3 In each case change in internal energy, entropy and determination of heat, work transfer may be considered & processes be plotted on P-V & T-S diagrams. (Numerical Problems)		
5	**Heat Transfer :**		
	5.1 Modes of heat transfer: conduction, convection & radiation.		
	5.2 Heat transfer by Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction & convection. (Simple Numerical)	07	12
	5.3 Heat transfer by Radiation: thermal Radiation, Absorptivity, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Boltzman Law.		
6	**Properties of Steam & Vapour Process:**		
	6.1 Formation of steam at constant pressure, wet steam, dry steam, superheated steam, dryness fraction, sensible heat, latent heat, enthalpy & entropy of steam, internal energy of steam, external work done during evaporation, use of steam tables & numerical problems.	10	16
	6.2 Various processes for vapour like constant Volume		
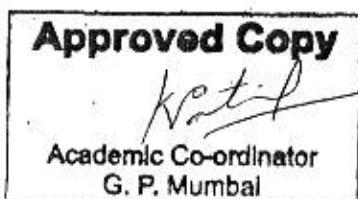
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(Isochoric), const. pressure (Isobaric), Isothermal, Adiabatic, Polytropic, Throttling. 6.3 Determination of property changes like change in enthalpy, internal energy, work & heat transfer in each process, Representation of various processes on P-V, T-S & H-S planes. 6.4 Determination of dryness fraction of steam using separating & throttling calorimeter. (Simple Numerical Problems)	

List of Experiments:

1. Determination of dryness fraction of steam using calorimeter.
2. Calculation of thermal conductivity of a solid metallic rod.
3. Study & compare various heat exchangers such as reactors, evaporators, condensers etc;
4. Trace and draw the path of flue gases and water-steam circuit with the help of boiler model.
5. Prepare a report on a visit to sugar factory / Dairy / steam power plant, with specifications of boiler and list mountings and accessories.
6. MINI PROJECT: Collect data related to energy produced by using conventional and non conventional energy sources in India and make comparison with practices followed in developed countries.

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Reference Books:

Sr.No	Author	Title	Publication
01	P. L. Ballaney	Thermal Engineering	Khanna Publication
02	R. K. Kapoor	Thermal Engineering Vol. I & II	Kadmbini Publication
03	V.M. Domkundwar	Thermal Engineering	Dhanpat Rai & son's
04	Mahesh M.Rathore	Thermal Engineering	Tata McGraw Hill publication
05	PK Nag	Engineering Thermodynamic	Tata McGraw Hill publication
06	R. S. Khurmi	Thermal Engineering	S Chand Technical Publication

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Programme : DIPLOMA IN MECHANICAL ENGINEERING

Course Code: **ME 11 209**	Course Title: **Machine Drawing**
	C/O: **Compulsory**

Credits				Duration of written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
3	-	4	7	4 hrs	2 Tests of 1.5 Hour each	80	20	-	-	50	150

Rationale:
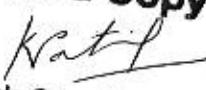
A Diploma holder, irrespective of his field of operation in an industry, is expected to possess a thorough understanding of drawing, which includes clear spatial visualization of objects and the proficiency in reading and interpreting a wide variety of production drawings. Besides, he is also expected to possess certain degree of drafting skills depending upon his job function, to perform his day to day activities i.e. communicating and discussing ideas with his supervisors and passing instructions to his subordinates unambiguously. This course envisages reinforcing and enhancing the knowledge and skills acquired in the earlier two courses viz. Engineering Graphics and Engineering Drawing.

Also Auto CAD software has become an integral part of engineering drawings because of its ability to draw neat, precise and fast drawing abilities. Knowledge of Auto CAD is need of the hour. Hence a package on this is a part of curriculum.

Objectives:

The students will be able to,

- Draw the assembly and details of the given machine components as specified.
- Read and interpret the given production drawings properly.
- Prepare the welding drawing as per the conventions.
- Know the significance & use of tolerances of size, forms & positions.
- Apply standard conventions used in machine drawing.
- Effectively use AutoCAD software to produce the drawing of machine components as required.

Section – I (Marks 40)

Contents:	Hrs.	Marks
1. Limits, Fits and Tolerances:- 1.1 Introduction to ISO system of tolerencing, dimensional tolerances, elements of interchangeable system, hole & shaft basis system, limits, fits & allowances. Selection of fit. **(Simple Numerical)** 1.2 Geometrical tolerances, tolerances of form and position and its geometric representation. 1.3 Characteristics of surface roughness - Indication of machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods.	06	12
2. Assembly to Details 2.1 Preparation of detailed working drawing from given assembly, indicating proper type of fit & tolerance relevant to that fit and the grade of surface finish required. The drawing to be self explanatory for manufacturing of the components. The objects may be selected from the following & not containing more than 8 parts: • Pedestal Bearing • Lathe Tail Stock • Drill Jig • Piston & connecting rod • Gland and Stuffing box Assembly • Valve – Not more than eight parts • Fast & loose pulley	08	16
3. Computer Aided Drafting 3.1 **Introduction to Computer Aided Drafting** • Understand and use basics of CAD systems. • Applications, Various Software's for Computer Aided drafting. • **Co-ordinate system** - Absolute, Relative, Polar. • **CAD initial settings commands** - Snap, grid, ortho, osnap, limits, units, filters, ltscale, mbuttonpan. • **Selection methods** – picking, window, crossing. 3.2 **Zoom and formatting Commands** • **Zoom Commands** – all, previous, out, in, extent, realtime, dynamic, window, pan. • **Formatting commands** - Layers, block, linetype, lineweight,	10	12

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color.

4.3 Draw and Enquiry commands

- **Draw Command** - Line, arc, circle, rectangle, polygon, spline, ellipse, block, hatch

- **Enquiry commands** – distance, area, volume

3.4 Edit and Modify commands

- **Modify Command** - Erase, oops, break, trim, copy, move, mirror, offset, fillet, chamfer, array, extend, rotate, scale, lengthen, stretch, measure, divide, explode, align.

- **Grips editing**- Move, Copy, Stretch.

3.5 Dimensioning, Text and Plot Commands

- **Dimensioning commands** - Dimension styles, Dimensional Tolerances and Geometrical Tolerances.

- **Text commands** - dtext, mtext command.

- **Plotting a drawing** - paper space, model space, creating table, plot commands.

Section – II (Marks 40)		
Contents:	Hrs.	Marks
4. Details to Assembly 4.1 Preparation of the assembly drawings from the given detailed drawings of the parts of machine unit. Objects may be selected from the following & not containing more than 8 parts. • Couplings – Universal couplings & Oldham's Coupling • Bearing – Foot Step Bearing & Pedestal Bearing • Lathe tool Post • Machine vice & Pipe Vice • Screw Jack	08	16

5. Conventional Representations	06	10

5.1 Standard convention using SP – 46 (1988)

- Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber

- Long and short break in pipe, rod and shaft.

- Ball and Roller bearing, pipe joints, cocks, valves, internal / external threads.

- Various sections- Half, removed, revolved, offset, partial and aligned sections.

- Knurling, serrated shafts, splined shafts, and chain wheels.

- Springs with square and flat ends, Gears, sprocket wheel

- Countersunk & counter bore.

- Tapers

6. Pipe Fittings 6.1 Standard conventions representing the following:- Pipe fittings in the pipe line layout, coupling, reducing sockets, elbows, bends, plugs, Tee, cross pipe line, flanged joint, union joint, hydraulic joint, socket and spigot joint as per I.S. code.	04	06

7. Welded Joints 7.1 Representation of the following weld & preparing working drawing showing the size of weld, weld length, flush finish etc.	06	08

- Fillet
- Square butt
- Single and double U
- Single and double V
- Single and double J
- Bevel butt
- Edge / seam / bead
- Spot weld
- All round weld·
- Flush finish weld

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Term Work:

1. Limit, Fit, Tolerances and Machining Symbols – one sheet

2. Assembly to Details drawing:-

Draw the given assembly and prepare component drawings, including conventional representation, tolerances and surface finish symbols. Prepare part list containing, name of components, quantity, material specifications and remarks - One sheet

3. Details to Assembly drawing:-

From a given drawings of components prepare an assembly with two views. Prepare a table containing name of component, quantity, material specifications and remarks, show overall dimensions of the assembly - One sheet

4. Dismantle any machine assembly having 6 to 10 part. Prepare the sketches in sketchbook with dimension and then draw assembly.

5. Conventional Representation as per SP – 46 (1988) - one sheet

6. Drawing to scale, minimum one fabricated component showing weld & symbols, weld length, weld size, weld finish & other relevant instruction about welding.
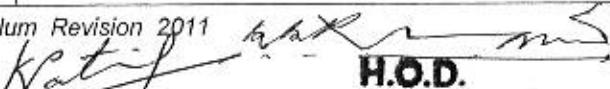
7. One sheet on Assembly & Detail drawing of any machine component, using any AutoCAD Package.

REFERENCES:

SR. NO.	AUTHOR	TITLE	PUBLICATION
1	N. D. Bhatt	Machine Drawing	Charotar Publishing House, Anand, Gujrat
2	L. K. Narayanan, P. Kannaich, K. VenkatReddy	Production Drawing	New Age International Publication
3	IS Code SP 46 (1988)	Code of practice for general engineering drawing	Engineering Drawing Practice for School and colleges
4	Sidheshwar	Machine Drawing	Tata McGraw – Hill
5	Sham Tickoo	Autocad: A Problem -Solving Approach	Thomson Learning EMEA, Limited
6	Gautam Purohit & Gautam Ghosh	M/c Drawing with AutoCad	Pearson Publication
7	– I.S. Code No. 696 – 1972 / I.S. Code No. 813 – 1961. – P.S.G. Design Data Book. – Blue print reading for machinist Delma Publication.		
8	http://www.autocadtutorials.net/ http://www.cadtutor.net/tutorials/autocad/ http://www.caddprimer.com/AutoCAD_training_tutorial/AutoCAD_training_lessons.htm		

Curriculum Revision 2011   ME 11 209: Machine Drawing

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                                Dept. of Mechanical Engineering
                                Govt. Polytechnic, Mumbai-51   Government Polytechnic, Mumbai-51

Programme	: **Diploma in Mechanical Engineering**										
Course Code	: **ME 11 210**			Course Title : **Theory of Machines**							
				C / O	: **Compulsory**						
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
4	-	2	6	3hrs	2 Tests of 1 Hour each	80	20	-	-	50	150

Rationale:

Mechanical engineering diploma holders primarily employed as production, maintenance supervisors. He works on various machines in practice.

Since these super-visors need working knowledge of basic principles of all types of machines used, he should be able to identify and interpret various elements of machines/mechanism in day to day life. It will be helpful to him/her to understand the mechanisms from operational point of view in a better way.

This subject imparts the kinematics involved in different machine elements and mechanisms like gear, cam-follower, follower, belt-pulley, flywheel, brake, dynamometer, clutch, etc. Detailed knowledge of these aspects with deep insight into the practical applications develops a professional confidence in them to become successful Engineer.

Objectives:

The student will be able to

1. Understand basic mechanism involved in conventional & modern machines.
2. Should be able to analyze the mechanism & estimate the required parameter
3. Draw cam profile suitable to various displacement diagram.
4. Select Suitable Drives and Mechanisms for a particular application.
5. Understand the function, operation and application of flywheel and governor.
6. Understand the function, operation and application of brake, dynamometer, clutch and bearing.
7. Understanding the concept of balancing and estimating the magnitude and plane of unbalance.
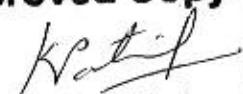
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Topic No	Contents	Hrs.	Marks
	Section –I (40 Marks)		
1	**Introduction to Plane Mechanisms** 1.1 Definition of Kinematics, Dynamics, statics, Kinetics, Kinematics link, Kinematics pair and its types, constrained motion and its types, Kinematic chain and its types, machine and structure, Mechanism, inversion, Degree of freedom. 1.2 **Inversion of Kinematic Chain** • Four bar chain, • Single slider Crank • Double Slider Crank Chain	08	10
2	**Kinematic Analysis of Plane Mechanism:** 2.1 Concept of relative velocity and relative acceleration of a point on a link, angular acceleration, inter-relation between linear and angular velocity and acceleration. 2.2 Drawing of velocity and acceleration diagram of a given configuration, diagrams of simple Mechanism. Determination of velocity and acceleration of point on link by relative method {Excluding coriollis component of acceleration. 2.3 Analytical method (No derivation) and Klein's construction to determine velocity and acceleration of different links and piston in single slider crank mechanism.	08	12
3	**Flywheel and governor** 3.1 Flywheel –Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C Engine (no Numericals) Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance. 3.2 Governors- Types, concept, function and application & Terminology of Governors.Comparison between Flywheel and Governor.	08	8
4	**Clutches and Bearings.** 4.1 Definition of friction, it's necessity, Laws of friction, Friction between dry surfaces, coefficient of friction. 4.2. Pivot & collar friction, uniform pressure & uniform wear assumptions, power absorbed in flat, conical pivot bearings, 4.3. Study of single plate, multiple plate, & cone clutch, power transmitted by them. (simple numerical)	08	10

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	Section –II (40 Marks)		
5	**Power transmission**		
	5.1 Belt Drives- flat belt, V-belt & its applications, material for flat and V-belt. Selection of belts, angle of lap belt length Slip and creep. Determination of velocity ratio, of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission (Simple numerical)		
	5.2 Chain Drives- Types of chains and sprockets, velocity ratio. Advantages & Disadvantages of chain drive over other drives, Selection of Chain & Sprocket wheels, methods of lubrication.	12	14
	5.3 Gear Drives – Spur gear terminology, types of gear trains, their selection for different applications, train value & velocity ratio for simple, compound, reverted and epicyclic gear trains, Law of gearing.		
6	**Cam and Followers**		
	6.1 Concept, definition and application of Cams and followers. Classification of Cams and followers Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation.	08	12
	6.2 Drawing of profile of radial cam with knife edge and roller follower with and without offset with reciprocating motion (graphical method)		
7	**Brakes and Dynamometers:**		
	7.1 Definition Classification & Comparison between brakes and dynamometers.		

	7.2 Construction & working of
	    a) Block brake
	    b) Band brake
	    c) Combined block and band brake.
	    d) Internality expand shoe brake
	    e) Hydraulic brake
	Numerical problems to find braking force and braking torque and power for block, band and block and band brake.
		08	10

	7.3 Construction & working of
	    a) Rope brake dynamometer
	    b) Hydraulic dynamometer
	    c) Belt type transmission dynamometer		

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8	Balancing		
	8.1 Concept of Balancing		
	8.2 Balancing of single revolving mass.	04	04
	8.3 Graphical and numerical method for balancing several masses in the same plane.		
	8.4 Static Balancing, Dynamic Balancing (Introduction)		

Laboratory work and Term work:
The term work shall consist of
1. Mini project 1: To make models of mechanisms & their inversions mentioned under topic no. 1.
2. Draw sketches & write working of mechanisms & their inversions mentioned under topic no. 1.
3. Determination of velocity and acceleration by relative velocity method (four problems).
4. To draw four cam profile on drawing sheets (with & without offset).
5. Determine graphically balancing of several masses rotating in a single plane.
6. Mini Project 2: report based on selection and practical applications of
   - belt drive
   - chain drives
   - Gearbox for various 2 wheelers, 4 wheelers lathe machines etc.
   - Single plate & multiple plate clutch
   - Types of brakes.
   - Types of dynamometers.

Note: The projects are to be distributed in group of 4-6 students. The student will collect the information by visiting trading firms, automobile service stations or internet websites etc. The assessment is based on presentation and project report.

Text Books:

| Sr.No	Author	Title	Publication
01	Khurmi Gupta	Theory of Machines	Eurasia publishing House Pvt. Ltd. 2006 edition
02	P. L.Ballaney	Theory of machines	Khanna Publication

Reference Books:
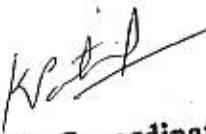
Sr.No	Author	Title	Publication
01	S.S. Rattan	Theory of Machines	McGraw Hill companies, II Edition
02	Jagdishlal	Theory of machines	Bombay metro-politan book limited
03	Sadhu Singh	Theory of Machines	Pearson
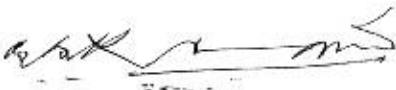
04	Ghosh – Mallik	Theory of Machines	Affiliated East west press
05	Thomas Bevan	Theory of Machines	Pearson
06	J.E. Shigley	Theory of Machines	Oxford

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H.O.D.
Dept. of Mechanical Engineering
Govt. Polytechnic, Mumbai-51

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Government Polytechnic, Mumbai-51

| Programme : **DIPLOMA IN MECHANICAL ENGINEERING**											
Course Code: **EC 11 210**				Course Title: **Fundamental of Electronics**							
				C/O: **Compulsory**							
Credits				Duration of written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
3	-	2	5	3 Hours	2 Tests of 1 Hour each	80	20	-		25	125
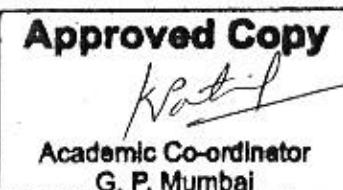
Rationale:

It is necessary for the students of mechanical engineering to study and apply the basic principles and analyze simple electronic subsystems. To acquire the basic knowledge of electronic devices and circuits that is essential for industrial application.
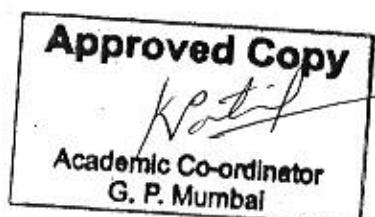
Objectives :

The students will be able to
  1. Understand principle and working of electronic devices and circuits
  2. Identify and test the power devices.
 3. Understand the applications of electronic devices.

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SECTION - I
(40 Marks)

Sr. No	Contents	Hrs.	Marks
1.	**Introduction to semiconductors** 1.1 Difference between conductors & Semiconductors 1.2 Intrinsic & Extrinsic semiconductors, majority & minority charges carriers, P-type & N-type semiconductor. 1.3 PN Junction, depletion layer & barrier potential, 1.4 Biased PN junction forward and reverse biased V-I characteristics	06	08
2.	**Diode Applications** 2.1 Half wave rectifier : Circuit , waveform, working 2.2 Full wave (Centre T), rectifier : Circuit , Waveform, Working 2.3 Bridge rectifies : Circuit , waveform , working 2.4 Filters : Waveform, working of capacitor, choke input and pi (II) type filter.	06	12
3.	**Special Diodes** Symbol, construction, characteristics, working & application of the following diodes. 3.1 Zener Diode 32. Light emitting diode 3.3 Photo diode	04	08
4.	**Transistor Fundamentals** 4.1 Construction & working of PNP & NPN transistors 4.2 Transistors configuration: CB, CE and CC. Working and characteristic of transistor in CE Mode Definition of β , concept of collector leakage current, Use of heat sinks. 4.3 Biasing methods of transistor : Need for biasing, circuit of biasing networks such as fixed bias, collector feedback bias, emitter bias, voltage divider bias. Concept of thermal stability. (No derivation and numerical to be asked in examinations)	08	12
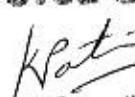
Sr. No	SECTION - II (40 Marks) Name of Topic	Periods 16	Marks 40
5.	**Application of Transistor** 5.1 Working of Single stage CE amplifier 5.2 Working of transistor as a switch 5.3 Oscillator: Principle , working of RC (RC Phase shift) and LC (Colpitt), applications.	06	10
6.	**MOSFET** 6.1 Symbol and working of MOSFET (depletion & enhancement type) 6.2 Comparison of MOSFET with BJT 6.3 MOSFET as a switch 6.4 IGBT : symbol , working and applications	05	08
7.	**Power devices and applications** 7.1 Construction, symbol , characteristics and application of SCR, TRIAC and DIAC. 7.2 SCR as a phase control (simple circuit) 7.3 TRAIC as a light Dimmer (simple circuit) 7.4 Timer circuits : RC timer and SCR timer 7.5 Speed Control circuit using SCR 7.6 Temperature control block diagram using SCR.	08	14
8.	**Regulators , Relays and switches** 8.1 Three pin regulator: Ckt, symbol, working, applications. 8.2 Switches : symbol , Types : Toggle , rotary, slide, micro, push to ON and push to OFF. 8.3 Relay : symbol , contacts , construction , working , applications of general purpose relay.	05	08

Assignment on: Search information on internet about Switches, Relays, contactor, SMD Components.

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List of Experiment, (Any Twelve)
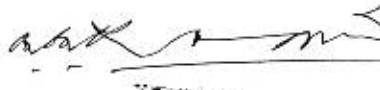
1. Testing of register by colour method
2. To plot V-1 characteristic of P-N junction diode.
3. To plot the V-I characteristics of LED.
4. To plot input and output characteristics of BJT in CE mode.
5. To plot V-I characteristic of Zener diode.
6. To plot V-I characteristics of SCR.
7. To construct and test full wave rectifier
    a. Observe waveforms and measure the voltage with capacitor input filter.
8. To measure the frequency of Colpitt oscillator on CRO.
9. To measure the frequency of RC Phase shift oscillator on CRO
10. To construct and test transistor as a switch.
11. To test the phase control / light dimmer circuit using SCR.
12. To test SCR timer using general purpose relay
13. To identify' and test different types of switches.
14. To construct and test three pin regulator
15. To construct and test transistor as an amplifier.
16. To test the temperature control circuit using SCR.
17. To demonstrate the function of contactor.

BOOKS:

Sr. No	Author	Title	Publisher
1.	V.K. Mehta	Principles of Electronics	S. Chand
2.	R. S. Sedha	A text book Applied Electronics	S. Chand
3.	Malvino	Electronic Principles	McGraw-Hill
4.	G.K.Mittal	Electronic Devices & Circuit Theory	G.K. Publishers
5.	N. N. Bhargava S.C. Gupta	Basic Electronics & Linear Circuit	TTTI, Bhopal
6.	Patil, Deshmukh, Markande	Electronic material & components	BPB Publication
7.	Mrs. Madhuri Joshi	Electronic Material & Components	Shroff. Publication

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| Programme : **Diploma in Mechanical Engineering**											
Course Code: **EE 11 212**				Course Title: **Electrical Technology**							
				C/O: **Compulsory**							
Credits				Duration of written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
3	-	2	5	3Hrs	2Tests of 1 Hour each	80	20	-	-	25	125

Rationale:

This subject helps to understand the analysis of the Electrical Technological concepts, principles and applications. Main stress is given on developing thinking ability, scientific attitude and application in practical work.

Objectives: The student will be able to-
1. Understand the basic principle of Electrical Engineering.
2. Know Electrical Motors, their characteristics, application and selection.
3. Know elementary aspects of power system protection and Safety precautions.
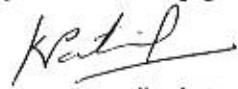
Topic no.	Section – I Contents	Hours	Marks
1	**Basic Concepts** 1.1 Electric current, Electric Potential, Potential difference 1.2 Concept of E.M.F. and Potential Difference 1.3 Resistance, factors affecting Resistance. 1.4 Effect of Temperature on Resistance. 1.5 Temperature Co-efficient of Resistance(Simple Problems) 1.6 Power & Electrical energy(Simple Problems) 1.7 Conductors types, materials advantages and disadvantages and specifications.	04	08
2	**Electromagnetism and Electromagnetic Induction** 2.1 Magnetic flux and magnetic flux density 2.2 Faraday's Laws of Electromagnetic Induction. 2.3 Lenz's law. 2.4 Types of Induced EMF 2.5 Fleming's Left Hand Rule / Right Hand Rule (Basic Generator/motor principle).	04	6

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Topic no.	Contents	Hours	Marks
3	**A.C.Fundamentals** 3.1 Generation of Alternating voltage and current. 3.2 Important terminology: cycle, time, frequency, amplitude 3.3 Equation of A.C. voltage and current. 3.4 RMS value, Average value, Form factor, Peak factor 3.5 Phase, Phase difference. 3.6 Concept of Power and power factor 3.7 Waveform and phasor diagram for Resistance, Inductance, Capacitance and R-L-C series circuit. Reactance and Impedance 3.8 Power triangle: Active power, Reactive power, Apparent power	06	08
4	**Polyphase circuit** 4.1 Advantage of polyphase over single phase 4.2 Interconnection of three phases: Balance and Unbalance system 4.3 Voltage, Current and power relationship in balance star and delta connected system. 4.4 Simple numerical based on above	04	08
5	**Transformer** 5.1 Working Principal of transformer. 5.2 Constructional features and types. (Shell, core & auto). 5.3 EMF equation(No derivation): Transformation ratio 5.4 Transformer losses. 5.5 Rating, Efficiency & Voltage Regulation. 5.6 Types of three phase transformers; connection and application 5.7 current transformer, power transformers, uses and connections.	06	10

Section – II

Topic no.	Contents	Hours	Marks
6	**D.C. Motor** 6.1 Constructional features & working principle. 6.2 Different parts of DC motor & their functions. 6.3 Types of DC motor – schematic diagram, speed/ torque characteristics, rating, specification and applications. 6.4 Necessity of starter. 6.5 Study of 3 point starter. 6.6 Speed control of DC Shunt & Series motor. i) Flux control ii) Armature control. 6.7 Reversal of DC Motor	07	12
7	**Induction Motor** 7.1 Working principle. 7.2 3ph Squirrel cage induction motor – construction, application 7.3 Slip Ring Induction motor – construction, application 7.4 Synchronous speed, % slip [simple problems] 7.5 Starting of 3 ph induction motor i) DOL ii) Star Delta iii) Reduced voltage iv) Rotor resistance starter 7.6 Torque – Slip characteristics, Rating and Specification.	12	20

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	7.7 Speed control: Voltage control, Rotor resistance control & frequency control.
	 7.8 Reversal of Induction Motor
	 7.9 Single phase Induction motor construction, Schematic representation,
	    Torque speed characteristics, Rating, specification & application
	    i) Capacitor start / capacitor run motor
	    ii) Split phase motor
	    iii) Shaded pole motor
	    iv) Universal motor
	 7.10 Selection of motors			

8	**Power systems & Protection**
	 8.1 Layout of Power supply system.
	 8.2 Location & Function of:
	    a) Current Switching Devices: Switches, Switch Fuse unit & Circuit Breakers: MCB, ELCB, MCCB, ACB, OCB, HRC fuse, etc.,
	    b) Introduction to Control & Distribution panels.
	 8.3 Electrical Safety precautions in indoor and outdoor installations:
	 8.4 Earthling : types and necessity,
		05	08	

_List of Experiments

* At least 08 experiments must be performed.
1. To determine change in resistance due to change in temperature of a coil.
2. To measure current, voltage, power and energy in single-phase circuit.
3. To verify line & phase values for star & Delta connected balanced load.
4. To perform speed control of DC shunt motor by
   a) Armature Voltage Control   b) Field Control
5. To plot Speed Torque characteristics of DC shunt motor.
6. To study Fault, Causes and Troubleshooting of DC motors.
7. To measure slip of 3-phase induction motor.
8. To plot speed Torque characteristics of 3- phase induction motor.
9. To study Fault, Causes and Troubleshooting of 3- phase induction motor.
10. To study different types of starters.
11. To study different types of Lamps and measure illumination by luxmeter.
12. To perform continuity test, Earth Fault test & Insulation Resistance test on Electrical Machine.
13. Identify & know the application of ICDP, ICTP, MCB, ELCB, TPN, Switch Fuse unit, HRC Fuse, MCCB, Contactors, Control & Distribution panel.
14. To know safety precautions to be observed for indoor & outdoor installations & know First Aid practice. Also refer artificial respiration chart.
15. To study high voltage test for insulation measurement.

Reference Books:
1. Electrical Technology: Vol-1 and Vol-2,   B.L. Theraja , S. Chand
2. Electrical Machine by S. K. Bhattacharya. Tata - McGraw-Hill Pub. Co. Ltd.
3. Electrical Machine by Samarjit Ghosh , Pearson Education.

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Curriculum revision 2011

EEII 212 Electrical Technology

Programme	: Diploma in Mechanical Engineering											
Course Code	: ME 11 307				Course Title : **Professional Practice**							
					C / O	: **Compulsory**						
Credits				Duration of Written Examination		Examination Scheme						
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL	
0	2	-	2	-	-	-	-	-	-	50	50	

Rationale:

In the competitive global industrial scenario the technician must possess minimal soft skills to undertake the supervisory functions. He needs to deal with the masses with set of targeted achievements.
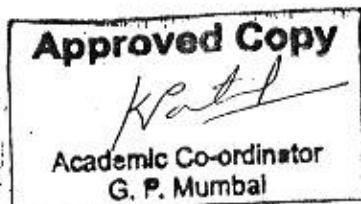
To cope up with the human engineering aspects efforts are taken to inculcate some soft skills and techniques to strengthen the qualities like leadership, motivation and general reporting methodologies in the industries.

In the curriculum implementation part mini projects, group discussions, role plays, are included. The interviewing techniques will deepen the personality development aspects and concept of marketing one self.

In nutshell Professional practices will ensure the integrated anchoring of soft skills, personality development aspects and techno managerial capabilities of a Technician.

Objectives: The student will be able to

1) Acquire presentation, leadership techniques.
2) Acquire interviewing techniques, planning and preparing for interviews.
3) Assimilate the information by participating in seminars and industrial visits..
4) Appreciate the importance of team building and group dynamics.

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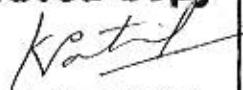
Topic No	Contents	Hrs.	Marks
	Section –I **(40 Marks)**		
1	**Group Discussion – two exercises** • Group discussions on any two topics from techno managerial or social interest. • Group size - divide practical batch into groups of 7 to 10 students, time for group discussion 15 to 20 minutes. Note: Suggested Topics i) Current topics from news papers / T.V. news related to social, education & technology ii) Energy crisis in India iv) Corruption prevention vi) Policies at institutional level – dress code, campus discipline & cleanliness vii) Ban on plastic carry bags. viii) Pollution control x) Brain drain xi) Diploma (Mechanical Engineering group) opting for Computer and Information Technology jobs. xii) Right to information act xiii) Anti-Ragging act. • Students should prepare a report on salient points discussed on the topic & summarize concluding remarks.	6	
2	Interview techniques: • SWOT Analysis • Techniques of presenting self	6	

3	**Seminars:** One seminar be arranged on the subjects related to 4th semester or topics beyond curriculum. Each student shall submit a report up to 10 pages and deliver the seminar. batch size – 3 to 4 students. Source of information – books, magazine , Journals, Website ,surveys, **Topics suggested** Topics related to recent techno economical interests like concurrent engineering, virtual manufacturing, E-Factory, collaborative designing. National GDP, Fiscal Deficit, etc.	4	
4	**Industrial visits** Structured industrial visits be arranged and report of the same shall be submitted by each student to form a part of the term work. No of visits- At least one Scale of industry- medium scale unit , large scale unit. Group size- preferably a practical batch Report-not exceeding 7 to 10 pages. Purpose : ➢ To study the profile of industry ➢ To see the advanced manufacturing processes and machinery& modern practices ➢ To observe work culture of the industry Following types of industries may be visited in & around the institute. • Manufacturing • Process industry • Services sectors in mechanical discipline • Any other relevant area.	04	
5	**Lectures by professionals/Industry Experts-** Two lectures of two hour duration be arranged on any two topics suggested below or any other suitable topics **to acquire practical information beyond scope of curriculum.** Students shall prepare a brief report of each lecture as a part of their term work. i) Effective preparation of project report ii) Various loan schemes of banks, LIC and other agencies for education and other purposes. iii) Use of plastics & rubbers in Automobiles industries. iv) Type of processes used to protect material surfaces from	4	14

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		environmental effect. v) Product life cycle. vi) Industrial application of mechatronics. vii) Special features of CNC machines viii) Gear manufacturing & gear teeth finishing processes. ix) Gear boxes-industrial & Automobile applications. x) Super-finishing operation &their industrial applications. xi) Processing methods for plastic components. xi) Critical pressure boiler xii) Strainers and filters –Types, functions and applications xiii) Industrial drives-Types, components, comparison and applications.		
6		**Socially Relevant Activities** Conduct any one activity through active participation of students and write the report. **Suggested activities** Blood donation camp Quality Control Activities Campus Maintenance Creating Carbon Credit Awareness amongst small scale industries Fire hazards, safety awareness, AIDS awareness etc	4	
7		Role play one exercise The teacher will guide group of student so as to make them aware the roles and responsibilities of industrial portfolio bearers. Group Dynamics one exercise	4	

Term work:

The term work shall be based on work performed by group of students as enlisted above.

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