

Course Code: DMW-C301

Course Name: Applied Mechanics

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective
The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other	

UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Introduction & Laws of Forces Introduction: Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics. Definition of basic and derived quantities. Basic units and derived units. Different systems of units (FPS, CGS, MKS & SI) and their conversion from one to another for density, velocity, acceleration, force, pressure, work, power. Concept of rigid body. Laws of Force: Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & uniformly distributed force, effects of force, characteristics (elements) of a force. Lami's theorem (concept only).	6
UNIT-2	<i>Module-2</i>	Moment Concept of moment. Moment of a force and units of moment. Varignon's theorem (definition only). Principle of moment and its applications (Levers- simple and compound, steel yard, safety valve, reaction at support). Parallel forces (like	6

		and unlike	
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		parallel force), calculating their resultant. Concept of couple, its properties and effects. General conditions of equilibrium of bodies under coplanar forces. Position of resultant force by moment.	
UNIT-3	<i>Module-3</i>	<p>Friction</p> <p>Definition and concept of friction, types of friction, force of friction. Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction.</p> <p>Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane, friction in simple screw jack.</p>	6
UNIT-4	<i>Module-4</i>	<p>Centre of Gravity & Moment of Inertia</p> <p>Centre of Gravity: Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion.</p> <p>Determination of center of gravity of solid bodies- cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed.</p> <p>Moment of Inertia: Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (without derivations).</p>	6

UNIT-5	<i>Module-5</i>	Simple Machines Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines. Simple and compound machine (Examples). Definition of ideal machine, reversible and self locking machine. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency. System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency. Working principle and application of wheel and axle, different pulley blocks, simple screw jack, worm and worm wheel, single and double winch crab.	6
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1. To provide a comprehensive knowledge of force, work and energy to calculate work done, power required and efficiency for various simple machines. 2. To understand the importance and application of various laws of Mechanics 3. At the end of the course students will be able to understand the importance and application of various laws of mechanics <p>NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.</p>
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Course Code: DMW-C302

Course Name: Material Science

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	<p>Introduction</p> <p>Introduction and importance of engineering materials in industry, Classification of engineering materials, Properties of engineering materials; UTS, Ductility, Toughness, Hardness, Malleability, Electrical conductivity and Thermal conductivity.</p> <p>Structure of Metals: Space lattice, Unit cell, BCC, FCC and CPH Structure of important metals, Crystallization (T-T diagram) of a pure metal, Grains, grain size and grain boundaries, Effect of grain size on properties of metals, Elastic and plastic deformation of metals.</p> <p>Imperfection in crystal structure Iron Carbon Diagram Cooling curve of iron and its allotropic forms. Constituents of iron and carbon: Ferrite, cementite, pearlite, austenite and ledeburite.</p> <p>Simplified iron – carbon diagram showing various phases and critical temperatures</p>	6
UNIT-2	<i>Module-2</i>	<p>Ferrous Metals & Alloys</p> <p>Principal ferrous materials – CI, steel and wrought iron. Main properties of different types of cast irons such as grey, white, mottled, malleable and ductile cast irons. Properties and composition of wrought iron. Classification, properties and uses of plain carbon steels Effect of alloying elements such as aluminum,</p>	6

		chromium, nickel, cobalt, manganese, molybdenum, tungsten, vanadium, silicon, sulphur and phosphorous on steels, Importance of alloy steels over plain carbon steels, Composition, properties and uses of stainless steels and high speed steels,	
UNIT-3	<i>Module-3</i>	Non-Ferrous Metals & Alloys Properties and uses of copper, aluminium, tin, zinc and lead. Composition and use of copper alloys, such as cartridge brass, muntz metal, phosphor bronze, gun metal and aluminium bronze. Composition and uses of cast aluminium-alloys & wrought aluminium-alloys.	6
UNIT-4	<i>Module-4</i>	Other Important Materials Plastics: Definition, classification of plastics, fibre glass, reinforced plastics. Major applications of various plastics & their uses and grades. Composite materials. Heat insulating materials: Properties and uses of asbestos, glass wool, thermocole, cork, mica. Electrical insulating materials. Properties and uses of china clay, leather, bakelite, ebonite, glass wool, rubber, felt. Sound insulating materials: Cork, fibre boards. Abrasion materials: Wood, plywood, rubber – natural and synthetic, Glass – plate glass, toughened glass, safety glass. Refractory materials: General characteristics and uses of dolomite, ceramics. Protective coating materials: Paints, primers, varnishes, enamels, putty, electroplating materials, rubasil, teflon coating. Sealant and adhesives – Application and availability of sealant and adhesives for industrial user.	6
UNIT-5	<i>Module-5</i>	Heat Treatment of Steels & Testing of Material Introduction and importance of heat treatment of steel. Main features of the heat treatment processes such as annealing, normalizing, hardening, tempering, surface hardening and case hardening. Different types of heat treatment furnaces. Description of identification tests such as appearance, sound, spark, weight, magnetic, bend and filing. Introduction and importance of non-destructive tests such as X-ray, gamma ray, magnaflux and ultrasonic. Study of microstructure using optical microscope, SEM	6
Total No. of Hours			30

Learning Outcomes:	1. Be able to apply core concepts in Materials Science to solve engineering problems. 2. Interpret about material fundamental and material processing.
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	<p>3. Distinguish the defects in crystal and its effect on crystal properties.</p> <p>4. Figure out the different mechanical properties of material by studying different destructive and non- destructive testing.</p> <p>5. Articulate and utilize corrosion prevention strategies and estimate corrosion behavior of materials and components</p> <p>6. Acknowledge the importance of surface modification and study the different surface modification methods.</p> <p>7. Perceive the basics of Powder metallurgy and application of powder metallurgy</p> <p>8. Select proper metal, alloys, non metal and powder metallurgical component for specific</p> <p>NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit</p>
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Advances in Material Science by Dr RK Dogra and Dr AK Sharma; SK Kataria and Sons, Nai Sarak, New Delhi.
2.	Physical Metallurgy by Y Lakhtin; Mir Publication, Moscow.
3.	Metallurgy by A Guleav, Mir Publication, Moscow.
4.	Material Science by RK Rajput, Laxmi Publications, Daryaganj, New Delhi.

Course Code:DMW-C303

Course Name: Workshop Technology-I

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices. This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Welding Principle of welding, Welding positions and techniques, symbols.- Gas Welding - Types of gas welding flames and their applications, Gas welding equipments- Gas welding torch, Oxy – acetylene cutting torch, Blowpipe, Pressure regulators, Filler rods and fluxes. Arc Welding - Arc welding machines and equipment, A.C. and D.C. arc welding, Effect of polarity, current regulation and voltage regulation, Electrodes: Classification, B.I.S. specification and selection, Flux for arc welding. Other Welding Processes - Principle of resistance welding, working and applications of spot welding, seam welding, projection welding and percussion welding, Welding defects and inspection of welded joints.	6
UNIT-2	<i>Module-2</i>	Pattern Making and Moulding Types of pattern, Pattern material, Pattern allowances. Pattern codes as per B.I.S., Introduction to cores, core boxes and core materials, Core making procedure, Core prints,	6

		<p>positioning of cores.</p> <p>Moulding Sand - Properties of moulding sand, their impact and control of properties viz. moisture, permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility, Various types of moulding sand.</p> <p>Mould Making - Introduction to moulding tools, Types of moulds, Step involved in making a mould, Moulding boxes, hand tools used for mould making, Moulding processes: Bench moulding, floor moulding, pit moulding and machine moulding,</p>	
UNIT-3	<i>Module-3</i>	<p>Casting</p> <p>Principles, working and applications of Dies casting: hot chamber and cold chamber, Centrifugal castin. Gating and Risering System - Elements of gating system, Pouring basin, sprue, runner, gates, Types of risers, location of risers, Directional solidification.Casting Defects - Different types of casting defects, Testing of defects: radiography, magnetic particle inspection, and ultrasonic inspection..</p>	6
UNIT-4	<i>Module-4</i>	<p>Lathe Description and function of various parts of a lathe. Classification and specification of various types of lathe. Work holding devices. Lathe operations: - Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling. Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time, tool life formula. Lathe accessories:- Centers, dogs, chucks, collets, face plate, angle plate, mandrel, steady rest, taper turning attachment, tool post grinder.tools like side-tools and V-shape tools</p>	6
UNIT-5	<i>Module-5</i>	<p>Cutting Tools and Cutting Materials</p> <p>Various types of single point cutting tools and their uses.Single point cutting tool geometry, tool signature. Multipoint cutting tool. Properties of cutting tool material.</p> <p>Study of various cutting tool materials viz. High speed steel, tungsten carbide, cobalt steel, cemented carbides, stellite, ceramics and polycrystalline diamond,Various failures of cutting tool, Cutting fluid – their types, importance, properties & advantages and applications.</p>	6
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1. Learn the process of metal casting. 2. Understand different sheet metal operations 3. Explain the concept of different metal forming operations. 4. Learn about different welding processes. 5. The ability to select manufacturing processes appropriate for particular applications;
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	<p>6. Further develops interpersonal understanding, teamwork and communication skills working on group assignments.</p>
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	A Text Book of Welding Technology by O.P. Khanna
2.	Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Sons, Delhi
3	Workshop Technology by RC Jindal; Ishan Publication Ambala city
4	Elements of Workshop Technology by S.K.Choudhary and Hazara; Asia Publishing House.

Course Code:DMW-C304

Course Name: Thermodynamics

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective A diploma holder in this course is supposed to maintain steam generators, turbines, compressors and other power plant equipment. Therefore, it is essential to impart him basic concepts of thermodynamics, steam generators, steam turbines, compressors and about IC engines.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	<p>Fundamental Concepts</p> <p>Thermodynamic state and system, boundary, surrounding, universe, thermodynamic systems – closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic, properties of system – intensive and extensive, thermodynamic equilibrium, quasi – static process, reversible and irreversible processes, Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy, internal energy</p> <p>Definition of gases, explanation of perfect gas laws – Boyle's law, Charle's law, Avogadro's law, Renault's law, Universal gas constant, Characteristic gas constants, derivation.</p> <p>Specific heat at constant pressure, specific heat at constant volume of gas, simple problems on gas equation</p>	6
UNIT-2	<i>Module-2</i>	<p>Thermodynamic Processes and Heat Transfer</p> <p>Types of thermodynamic processes – isochoric, isobaric, isothermal, isentropic, polytropic and throttling processes, equations representing the processes.</p> <p>Derivation of work done, change in internal energy, change in entropy, rate of heat</p>	6

		transfer for the above processes Introduction to Heat Transfer: Modes of heat transfer, Fourier's law, steady state conduction, composite structures, Natural and forced convection, thermal radiation	
UNIT-3	<i>Module-3</i>	Laws of Thermodynamics Laws of conservation of energy, first law of thermodynamics (Joule's experiment), Application of first law of thermodynamics to non-flow systems – Constant volume, constant pressure, Adiabatic and polytropic processes, steady flow energy equation, Application of steady flow energy to equation, turbines, pump, boilers, compressors, nozzles, evaporators, limitations. Heat source and heat sinks, statement to second laws of thermodynamics; Kelvin Planck's statement, Classius statement, equivalence of statements, Perpetual motion Machine of first kind, second kind, (PMM1, PMM2), Carnot engine, Introduction of third law of thermodynamics, concept of irreversibility, entropy.	6
UNIT-4	<i>Module-4</i>	Properties of Steam and Steam Boiler Formation of steam and related terms, thermodynamics properties of steam, steam tables, internal latent heat, internal energy of stream, entropy of water, entropy of steam, T-S diagrams, Mollier diagram (H – S Chart). Quality of steam (dryness fraction), measurement of dryness fraction, throttling calorimeter, separating and cycle, Rankine cycle Course throttling calorimeter, Carnot vapour.	6
UNIT-5	<i>Module-5</i>	Steam Boiler: Water and fire tube boilers, construction and working of lancashire, babcock and Wilcox boilers. Various mounting and accessories of boilers.	
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1. Students will be able to explain the basic principles and applications of the thermodynamics to the various real life systems. 2. Students will be able to describe fundamental laws of thermodynamics. 3. Students will be able to apply the concepts such as Entropy, Energy Balance also the calculations of heat, work and other important thermodynamic properties for various ideal gas processes. 4. Students will be able to estimate performance of various thermodynamic gas power cycles and gas refrigeration cycle and availability in each case.
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	<p>5. Students will be able to examine the condition of steam and performance of vapour power cycle and vapour compression cycle.</p> <p>NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.</p>
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Engineering Thermodynamics by PK Nag; Tata McGraw Hill, Delhi
2.	Basic Engineering Thermodynamics by Roy Chaudhary; Tata McGraw Hill, Delhi
3.	Basic Thermodynamics by PB Joshi and US Tumne; Pune Vidyarthi Grah Prakashan

Course Name: Material Science Lab

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<i>Objective</i> <i>Diploma holders in Mechanical Engineering are required to interpret drawings and therefore it is essential that they have skills of preparing drawings and sketches of mechanical components. This subject aims at development of drawing skills in the students.</i>
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.	2
<i>Experiment-2</i>	Material identification of say 50 common items kept in a box.	2
<i>Experiment-3</i>	Study of corrosion and its effects.	2
<i>Experiment-4</i>	Other tests such as shear, bend tests on UTM.	2
<i>Experiment-5</i>	Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines	2
<i>Experiment-6</i>	Spring index testing on spring testing machine	2
<i>Experiment-7</i>	Torsion testing of a rod on torsion testing machine.	2
<i>Experiment-8</i>	To conduct the Impact test (Izod / charpy) on the Impact testing machine and to find the impact strength.	2
Total number of hours		16

Course Code: DMW-C353

Course Name: Workshop Technology-I Lab

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	To prepare a half T joint of given dimensions. Molding Shop	2
<i>Experiment-2</i>	To prepare a mould of half bearing.	2
<i>Experiment-3</i>	To prepare a butt joint of MS strips using Arc welding.	2
<i>Experiment-4</i>	To prepare a T joint of MS strips using Oxy Acetylene gas welding.	2
<i>Experiment-5</i>	To prepare a rectangular piece with slant edge of given size from M.S.	2
<i>Experiment-6</i>	To prepare a job on Lathe machine of given shape and size.	2
<i>Experiment-7</i>	To prepare a job on Shaper machine of given shape and size	2
<i>Experiment-8</i>	To prepare a job on Milling machine of given shape and size.	2
Total number of hours		16

Course Code: DMW-C354

Course Name: Thermodynamics Lab

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Study of Fire Tube boiler model.	2
<i>Experiment-2</i>	Study of Water Tube boiler model.	2
<i>Experiment-3</i>	Study and working of Two stroke petrol Engine	2
<i>Experiment-4</i>	Study and working of Two stroke Diesel Engine	2
<i>Experiment-5</i>	Study and working of Four stroke petrol Engine	2
<i>Experiment-6</i>	Study and working of Four stroke Diesel Engine	2
<i>Experiment-7</i>	Study of Impulse & Reaction turbine	2
<i>Experiment-8</i>	Study of Steam Engine model.	2
Total number of hours		16

Course Code :DMW -C355

Course Name: Machine Drawing-I Lab

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective <i>Diploma holders in Mechanical Engineering are required to interpret drawings and therefore it is essential that they have skills of preparing drawings and sketches of mechanical components. This subject aims at development of drawing skills in the students.</i>
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Limits and fits (03 sheets) Maximum limit of size, minimum limit of size, tolerance, allowance, deviation, upper deviation, lower deviation, fundamental deviation, clearance, maximum clearance, minimum clearance. Fits – clearance fit, interference fit, transition fit. Hole basis system, shaft basis system, tolerance grades, calculating values of clearance, interference, hole tolerance, shaft tolerance with given basic size for common assemblies like H7/g6, H7/m6, H8/p6 Introduction to drawing office equipment through a visit to modern drawing office of an industry.	2
<i>Experiment-2</i>	Bearings Bushed Bearing (Assembled Drawing) Ball Bearing and Roller Bearing (Assembled Drawing) Plummer Block (Detailed Drawing) Plummer Block (Assembled Drawing) Foot step Bearing (Assembled Drawing)	2
<i>Experiment-3</i>	Bracket (01 sheets) Wall bracket (orthographic views). Pulleys (03 sheets) Stepped Pulley, V. Belt Pulley Fast and loose pulley (Assembled Drawing). Pipe Joints (03 sheets) Expansion pipe joint (Assembly drawing), Flanged pipe and right angled bend joint (Assembly Drawing), Spigot and Socket joint.	2
<i>Experiment-4</i>	Lathe Tool Holder (Assembly Drawing) (01 sheets)	2
<i>Experiment-5</i>	Reading of mechanical components drawings (01 sheets)	2
<i>Experiment-6</i>	Sketching practice of bearing, bracket and pulley(02 sheets)	2

Experiment-7	Drilling Jig (Detail and Assembly) (02 sheets)	2
Experiment-8	Machine Vice (Detail and Assembly) (02 sheets)	2
Total number of hours		16

Learning Outcomes:	<ol style="list-style-type: none"> 1. First angle projection should be followed, 20% of drawings may be prepared in third angle projection. 2. SP-46-1988 should be followed 3. The drawing should include discussion with tolerances, whenever necessary and material list as per BIS / ISO specifications.
	<p>INSTRUCTIONAL STRATEGY</p> <ol style="list-style-type: none"> 1. Teachers should show model of the components/part whose drawing is to be made 2. Emphasis should be given to cleanliness, dimensioning, layout of sheet 3. Teachers should ensure use of IS codes related to drawing Focus should be on the proper selection of drawing instrument and its proper use

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Lakshminarayanan, V., and Mathur, M.L., "Text Book of Machine Drawing (with Computer Graphics)", 12th Ed., Jain Brothers, ISBN: 8186321330.
2.	Sidheswar, N., "Machine Drawing", McGraw-Hill, ISBN-10: 9780074603376.

Course Name: Measurement & Metrology

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective Metrology is the science of measurement, Diploma holders in this course are responsible for ensuring process and quality control by making measurements and carrying out inspection of various parameters. For this purpose, knowledge and skills about various measuring instruments are required. The aim of this subject is to develop knowledge and skills regarding various measuring instruments amongst the students.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	<p>Introduction</p> <p>Definition of metrology. Standard of measurement. Types of Errors - Controllable and random errors. Precision, accuracy, sensitivity, hysteresis, response time, repeatability, calibration, uncertainty of measurement. Standardization and standardizing organizations</p> <p>Limits, Fits and Tolerances: Definition and terminology of limits, fits and tolerances. Hole basis and shaft basis systems. Type of fits. Limit gauges</p>	6
UNIT-2	<i>Module-2</i>	<p>Linear Measurement</p> <p>Construction features and use of instruments for non precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block. Construction features and use of instruments for precision measurements: vernier calipers, vernier height and depth gauges, micrometers. Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges. Cylinder bore gauges, feeler and wire gauges. Comparators – Characteristics, uses, working principles of different types of comparators: mechanical, electrical, electronics and pneumatic comparator.</p>	6

UNIT-3	<i>Module-3</i>	Angular Measurement Construction and use of instruments for angular measurements: bevel protector, sine bar, angle gauges, clinometer, angle dekker. Optical instruments for angular measurement, auto collimator. Measurement of Surface Finish: Terminology of surface roughness. Concept of primary texture and secondary texture. Factors affecting surface finish. CLA, RMS and RA value. Principle and operation of stylus probe instruments. Tomlinson surface meter and Taylor surface talysurf. Measurements of Screw threads and Gears. Measurement of screw threads- Introduction, measurements of external and core diameters, checking of pitch and angle of threads with gauges.	6
UNIT-4	<i>Module-4</i>	Instrumentation Various types of instruments used for mechanical quantities such as displacement, velocity, acceleration, speed and torque. Use of transducers and electronic counters, stroboscope, vibrating reeds and tachometers. Strain gauge – use of strain gauge and load cells. Liquid level and viscosity – liquid level measuring methods and devices, viscometer – plate and cone viscometer, two float viscometer, Rheo viscometer. Temperature measurement – Various types of thermometers, thermocouples, pyrometer (radiation and optical type) Inspection: Necessity of inspection, their advantages. Types of inspection: remedial, preventive and operative inspection, incoming inspection, in-process and final inspection	6
UNIT-5	<i>Module-5</i>	Quality Control Definition of quality, importance of quality, quality control, Basic statistical concepts, empirical distribution and histograms. Frequency, mean, mode, standard deviation, normal distribution, binomial and poisson (No mathematical derivations). Introduction to control charts, - X, R, P and C charts and their applications. Sampling plans, selection of sample size, method of taking samples. Concept of TQM	6
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1. To understand the basic measurement units and able to calibrate various measuring devices. 2. To express error and correction factors of various measuring devices. 3. To use measuring tools such as Sine Bar, Sine Center, Bevel Protractor, 4. Tool Maker Microscope, Gear Tooth Micrometer, Optical Flats <p>NOTE FOR PAPER SETTER: The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit</p>
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana.
2.	Engineering Metrology by RK Jain; Khanna Publishers, New Delhi.
3.	A Text Book of Production Engineering by RC Sharma; S Chand and Company, New Delhi
4.	Metrology Laboratory Manual by M Adithan and R Bahl; NITTTR, Chandigarh.
5.	Statistical Quality Control by M. Mahajan: Dhanpat Rai and Sons, Delhi

Course Name: Hydraulic Machine

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
2 1 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective Diploma holders in this course are required to deal with problems of fluid and use of hydraulics and pneumatics in power generation. For this purpose, knowledge and skills about fluid mechanics and machinery, hydraulics and pneumatics systems are required to be imparted for enabling them to perform above functions
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Introduction and Pressure Measurement Fluid, types of fluid; properties of fluid viz mass density, weight density (specific weight), specific volume, capillarity, specific gravity, viscosity, compressibility and their units. Pressure and its Measurement: Concept of Pressure (Atmospheric Pressure, gauge pressure, absolute pressure), Pascal's Law, Static Pressure, Units. Pressure measuring devices: piezometer tube, manometers - simple U-tube, differential single column, inverted U-tube, micro manometer. Bourdon pressure gauge. Simple problems.	8
UNIT-2	<i>Module-2</i>	Flow of Fluids Types of fluid flow-steady and unsteady, uniform and non-uniform, laminar and turbulent; rate of flow and their units; continuity equation of flow; Bernoulli's theorem (without proof) and its applications, Discharge measurement with the help of venturimeter, orifice meter and pitot tube, energy of fluid -K.E., P.E., simple problems	8
UNIT-3	<i>Module-3</i>	Flow through Orifices and Pipes Cc, Cv, Cd, flow through drowned, partially drowned orifices, time for emptying a tank through a circular orifice. Simple problems.	8

		Flow through pipes: Definition of pipe flow, wetted perimeter, hydraulic mean depth, hydraulic gradient; loss of head due to friction; Chezy's equation and Darcy's equation of head loss. Loss of head in pipes due to sudden enlargement, sudden contraction, obstruction on flow path, change of direction and pipe fittings, Simple problems.	
UNIT-4	Module-4	Hydraulic Devices Description, operation and application of hydraulic machines – hydraulic ram, hydraulic jack, hydraulic brake, hydraulic accumulator, hydraulic door closer, hydraulic press, selection of specifications of above machines.	6
Total No. of Hours			40
Learning Outcomes:		<ol style="list-style-type: none"> 1. Student should be able to apply hydraulic and pneumatic system knowledge in modern equipments and machines to improve the efficiency with low cost. 2. Student should be able to know concepts of fluid mechanics and governing laws in hydraulic and pneumatic systems. 3. Student should be able to understand operating principle of different components used in hydraulic and pneumatic systems. 4. Student should be able to select various components for hydraulic and pneumatic systems. 5. Student should be able to use hydraulic and pneumatic circuits in various Industrial applications. 6. Student should be able to understand low cost automation by using pneumatic systems. <p>NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit</p>	

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Hydraulics and Fluid Mechanics by Jagdish Lal; Metropolitan Book Company Ltd., Delhi.
2.	Fluid Mechanic, Hydraulics and Hydraulic Machines by K.K. Arora; Standard Publishers Distributors, Delhi
3.	Fluid Mechanics, Hydraulics and Fluid Machines by S. Ramamruthan; Dhanpat Rai and Sons, Delhi

Course Name: Fundamental of I.C.Engines and Automobile

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	
NOTE:	Objective: A diploma holder in this course is supposed to know about testing of IC Engines, fuel supply, ignition system, cooling and lubrication of engines and gas turbines. Hence this subject

UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Hypothetical & Actual Indicator Diagram of Two-Stroke and FourStroke (Petrol and Diesel) Engines.//	6
UNIT-2	<i>Module-2</i>	Valve Timing Diagram of Two-Stroke and Four-Stroke (Petrol and Diesel) Engines. Brief Description of I.C. Engine Combustion (SI & CI), Firingorder of Multi-cylinder I.C. Engine, Scavenging, Preignition, Detonation, Supercharging, Turbo-charging, Simple Carburetor, M.P.F.I. and Fuel Injection Pump.	8
UNIT-3	<i>Module-3</i>	Basic Concept of Governing of I.C Engine, Lubrication of I.C Engine and Cooling of I.C Engine. Performance of I. C Engine – Indicator Power, Brake Power, Morse Test, Mechanical Efficiency, Thermal Efficiency, Relative Efficiency (Efficiency Ratio), Volumetric Efficiency, Specific Fuel Consumption and Heat Balance Sheet. (Simple numerical)	8
UNIT-4	<i>Module-4</i>	Pollutants in Exhaust Gases of Petrol and Diesel Engines, their effects on environment and possible ways of reducing the Pollutants in the Exhaust Gases.	6
Total No. of Hours			30

Learning Outcomes:	5. To understand the basic measurement units and able to calibrate various measuring devices.
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	<p>6. To express error and correction factors of various measuring devices.</p> <p>7. To use measuring tools such as Sine Bar, Sine Center, Bevel Protractor,</p> <p>8. Tool Maker Microscope, Gear Tooth Micrometer, Optical Flats</p>
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NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Elements of Heat Engines by Pandey and Shah; Charotar Publishing House, New Delhi.
2.	Thermal Engineering by PL.Ballaney; Khanna Publishers, New Delhi.
3.	Engineering Thermodynamics by Francis F Huang; MacMillan Publishing Company

Course Code:DMW-C404

Course Name: Strength of Materials

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>Objective</p> <p>Diploma holders in this course are required to analyze reasons for failure of different components and select the required material for different applications. For this purpose, it is essential to teach them concepts, principles, applications and practices covering stress, strain, bending moment, shearing force, shafts, columns and springs. It is expected that efforts will be made to provide appropriate learning experiences in the use of basic principles in the solution of applied problems to develop the required competencies</p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	<p>Stresses, Strains and Instantaneous Stress</p> <p>Concept of load, stresses and strain. Tensile, compressive and shear stresses and strains.</p> <p>Concept of elasticity, elastic limit and limit of proportionality. Hooke's Law, Young's Modulus of elasticity, Yield point, plastic stage, Strain hardening, Stress strain diagram, Ultimate strength and breaking stress, Percentage elongation, shear stress, shear modulus, Proof stress and working stress.</p> <p>Factor of safety, Bars of varying cross-section, Temperature stresses and strains, Composite sections under compression and tension, Lateral strain, Poisson's ratio, Numerical Problems.</p> <p>Resilience and Instantaneous Stress: Concept of resilience, proof resilience and co-efficient of resilience. Modes of loading: gradual loading, sudden loading and falling load</p> <p>Calculation of instantaneous stress induced due to gradual loading, sudden load and falling loads. Numerical problems on the above.</p>	8
UNIT-2	<i>Module-2</i>	<p>Beams and Types of Loads</p> <p>Concept of beams, Types of beams, Types of loading, Concept of end supports – Roller, hinged and fixed, Concept of bending moment and shearing force, Bending moment and</p>	8

		shearing force diagram for cantilever and simply supported beams with and without overhang subjected to concentrated and UDL. Point of contra flexure. Numerical problems.	
UNIT-3	<i>Module-3</i>	Bending Stress Concept of bending stresses, Theory of simple bending, assumptions made in bending theory, Use of equation $\sigma/y = M/I = E/R$, Concept of moment of resistance, Bending stress diagram, Calculation of maximum bending stress in beams of rectangular, I and T sections, Permissible bending stress, section modulus for rectangular, circular and symmetrical I sections.	8
UNIT-4	<i>Module-4</i>	Columns Concept of column, modes of failure, Types of columns, Buckling load, crushing load, Slenderness ratio, Factors effecting strength of a column, End restraints, Effective length, Strength of column by Euler Formula without derivation, Rankine Gourdan formula (without derivation), Direct and eccentric loading, Direct and bending stresses and their combination, Numerical problems.	8
UNIT-5	<i>Module-5</i>	Torsion and Springs Determination of number of plates, Maximum bending stress and deflection, Closed coil helical spring subjected to axial load, Stress deformation, Stiffness and angle of twist and strain energy, Falling loads on springs, Numerical problems Torsion: Concept of torsion, difference between torque and torsion, Use of torque equation, Comparison between solid and hollow shaft with regard to their strength, weight and shear stress diagram, Power transmitted by shaft, Concept of mean and maximum torque, Numerical problems.	8
Total No. of Hours			40

Learning Outcomes:	<ol style="list-style-type: none"> 1. Mechanical behavior of the body by determining the stresses, strains and deflections produced by the loads up to the elastic limit. 2. Fundamental concepts related to deformation, strain energy, moment of inertia, load carrying capacity, slope and deflection of beams, shear forces, bending moments, torsional moments, column and struts, principal stresses and strains and theories of failure 3. Apply knowledge of mathematics, science for engineering applications
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	<ol style="list-style-type: none"> 4. Design and conduct experiments, as well as to analyze and interpret data 5. Design a component to meet desired needs within realistic constraints of health and safety 6. Identify, formulate, and solve engineering problems 7. Practice professional and ethical responsibility 8. Use the techniques, skills, and modern engineering tools necessary for engineering practice
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NOTE FOR PAPER SETTER: The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Strength of Materials by R.S. Khurmi; S. Chand and Company, Delhi.
2.	Strength of Materials by DR Malhotra, Satya Prakashan, Delhi.
3.	Strength of Materials by RK Rajput, SK Kataria and Sons, Delhi
4.	Strength of Materials by Birender Singh
5.	Strength of Materials by Dr. Sadhu Singh.

Course Code: DMW-C451

Course Name: Measurement & Metrology Lab

MM: 50		Sessional: 15
Time: 2 Hr.		ESE: 35
L T P		Credit : 1
0 0 2		
Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Speed Measurement by using Stroboscope / Magnetic / Inductive Pick Up.	2
<i>Experiment-2</i>	Test and calibration of a thermocouple.	2
<i>Experiment-3</i>	Measurement with height gauge and depth gauge.	2
<i>Experiment-4</i>	Measurement of flatness with dial indicator.	2
<i>Experiment-5</i>	Measurement with combination set and bevel protector.	2
<i>Experiment-6</i>	Study and use of slip gauges.	2
<i>Experiment-7</i>	Measurement of angle with sine bar.	2
<i>Experiment-8</i>	Measurement of surface roughness of a surface.	2
Total number of hours		16

Course Code: DMW-C452

Course Name: Hydraulic Machine Lab

MM: 50 Time: 2 Hr. L T P 0 0 2	Sessional: 15 ESE: 35 Credit : 1
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	1. Measurement of pressure head by employing i) Piezometer tube ii) Single and double column manometer iii) Pressure gauge	2
<i>Experiment-2</i>	To find out the value of coefficient of discharge for a venturimeter	2
<i>Experiment-3</i>	Measurement of flow by using venturimeter	2
<i>Experiment-4</i>	Verification of Bernoulli's theorem	2
<i>Experiment-5</i>	To determine the coefficient of friction of pipe using Darcy's equation	2
<i>Experiment-6</i>	Study the working of a pelton wheel and Francis turbine	2
<i>Experiment-7</i>	Dismantling and assembly of a single stage centrifugal pump to study its constructional details, operation including fault diagnosis.	2
<i>Experiment-8</i>	Study of characteristics curve for centrifugal pump and plot its curves	2
Total number of hours		16

Course Code: DMW-C453

Course Name: Fundamental of I.C.Engines and Automobile Lab

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Understand working principle and construction of four-stroke Petrol and Diesel Engine.	2
<i>Experiment-2</i>	Understand working principle and construction of two-stroke Petrol and Diesel Engine.	2
<i>Experiment-3</i>	Conduct trial on I.C. Engine Test Rig to find out the Heat Balance in an I.C. Engine.	2
<i>Experiment-4</i>	Study of valve timing diagram of four-stroke Petrol and Diesel Engine.	2
<i>Experiment-5</i>	Determination of I.P., B.P., Mechanical Efficiency and Thermal Efficiency of an I.C. Engine through suitable method.	2
<i>Experiment-6</i>	Conduct Morse Test on Multi-cylinder Diesel / Petrol Engine.	2
<i>Experiment-7</i>	Study of Cooling System generally installed in four-stroke (single / multi-cylinder) I.C. Engine.	2
<i>Experiment-8</i>	Study of Lubrication System generally installed in two-stroke I.C. Engine.	2
Total number of hours		16

Course Code: DMW-C454

Course Name: Fundamental of Computer Applications Lab

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Experiment	Course Content	No. of Hours
Experiment-1	<i>Given a PC, name its various components and list their functions</i> <i>Identification of various parts of a computer and peripherals</i>	2
Experiment-2	Practice in installing a computer system by giving connection DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP	2
Experiment-3	Exercises on entering text and data (Typing Practice using any tutor)	
Experiment-4	Features of Windows as an operating system <ul style="list-style-type: none"> - Start - Shutdown and restore - Creating and operating on the icons - Opening closing and sizing the windows - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file - Creating and operating on a folder - Changing setting like, date, time color (back ground and fore ground) - Using short cuts Using on line help 	2
Experiment-5	MS-Word <ul style="list-style-type: none"> - File Management: Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file - Page Set up: Setting margins, tab setting, ruler, indenting - Editing a document: Entering text, Cut, copy, paste using tool- bars - Formatting a document: Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods - Aligning of text in a document, justification of document, Inserting bullets and numbering - Formatting paragraph, inserting page breaks and column breaks, line spacing Use of headers, 	2

	<p>footers: Inserting footnote, end note, use of comments</p> <ul style="list-style-type: none"> - Inserting date, time, special symbols, importing graphic images, drawing tools - Tables and Borders: <p>Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table</p> <ul style="list-style-type: none"> - Print preview, zoom, page set up, printing options - Using Find, Replace options - Using Tools like: <p>Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels</p> <ul style="list-style-type: none"> - Using shapes and drawing toolbar, - Working with more than one window in MS Word, - How to change the version of the document from one window OS to another Conversion between different text editors, software and MS word 	
<i>Experiment-6</i>	<p>MS-Excel</p> <ul style="list-style-type: none"> - Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets - Menu commands: <p>Create, format charts, organize, manage data, solving problem by analyzing data, and exchange with other applications. Programming with MS-Excel, getting information while working</p> <ul style="list-style-type: none"> - Work books: <p>Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays</p> <ul style="list-style-type: none"> - Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet - Creating a chart: <p>Working with chart types, changing data in chart, formatting a chart, use chart to analyze data</p> <ul style="list-style-type: none"> - Using a list to organize data, sorting and filtering data in list 	2
<i>Experiment-7</i>	<ol style="list-style-type: none"> 1. MS PowerPoint <p>a) Introduction to PowerPoint</p> <p>How to start PowerPoint</p> <p>Working environment: concept of toolbars, slide layout,</p>	2

	<p>templates etc. Opening a new/existing presentation Different views for viewing slides in a presentation: normal, slide-sorter etc.</p> <p>b) Addition, deletion and saving of slides e) How to view the slide show?</p> <p>Viewing the presentation using slide navigator Slide transition Animation effects etc.</p>	
<i>Experiment-8</i>	<p>2. Internet and its Applications</p> <p>a) Log-in to internet</p> <p>b) Navigation for information seeking on internet</p> <p>c) Browsing and down loading of information from internet</p> <p>d) Sending and receiving e-mail</p> <ul style="list-style-type: none"> - Creating a message - Creating an address book - Attaching a file with e-mail message - Receiving a message , Deleting a message 	2
Total number of hours		16

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Fundamentals of Computer by V . Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi.
2.	Computers Today by SK Basandara, Galgotia Publication Pvt ltd. Daryaganj, New Delhi
3.	MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi

Course Code:DMW-C501

Course Name: Dynamics of Machine

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	<p>Basic Concepts: Definition of statics, dynamics, kinetics, and kinematics, Rigid body and resistant body., Links, its classification, Kinematics chain and their types, Kinematics pairs and it's classification, Mechanism. Machine, Structure & Inversion, Degree of freedom, Types of joints, Constrained motion, and it's classification , Classification of mechanisms, Four bar chain and it's inversion, Single slider crank chain and its inversions.</p> <p>Fly Wheel: Turning moment diagram plotting and its purpose, Turning moment diagram for single cylinder single acting steam engine, Fluctuation of energy & fluctuation of speed of Flywheel, Applications of fly wheel, Types of fly wheels, Mass and size calculations in different cases</p>	06
UNIT-2	<i>Module-2</i>	<p>Governors: Functions of governor, Classification of governors - elementary knowledge of porter governor, Watt governor, Proell governor, Porter governor, Terminology used in governors, Governors effort and power, Hunting, isochronism, stability, sensitiveness of a governor, Simple problems related to watt, porter and proell governor, Applications of governors</p> <p>Cams:Definition of cam, Classification of cams, Followers and their classification, Applications of cam, Basic definition related to cams, Construction of displacement diagram of follower performing uniform velocity, Construction of displacement diagram of follower performing SHM</p>	06

UNIT-3	<i>Module-3</i>	Power Transmission Devices (Belt, Rope and Chain Drive): Introduction, Belt, Rope and Chain drives ,Material for Belt, and Rope, Open and crossed belt drives, action of belt on pulleys, velocity ratio, Slip and Creep in belts ,Length of belt in case of open and cross belt, Ratio of tensions in case of flat and V belt, Power transmitted and maximum power transmitted by belt, Centrifugal force and its effect on belt tension, Initial tension and its effect on the transmission of maximum.	06
UNIT-4	<i>Module-4</i>	Gear Drive: Functions of gear, Classification of gears and Gear material, Gear nomenclature, Simple, compound, reverted and epicyclic gear train, Horse power transmitted by a gear train, Selection of gear trains- simple and epicyclical	06
UNIT-5	<i>Module-5</i>	Brakes and Dynamometers: Introduction and Classification of brakes, Brief description of different types of Mechanical Brake such as block or shoe brake Simple and Differential band brake, Definition and types of dynamometers, prony brake dynamometer, rope brake dynamometers, hydraulic dynamometer, belt transmission dynamometer. Clutches:Function of clutch, Classification of clutches, Principle of working of Single Disc clutch and Cone clutch with simple linediagram, Principle of working of Multi plate clutch and Centrifugal clutch	06
Total No. of Hours			30

Learning Outcomes:	NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Vinogradov, O., "Fundamentals of Kinematics and Dynamics of Machines and Mechanisms", CRC Press, ISBN 9780849302572. .
2.	Massie, H.H., and Reinholtz, C.F., "Mechanisms and Dynamics of Machinery, 4th Ed., John Wiley & Sons, ISBN: 978-0-471-80237-2

Course Code:DMW-C502

Course Name: CNC Machine And Automation

MM: 100	Sessional: 30
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Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective Diploma holders are required to supervise and handle specialized machines and equipment like CNC machines. For this purpose, knowledge and skills about NC machines, part programming in NC machines and tooling for CNC machines are required to be imparted for enabling them to perform above functions. This subject aims at development of knowledge and skills about CNC machines, tools, equipment and use of high tech machines for increased productivity and quality.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Introduction Introduction to NC, CNC & DNC, their advantages, disadvantages and applications, Machine Control Unit, input devices, selection of components to be machined on CNC machines, Problems with conventional NC, New developments in NC, Axis identification, PLC Control and its components. Its advantages and disadvantages.	06
UNIT-2	<i>Module-2</i>	Construction and Tooling Design features, specification Chart of CNC machines, use of slideways, balls, rollers and coatings, motor and leadscrew, swarf removal, safety and guarding devices, various cutting tools for CNC machines, overview of tool holder, different pallet systems and automatic tool changer system, management of a tool room.	06
UNIT-3	<i>Module-3</i>	Part Programming Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rational components, part programming using conned cycles, subroutines and do loops, tool off sets, cutter radius compensation and wear compensation.	06
UNIT-4	<i>Module-4</i>	System Devices, Problems in CNC Machines ,Automation and NC system Actuators, Transducers and Sensors, Tachometer, LVDT, opto-interrupters,	08

		<p>potentiometers for linear and angular position, encoder and decoder, axis drives, open loop system, close loop system.</p> <p>Common problems in mechanical, electrical, pneumatic, electronic and PC components of NC machines, diagnostic study of common problems and remedies, use of on-time fault finding diagnosis tools in CNC machines.</p> <p>Role of computer in automation, emerging trends in automation, automatic assembly, manufacture of magnetic tape, manufacture of printed circuit boards, manufacture of integrated Circuits, Overview of FMS, Group technology, CAD/CAM and CIM.</p>	
UNIT-5	<i>Module-5</i>	<p>Robot Technology</p> <p>Introduction to robot technology, basic robot motion, robot applications.</p>	04
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1. Investigate; understand new and ongoing developments in the area of numerical control of machine tool. 2. Understand basic concepts of machines operated through numerical control. 3. Understand the principles of computer numerical control (CNC) and machine Structures. 4. Be able to interpret a component specification and produce an operational plan for its manufacture. 5. Develop simple part programs with the help of programming languages and manufacture a component <p>NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit</p>
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd., Delhi.
2.	Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata Mc Graw Hill, New Delhi.
3.	CNC Machine by Bharaj; Satya Publications, New Delhi.

Course Code:DMW-C503

Course Name: Workshop Technology-II

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
2 1 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>Objective</p> <p><i>As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.</i></p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	Module-1	<p>Carpentry and Painting Shop-II</p> <p>Introduction to joints, their relative advantages and uses.</p> <p>Job I Preparation of Dovetail joint and glued joint.</p> <p>Job II Preparation of Mitre Joint</p> <p>Job III Preparation of a lengthening Joint</p> <p>Job 1V Preparation of at least one utility job with and without lamination..</p> <p>Demonstration of job showing use of Rip Saw, Bow saw and Tramme, method of sharpening various saws.</p> <p>Demonstration of job on Band Saw and circular saw, chain and diesel universal wood working machine, saw resharpening machine, Saw Brazing unit.</p> <p>Demonstration of various methods of painting wooden items.</p> <p>Job V Preparation of surface before painting.</p> <p>Job VI Application of primer coat</p> <p>Job VII Painting wooden items by brush/roller/spray.</p>	06
UNIT-2	Module-2	<p>Fitting and Plumbing Shop-II</p> <p>Description and demonstration of various types of drills, taps and dies Selection of dies for tapping. Types of taps, tapping, dieing and</p>	06

		<p>drilling operations.</p> <p>Job I Making internal and external threads on a job by tapping and dieing operations (manually)</p> <p>Precautions while drilling soft metals, specially aluminum and lead.</p> <p>Job II Drilling practice on soft metals (Aluminum, Brass and lead) Care and maintenance of measuring tools like calipers, steel rule, try square, vernier, micrometer, height gauge, combination set, reading gauge. Handling of measuring instruments, checking of zero error, finding of least count.</p> <p>Job III Preparation of a job by filing on non-ferrous metal.</p> <p>Job IV Production of a utility job involving all the above operations.</p> <p>Job V Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow T - Union, socket, stopcock, taps, etc</p> <p>Description and demonstration of various types of drills, taps and dies; Selection of dies for tapping; Types of taps, Tapping and dieing operations.</p>	
UNIT-3	<i>Module-3</i>	<p>Welding Shop-II</p> <p>Introduction of the gas welding, gas welding equipment, adjustments of different types of flames, demonstration and precautions about handling welding equipment.</p> <p>Job I Practice in handling gas welding equipment and welding practice. Common welding joints generally made by gas welding.</p> <p>Job II Preparation Butt joint by gas welding.</p> <p>Job III Preparation of small cot conduit pipe frame by electric arc welding/gas welding.</p> <p>Job IV Preparation of square pyramid from M.S rods by welding (type of welding to be decided by students themselves).</p> <p>Job V Exercise job on spot/seam welding machine. Demonstration of various methods adopted for painting steel items.</p> <p>Job VI Painting steel items by brush/roller/spray</p>	06
UNIT-4	<i>Module-4</i>	<p>Sheet metal & Machine shop</p> <p>Introduction to sheet metal process and tools.</p> <p>Job I Making sheet metal joints</p> <p>Job II Making sheet metal tray or a funnel or a computer chassis</p> <p>Job III Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering</p> <p>Job IV Prepare a lap riveting joint of sheet</p>	06

		<p>metal pieces Introduction to various machines used in machine shop.</p> <p>Job V Exercise on simple turning</p> <p>Job VI Exercise on taper turning</p> <p>Job VII Marking and drilling practice on mild steel piece</p> <p>Job VIII Marking and drilling practice on aluminium piece</p> <p>Job IX Demonstration of various functions of CNC Machine</p>	
UNIT-5	<i>Module-5</i>	<p>Electric Shop-II</p> <p>Importance of three phase wiring and its effectiveness.</p> <p>Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine. Estimating and costing power consumption.</p> <p>Job II Connecting single phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.</p> <p>Job III Checking continuity of connection (with tester and bulbs), location of faults with a multimeter and their rectification in simple machines and/or other electric circuits fitted with earthing.</p> <p>Demonstration of dismantling, servicing and reassembling of a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geaser, electric oven etc.</p> <p>Job IV Dismantling, serving and reassembling of any of the above electrical</p> <p>Job V Demonstration of testing single phase/three phase electrical motor by using voltmeters ammeter clip on meter technometer etc.</p> <p>Job VI Reversing the rotation of motor.</p>	06
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1)Student will be able to choose machining processing to manufacture any component Manufacturing Industries. 2)To Estimate machining time for milling and drilling process 3) To understand finishing processes 4)To calculate forces during orthogonal metal cutting. 5) To explain principle and applications of advanced machining to develop part program for turning. design jig and fixture for given component
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Manual on Workshop Practice by K Venkata Reddy, KL Narayana and P Kaunaioh; MacMillan India Ltd., New Delhi
2.	Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

Course Code:DMW-C504**Course Name: Industrial Engineering**

MM: 100 Time: 3 Hr. L T P 2 1 0	Sessional: 30 ESE: 70 Credit : 3
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Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective: 1. Basic understanding of Industrial process like type of industry, optimization of production process, reduction of inventory, organization structure and modern manufacturing practices like JIT . 2. To apply knowledge of mathematics, science, and engineering for process mapping and productivity enhancement
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Productivity: Introduction, definition, measurement, productivity index, ways to improve productivity, Types of Production System. Work Study: Meaning and benefits of work study, time & motion study. Micromotion study P.M.T.S. man machine Diagram flow chart. Motion economy	6
UNIT-2	<i>Module-2</i>	Method Study: Objectives and scope of method study, recording techniques, micromotion study and memo-motion study, fundamental motion and therbligs, principal of motion economy, critical examination	6
UNIT-3	<i>Module-3</i>	Work Measurement: Objectives of work measurement, work measurement techniques, procedure. Work sampling, determining the sample size, determining time standards by work sampling. Absolute error or desired absolute accuracy	6
UNIT-4	<i>Module-4</i>	Inventory Control: Inventory, function, cost, deterministic models. Introduction to MRP, supply chain Management.	6
UNIT-5	<i>Module-5</i>	Plant Layout and Materials Handling: Plant location, type of layout, principles of facility layout principles of material handling, Material Handling eqpts. Production Planning and Control: Objectives, Forecasting, product design and	6

		development functions, steps in PPC. Planning roating, scheduling, Dispatching & follow-up, Effectiveness of PPC, Introduction of JIT.	
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1. An ability to identify, formulate, and solve complex problems related to productivity.. 2. An ability to apply engineering design to produce solutions that meet specified needs 3. with consideration of public health, safety, and welfare, as well as global, cultural, social, 4. Environmental, and economic factors 5. An ability to function effectively on a team whose members together provide leadership for development of an organization. 6. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies..
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Buffam E.S,Modern production operations Management, Wiley eastern.
2.	O.P. Khanna.,Industrial Engg. & Management, ISBN-10-818992835X

Course Code:DMW-C551

Course Name: Dynamics of Machine Lab

MM: 50		Sessional: 15
Time: 2 Hr.		ESE: 35
L T P		Credit : 1
0 0 2		
Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Study of simple links/models/mechanisms.	2
<i>Experiment-2</i>	Study of various commonly used mechanisms and its inversions in machines	2
<i>Experiment-3</i>	Study of various types of models of cam and follower arrangements.	2
<i>Experiment-4</i>	Study of various models of gear trains arrangements	2
<i>Experiment-5</i>	Experiment on cam and follower apparatus	2
<i>Experiment-6</i>	Experiment on Journal bearing apparatus	2
<i>Experiment-7</i>	Experiment on Engine Brakes	2
<i>Experiment-8</i>	Experiment on Gyroscope apparatus	2
Total number of hours		16

Course Code:DMW-C552

Course Name: CNC Machines and Automation Lab

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	1. Study the constructional details of CNC lathe.	2
<i>Experiment-2</i>	Study the constructional details of CNC milling machine.	2
<i>Experiment-3</i>	Study the constructional details and working. - Automatic tool changer and tool setter - Multiple pallets - Swarf removal system - Safety devices	2
<i>Experiment-4</i>	Develop a part programme for following lathe operations and make the job on CNC lathe and CNC turning center. Plain turning and facing operations Taper turning operations (internal and external) - - Thread cutting operations (internal and external) - - Operation along contour using circular interpolation	2
<i>Experiment-5</i>	Develop a part programme for the following milling operations and make the job on CNC milling and CNC machining centre (vertical and horizontal type). - Plain milling - Slot milling - Contouring - Pocket milling	2
<i>Experiment-6</i>	Preparation of work instruction for machine operator.	2
<i>Experiment-7</i>	Preparation of preventive maintenance schedule for CNC machine.	2
<i>Experiment-8</i>	Demonstration of FMS on prototype model and industrial visit for awareness of actual working in production	2
Total number of hours		16

Course Code:DMW-C553

Course Name: Workshop Technology – II Lab

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Produce a rectangular block by face milling and prepare a slot on one face with a slotting cutter / side and face cutter..	2
<i>Experiment-2</i>	Gear manufacturing by some indexing device on a milling machine & gear hobber. Inspection of gear	2
<i>Experiment-3</i>	Job on grinding using <ul style="list-style-type: none"> a. Surface grinding b. Cylindrical grinding c. Centreless grinding 	2
<i>Experiment-4</i>	Milling cutter grinding on tool and cutter grinder.	2
<i>Experiment-5</i>	Preparation of job through eccentric turning.	2
<i>Experiment-6</i>	Practice of taper turning.	2
<i>Experiment-7</i>	Exercise on EDM for preparation of electrodes(male and female).	2
<i>Experiment-8</i>	Marking and drilling practice using column and knee type drilling machine and radial drilling machine	2
Total number of hours		16

Course Code:DMW-C554

Course Name: Minor Project Work

MM: 100	Sessional: 30
Time: 2 Hr.	ESE: 70
L T P	Credit : 1
0 0 2	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>The object of this training is to:</p> <ol style="list-style-type: none"> 1. Expose the students to industrial/field procedures and practices so as to have an appreciation of the size and scale of operations. 2. Develop comprehension regarding concepts, principles and practices taught in the classroom in their application in solving field/industrial tasks/problems.
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Course Content	No. of Hours
<p>For effective planning and implementation of this practical training, it is proposed to:</p> <p>i) Identify adequate number of industrial/field organizations where students will be sent for practical training.</p> <p>ii) Prepare a workbook, which can be used by students for guiding students to perform definite task during the practical training.</p> <p>iii) Identification of teachers who would supervise the students and provide guidance during practical training.</p> <p>The components of evaluation will include the following:</p> <ul style="list-style-type: none"> - Punctuality and regularity - Initiative in learning - Relationship at works - Industrial training report 	30

Course Code:DMW-C601

Course Name: Computer Aided Drafting and Drawing

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
2 1 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective: The primary objective of the course is to introduce the student to working with discretised geometry in design of mechanical components and representations of shapes. They will also practice on AUTOCAD and CREO.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	<ul style="list-style-type: none"> ○ Introduction and Review of Computer Programming: Introduction to CAD/CAE, Element of CAD, Concepts of integrated CAD/CAM, CAD Engineering applications, its importance & necessity. 	06
UNIT-2	<i>Module-2</i>	<p>Computer Graphics I - Computer systems, Graphics input devices- cursor control devices, Digitizers, Scanners, speech oriented devices and touch panels, Graphics display devices CRT, colour CRT monitors,</p> <p>Computer Graphics-II: Graphics software, Graphics functions, output primitives- Bresenham's line drawing and Mid-point circle algorithms.</p>	06
UNIT-3	<i>Module-3</i>	Geometric Transformations - Word/device co- ordinate representations, 2D and 3D geometric transformations, Matrix representation-translation.	06
UNIT-4	<i>Module-4</i>	Plane Curves: Curve representation, Interpolations Vs approximation, Parametric Continuity conditions, Spline Curves- Hermit spline, Bezier spline and B- spline Curves and its Properties.)	06
UNIT-5	<i>Module-5</i>	3-D Graphics: Polygon surfaces Polygon mesh representations, Quadric and Super quadrics surfaces and Blobby objects, Fractals. Solid modelling- wire mesh and sweep representation, constructive solid geometry, Boolean operations,	06

		Boundary representations. Colour models.	
Total No. of Hours			30

Learning Outcomes:	By completing this module, the student should be able to understand the basic concepts in CAD. They will be able to write computer programs and use them in Mechanical Engineering Design
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Davis, M. J., “ <i>Computer Graphics</i> ”, UK Ed., Nova Science Pub Inc, ISBN-978-1617618116
2.	Rogers, D. F., Earnshaw, R. A., Graphics, B. C. S. C., Group, D., & Society, C. G. “ <i>Computer graphics techniques theory and practice</i> ”, 1990 Ed. Springer-Verlag, ISBN- 978-0387972374

Course Name: Refrigeration and Air Conditioning

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
2 1 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective The diploma holder of Mechanical Engineering are responsible for supervising and maintenance of RAC system. For this purpose, the knowledge and skill covering basic principles of refrigeration and air conditioning is required to be imparted to the students. Moreover, RAC industry is expanding and employment opportunities in this field are good.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Fundamental of Refrigeration/Refrigerants Introduction to refrigeration and air conditioning, units of refrigeration, methods of refrigeration, natural system and artificial system of refrigeration, refrigeration effect. Rating of refrigeration, co efficient of performance. Difference between COP and efficiency. Introduction to air refrigeration cycle. Bell – Colleman cycle, calculation of mass flow rate, work done and COP. Miscellaneous: Study of Ice plant, cold storage, centrally air-conditioned plant, air conditioning of car. Insulating materials. Safety switches – thermostat, overload protector, low pressure high pressure cut out switch, oil pressure cut out switch.	08
UNIT-2	<i>Module-2</i>	Vapour Compression System Principle, function, parts and necessity of vapour compression system.P – H charts. Dry, wet, and super heated compression. Effect of sub cooling and super heating, effect of moisture in vapour compression system. Comparison between air refrigeration and vapour compression system. Vapour Absorption System: Introduction, principle and working of electrolux refrigeration system, solar power refrigeration system,	08

		advantages and disadvantages of solar power refrigeration system over vapour compression system.	
UNIT-3	<i>Module-3</i>	Refrigerants Physical, chemical, thermodynamic and commercial properties of NH ₃ , water, CO ₂ , R-12, R-22 and R-134 A. Properties of ideal refrigerants used in refrigeration system.	08
UNIT-4	<i>Module-4</i>	Vapour Absorption System Introduction, principle and working of Electrolux refrigeration system, solar power refrigeration system, advantages and disadvantages of solar power refrigeration system over vapour compression system.	08
UNIT-5	<i>Module-5</i>	Refrigeration Equipment Compressor – Function, various types of compressor. Condenser – Function, Various types of condenser. Evaporators – Function, Various types of evaporators. Expansion Devices – Function, Different types such as capillary tube, thermostatic expansion valve, automatic expansion valve, low side float valve and high side float valve. Psychrometry: Definition of dry air, moisture, saturated air, unsaturated air, specific humidity, relative humidity, degree of saturation, DBT, WBT, DPT. Psychrometric charts, heating with humidification, cooling with dehumidification, by pass factor. Air conditioning systems. Windows type air conditioner, split type air conditioner.	08
Total No. of Hours			40

Learning Outcomes:	<ol style="list-style-type: none"> 1. Students should be able to understand various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables. 2. Students should be able to illustrate the fundamental principles and applications of refrigeration and air conditioning system 3. Students should be able to obtain cooling capacity and coefficient of performance by conducting test on vapor compression refrigeration systems 4. Students should be able to present the properties, applications and environmental issues of different refrigerants 5. Students should be able to estimate the condition of steam and performance of vapour power cycle and vapour compression cycle. 6. Students should be able to calculate cooling load for air conditioning systems used for various applications 7. Students should be able to use Psychometric charts and estimate various essential properties related to Psychrometry and processes.
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8. Students should be able to operate and analyze the refrigeration and air conditioning systems

NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Refrigeration and Air conditioning by A.S Sarao; Satya Prakashan, New Delhi.
2.	Refrigeration and Air conditioning by Mahohar Lal.
3.	Refrigeration and Air Conditioning by R.S Khurmi & J.K Gupta; S. Chand, New Delhi.

Course Code:DMW-C603

Course Name: Production Management

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
2 1 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>Objective</p> <p>Diploma holder in this course is responsible for controlling production and quality of the product on the shop floor as well as for production planning and control. He is also required to supervise erection, installation and maintenance of equipment including material handling and undertake work-study for better utilization of resources. For this purpose, knowledge and skills about these topics need to be imparted to them. This subject aims at development of competencies to prepare material, equipment schedule and production control schedules and maintain required quality levels. In addition, it will also help in developing skills in erection, installation and testing of equipment.</p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Production, Planning and Control Types of production. – Job, batch and mass production. Concept of planning, scheduling, routing, dispatching and follow up, forecasting. Break even analysis and Gantt chart. Project scheduling, application of CPM and PERT, simple numerical problems.	06
UNIT-2	<i>Module-2</i>	Plant Location Layout and Handling Definition. Factors affecting the site selection of plant. Factors affecting plant layout. Types of layout – Process, product, combination and fixed position, layout patterns. Techniques of making layout – Flow diagram, templates, distance volumematrix, travel chart. Line balancing, workstation. Material Handling: Principles of economic material handling. Hoisting equipment – Fork lift truck, cranes – mobile motor cranes, overhead cranes, traveling bridges crane, derrick crane. Conveying Equipment – Package	06

		conveyor, gravity roller conveyors, screw conveyors, flight or scraper conveyors, bucket conveyors, bucket elevators, belt conveyors, and pneumatic conveyors.	
UNIT-3	<i>Module-3</i>	Work Study Definition, advantages and procedure of Work study. Difference between production and Productivity, measures to improve productivity. Method study – Definition, Objectives and Procedure. Symbols, Flow process chart, Flow diagram, Machine chart, Two hand process chart. Principles of motion economy, Therblig symbols, Simo chart. Work Measurement – Time study, definition, principle and method of time study. Stop watch study – Number of readings, calculation of basic time, rating techniques, normal time, allowance, standard time, simple numerical problems. E	06
UNIT-4	<i>Module-4</i>	Inventory Management Material purchasing, store keeping, functions and duties of store department. Definition of inventory, Types of inventory. ABC analysis. Procurement cost, carrying charges, lead-time, reorder point, economic ordering quantity, simple numerical problems. Codification and standardization. Objectives and functions of MRP. Management information of MRP. Concept of JIT.	06
UNIT-5	<i>Module-5</i>	Estimation and Costing Introduction, Purpose/functions of estimating. Different between estimation and costing. Costing concept – ladder and elements of cost. Depreciation, methods of calculating depreciation. Overheads and their types. Estimation of material cost. Estimation of cost for machining processes and fabrication. Numerical problems. Profit and loss estimation	06
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1. In production management we learn the concept of production and many type of production planning system. 2. In production we study the plant location layout as well as the site selection of plant. 3. It Introduce the concept of planning management scheduling routing and many other concepts production.
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	<p>4. We Learn the principal of different type of material handling processes by using hoisting equipments.</p> <p>5. Also study about production and productivity and to improve the productivity by work study method.</p> <p>6. Understand the principles of inventory managements. Observe the time schedule and proper way of method study objective and procedure</p>
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NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Industrial Engineering and Management by T.R. Banga and SC Sharma; Khanna Publishers, Delhi.
2.	Industrial Engineering and Management by O.P. Khanna; Dhanpat Rai and Sons, New Delhi.

Course Code:DMW-C604

Course Name: Maintenance Management

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
2 1 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>Objective: • To ensure that equipment and infrastructure are always in good condition.</p> <p>To carry out prompt emergency repair of equipment and infrastructure so as to secure the best possible availability for production.</p> <p>To ensure the operation of equipment for production and for the distribution of energy and fluids.</p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Introduction: Introduction, operating life cycle, reliability, Failure analysis, failure rate curve, elements in series, parallel, logic diagrams, improving reliability, maintainability, availability, reliability and maintainability.	08
UNIT-2	<i>Module-2</i>	Maintenance Strategies: Break down maintenance, planned maintenance, strategies, preventive maintenance, design out maintenance, planned lubrication, total productive maintenance, and zero break down. Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure.	08
UNIT-3	<i>Module-3</i>	Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure	6
UNIT-4	<i>Module-4</i>	Break down maintenance planning,	08

		assignment model, minimum cost service rate. Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning	
Total No. of Hours			30

Learning Outcomes:	Understand the maintenance function and its objectives and know how to prepare report about the maintenance function. Gain the necessary knowledge about the types of maintenance and know how to use them when design maintenance systems. NOTE FOR PAPER SETTER: The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Nauhria & Prakash, Management of systems, Wheeler publishing, ISBN-9788185814520
2.	V. Venkataraman , Maintenance engineering and management, Prentice Hall India Learning Private Limited, ISBN- 978-8120331303

Course Code:DMW-C651

Course Name: CAD (Computer Aided Design) Lab

MM: 100 Time: 3 Hr. L T P 2 1 0	Sessional: 30 ESE: 70 Credit : 3
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Experiment	Course Content	No. of Hours
Experiment-1	1. Detail and assembly drawing of the following using AUTOCAD (2D) (4 sheets) <ul style="list-style-type: none">○ Plummer Block○ Wall Bracket○ Stepped pulley, V-belt pulley○ Flanged coupling○ Machine tool Holder (Three views)○ Screw jack or knuckle joint	4
Experiment-2	Isometric Drawing by CAD using Auto CAD (one sheet) Drawings of following on computer: Cone Cylinder Isometric view of objects	4
Experiment-3	Modelling (02 sheets) 3D modelling, Transformations, scaling, rotation, translation	4
Experiment-4	Introduction to other CAD softwares; (Pro Engineer/CATIA / Inventor/Unigraphics/Solid Work: Salient features, simple drawing of components (2 D and 3D)(At least one software)	4
Total		16

Course Code:DMW-C652

Course Name: Refrigeration and Air Conditioning Lab

MM: 50 Time: 2 Hr. L T P 0 0 2	Sessional: 15 ESE: 35 Credit : 1	
Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Experiment on refrigeration test rig and calculation of various performance parameters.	2
<i>Experiment-2</i>	Experiment on air-conditioning test rig & calculation of various performance parameters.	2
<i>Experiment-3</i>	Experiment on Ice-plant test rig & calculation of various performance parameters.	2
<i>Experiment-4</i>	To study different types of expansion devices used in refrigeration system.	2
<i>Experiment-5</i>	To study different types of evaporators used in refrigeration systems.	2
<i>Experiment-6</i>	To study basic components of air-conditioning system.	2
<i>Experiment-7</i>	To study air washer system and processes.	2
<i>Experiment-8</i>	To study the window air conditioner	2
Total number of hours	16	

Course Code:DMW-C653

Course Name: Major Project Work

MM: 200	Sessional: 40
Time: 2 Hr.	ESE: 160
L T P	Credit : 2
0 0 2	

Prerequisites:	
Objectives:	
Course Coordinator	

Course outcome	Review and finalization of the Approach to the Problem relating to the assigned topic. Preparing an Action Plan for conducting the investigation, including team work. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed. Final development of product/process, testing, results, conclusions and future directions.
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Module	Course Content	No. of Hours
	PROJECT WORK Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred. Each teacher is expected to guide the project work of 5-6	

	<p>students.</p> <ul style="list-style-type: none"> - Projects related to increasing productivity - Projects related to quality assurance - Projects related to estimation and economics of production - Projects connected with repair and maintenance of plant and equipment - Projects related to identification of raw material thereby reducing the wastage - Any other related problems of interest of host industry <p>It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.</p>	
Total number of hours	30	

Learning Outcomes:	<ol style="list-style-type: none"> 1. Students will get knowledge of problem identification and use their skills for team building and project development. 2. Develop a solution for any real world problem. 3. Students will get equipped with knowledge of latest/upcoming problems and solutions. 4. Students will also be able to improve skills for project planning, implementation and communication.
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