SCHEME OF EXAMINATION
AND
COURSE OF STUDY

THREE-YEAR DIPLOMA
IN
MECHANICAL ENGINEERING
FOR
WORKING PROFESSIONALS
(w.e.f. 2023-2024)

Department of Mechanical Engineering

FACULTY OF ENGINEERING & TECHNOLOGY
GURUKULA KANGRI (DEEMED TO BE) UNIVERSITY, HARIDWAR

Admission under Lateral Entry scheme are soughted in second year (third semester) of the program

Syllabus

Diploma in ME for Working Professionals

(Semester- III)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	DMW-C301	ESC	Applied Mechanics	3	0	0	20	10	30	70	3	100
2	DMW-C302	ESC	Material Science	3	0	0	20	10	30	70	3	100
3	DMW-C303	ESC	Workshop Technology-I	3	0	0	20	10	30	70	3	100
4	DMW-C304	ESC	Thermodynamics	3	0	0	20	10	30	70	3	100
PRACTICAL / TRAINING / PROJECT												
5	DMW-C352	ESC	Material Science Lab	0	0	2	20	10	15	35	1	50
6	DMW-C353	ESC	Workshop Technology-I Lab	0	0	2	20	10	15	35	1	50
7	DMW-C354	ESC	Thermodynamics Lab	0	0	2	20	10	15	35	1	50
8	DMW-C355	ESC	Machine Drawing	0	0	2	20	10	15	35	1	50
TOTAL				12	0	8	160	80	180	420	16	600

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Course Code: DMW-C301
Course Name: Applied Mechanics

MM: 100 **Time: 3 Hr.** **L T P** **3 1 0**	**Sessional: 30** **ESE: 70** **Credit : 4**

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 allied subjects. The subject enhances the analytical ability of the students

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Introduction & Laws of Forces:** **Introduction:** Concept and Defination of Engineering Mechanics, Statics, and Dynamics. Definition of Applied Mechanics. Basic units and derived units. Different systems of units (FPS, CGS, MKS & SI) and their conversion from one to another, Concept of rigid body. **Laws of Force:** Definition of force, measurement of force in SI units, its representation, types of force: Point force & uniformly distributed force, System of Forces, Lami's theorem (concept only).	8
UNIT-2	*Module-2*	**Moment & Couple** **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 and unlike parallel force), calculating their resultant. **Concept of couple** and units of couple. General conditions of equilibrium of bodies under coplanar forces. Position of resultant force by moment.	6
UNIT-3	*Module-3*	**Friction** Definition and concept of friction, types of friction, Friction force. Laws of static friction and dynamic friction, coefficient of friction, angle of friction, angle of repose. Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane, friction in simple screw jack.	**8**

UNIT-4	*Module-4*	**Centre of Gravity:** Concept, definition of centroid of plain figures. Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion. Determination of center of gravity of solid bodies- cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed. **Moment of Inertia:** Concept of moment of inertia, radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (without derivations).	**8**
UNIT-5	*Module-5*	**Simple Machines** Definition of effort, load, 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.	**8**
Total No. of Hours			**40**

Learning Outcomes:	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 of the course students will able to understand the importance and application of various laws of mechanics **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.	Applied Mechanics By TL Singla, Harbhajan Singh Parmod Kumar Singla Published By Abhishek Publication, 57-59, Sector-17, Chandigarh.
2.	A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3.	Text Book in Applied Mechanics by MM Malhotra, R Subramanian, PS Gahlot and BS Rathore; Wiley Eastern Ltd., New Delhi.

Course Code: DMW-C302
Course Name: Material Science

MM: 100 **Time: 3 Hr.** **L T P** **3 1 0**	**Sessional: 30** **ESE: 70** **Credit : 4**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Introduction Introduction and importance of engineering materials in industry, Classification of engineering materials, Properties of engineering materials; Ductility, Toughness, Hardness, Malleability etc.. Structure of Metals: Space lattice, Unit cell, Structure of material, grain size and grain boundaries,Elastic and plastic deformation of metals. Imperfections, Defects & Dislocations in solids.	**8**
UNIT-2	*Module-2*	Ferrous Metals & Alloys Brief introduction of iron and steel making furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses. Uniary and Binary diagrams, Phase rules. Types of equilibrium diagrams, .Iron-carbon equilibrium diagram.	8
UNIT-3	*Module-3*	Magnetic Properties: Concept of magnetism - Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages. Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors. P-n junction and transistors	8
UNIT-4	*Module-4*	Plastics: Various types of polymers/plastics and its applications. Mechanical behavior and processing of plastics. Future of plastics. Ceramics: Structure types and properties and	8

		applications of ceramics. Mechanical/Electrical behavior and processing of Ceramics.	
UNIT-5	*Module-5*	Heat Treatment: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.	8
Total No. of Hours			**40**

Learning Outcomes:	1. Be able to apply core concepts in Materials Science to solve engineering problems. 2. Interpret about material fundamental and material processing. 3. Distinguish the defects in crystal and its effect on crystal properties. 4. Figure out the different mechanical properties of material by studying different destructive and non- destructive testing. 5. Articulate and utilize corrosion prevention strategies and estimate corrosion behavior of materials and components 6. Acknowledge the importance of surface modification and study the different surface modification methods. 7. Perceive the basics of Powder metallurgy and application of powder metallurgy 8. Select proper metal, alloys, non metal and powder metallurgical component for specific **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.	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 **Time: 3 Hr.** **L T P** **3 1 0**	**Sessional: 30** **ESE: 70** **Credit : 4**

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

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Welding Principle of welding, Gas Welding - Types of gas welding flames and their applications, Gas welding equipment- Gas welding torch, Oxy – acetylene cutting torch, Blowpipe, Pressure regulators, Filler rods and fluxes. Arc Welding - Arc welding machines and equipment Electrodes: Classification, 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.	**8**
UNIT-2	*Module-2*	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, positioning of cores. Moulding Sand - Properties of molding sand, their impact and control of properties viz. moisture, permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility, Various types of molding sand.	8
UNIT-3	*Module-3*	Casting 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	8

		inspection, and ultrasonic inspection..	
UNIT-4	*Module-4*	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.	8
UNIT-5	*Module-5*	Cutting Tools and Cutting Materials 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. Study of various cutting tool materials viz. High speed steel, tungsten carbide, cobalt steel, cemented carbides, ceramics and polycrystalline diamond.	8
Total No. of Hours			**40**

Learning Outcomes:	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; 6. Further develops interpersonal understanding, teamwork and communication skills working on group assignments.

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 **Time: 3 Hr.** **L T P** **3 1 0**	**Sessional: 30** **ESE: 70** **Credit : 4**

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.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Fundamental Concepts 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 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. Specific heat at constant pressure, specific heat at constant volume of gas, simple problems on gas equation	**10**
UNIT-2	*Module-2*	Thermodynamic Processes and Heat Transfer Types of thermodynamic processes – isochoric, isobaric, isothermal, isentropic, polytropic and throttling processes, equations representing the processes. Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above processes Introduction to Heat Transfer: Modes of heat transfer, Fourier's law, steady state	8

		conduction, composite structures, Natural and forced convection, thermal radiation	
UNIT-3	*Module-3*	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.	10
UNIT-4	*Module-4*	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 cylce, Rankine cycle Course throttling calorimeter, Carnot vapour	8
UNIT-5	*Module-5*	Steam Boiler: Water and fire tube boilers, construction and working of lancashire, babcock and Wilcox boilers. Various mounting and accessories of boilers.	4
Total No. of Hours			**40**

Learning Outcomes:	1. Students will be able to explain the basic principles and applications of the thermody0mics to the various real life systems. 2. Students will be able to describe fundamental laws of thermody0mics. 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 thermody0mic gas power cycles and gas refrigeration cycle and availability in each case. 5. Students will be able to examine the condition of steam and performance of vapour power cycle and vapour compression cycle. **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.	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 Code: DMW-C352
Course Name: Material's Lab

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

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	**Objective** 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.

Experiment	Course Content	No. of Hours
Experiment-1	study of Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.	**2**
Experiment-2	Material identification of say 50 common items kept in a box.	2
Experiment-3	Study of corrosion and its effects.	2
Experiment-4	compressive test on UTM.	2
Experiment-5	Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines	2
Experiment-6	Spring index testing on spring testing machine	2
Experiment-7	Torsion testing of a rod on torsion testing machine.	2
Experiment-8	To conduct the Impact test (Izod / charpy) on the Impact testing machine.	2
Total number of hours		**16**

Course Code: DMW-C353
Course Name: Workshop Technology-I Lab

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

Experiment	Course Content	No. of Hours
Experiment-1	To prepare a mould.	**2**
Experiment-2	Study of equipment used in moulding.	2
Experiment-3	To prepare a butt joint of MS strips using Arc welding.	2
Experiment-4	To prepare a T joint of MS strips using Oxy Acetylene gas welding.	2
Experiment-5	To prepare a rectangular piece with slant edge of given size from M.S.	2
Experiment-6	To prepare a job on Lathe machine of given shape and size.	2
Experiment-7	To prepare a job on Shaper machine of given shape and size	2
Experiment-8	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 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	Study of Fire Tube boiler model.	**2**
Experiment-2	Study of Water Tube boiler model.	2
Experiment-3	Study and working of Two stroke petrol Engine	2

Experiment-4	Study and working of Two stroke Diesel Engine	2
Experiment-5	Study and working of Four stroke petrol Engine	2
Experiment-6	Study and working of Four stroke Diesel Engine	2
Experiment-7	Study of Impulse & Reaction turbine	2
Experiment-8	Study of Steam Engine model.	2
Total number of hours		**16**

Course Code: DMW-C355
Course Name: Machine Drawing Lab

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

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	**Objective** 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.

Experiment	Course Content	No. of Hours
Experiment-1	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**
Experiment-2	Bearings Bushed Bearing (Assembled Drawing) Ball Bearing and Roller Bearing (Assembled Drawing)	**2**

	Plummer Block (Detailed Drawing) Plummer Block (Assembled Drawing) Foot step Bearing (Assembled Drawing)	
Experiment-3	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
Experiment-4	Lathe Tool Holder (Assembly Drawing) (01 sheets)	2
Experiment-5	Reading of mechanical components drawings (01 sheets)	**2**
Experiment-6	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:	**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. INSTRUCTIONAL STRATEGY 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.