



Veermata Jijabai Technological Institute (V.J.T.I)

(Central Technological Institute, Maharashtra State, INDIA)

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Programme: Diploma in Mechanical Engineering (DME)

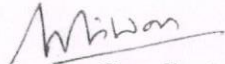
Semester: VI

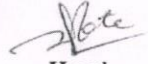
Implemented from: 2017

COURSE CODE	COURSE	GR	TEACHING SCHEME (HRS/WK)				EXAMINATION SCHEME													
			L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR*		OR*		TW		TOTAL MARKS	
								Max	Min		Max	Min	Max	Min	Max	Min				
174ME 61	Machine Design	A	4	0	2	6	3	80	32	20	100	40	-	-	25	10	25	10	150	
174ME 62	Refrigeration and Air Conditioning	A	3	0	2	5	3	80	32	20	100	40	25	10	-	-	25	10	150	
174ME 63	Metrology and Quality Control	A	3	0	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150	
174ME 64	Industrial Management	M	3	0	0	3	3	80	32	20	100	40	-	-	-	-	-	-	100	
\$	Elective – II (Any One)	A	3	0	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150	
174ME 65	Enterpreunership Development and Economic Analysis	M	1	0	2	3									25	10	25	10	50	
174ME66	PROJECT-II	A	-	-	6	6	-	-	-	-	-	-	-	-	50	20	100	40	150	
	TOTAL		17	0	16	33	-	400	-	100	500	-	25	-	150	-	225	-	900	

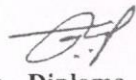
Abbreviations: B – Basic; C – Core; A – Applied; M – Management; L – Theory Lecture; T – Tutorial; P – Practical; TH – Theory Paper; IST – In-Semester Test; PR – Practical Exam; OR – Oral Exam; TW- Term Work; GR – Grade; CR - Credits

*Assessment by Internal and External Examiners


Curriculum Coordinator


Head
Diploma in Mechanical Engineering




Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: SIXTH
COURSE TITLE	: MACHINE DESIGN
COURSE CODE	: 174ME61

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
4	0	2	6	3	80	32	20	100	40	0	0	25	10	25	10	150

Course Objectives:

The Diploma Engineers in practical field come across the situations involving design & drafting of machine components & assemblies incorporating various aspect of design such as strength, rigidity, functional design, Ergonomics considerations, Economy etc. In view of this he has to select appropriate materials & heat treatment for manufacturing the machine parts. Considering this it is very important to expose the diploma engineers to fundamental concept of machine design.

Machine parts fail due to different causes and different types of loads. Many of the parts are subjected to combined loading and hence requires analysis of the stresses induced. The selection of materials for particular applications is also essential. The shape of the part and manufacturing processes are also to be considered. Hence consideration of all the points is essential before the final shape and size of the part is decided.

The student should also be conversant with the use of handbooks so that he knows where to look for a particular data required. Thus, this subject student will be given an idea of the process of designing.

Course Outcomes:

Student should be able to

CO 1	To interpret different considerations in machine design
CO 2	To analyze the status of machines and components and draw conclusions
CO 3	To draw diagrams after the completion of design procedure of machine components
CO 4	To revive the systems, methods and procedures etc to achieve the results

Course Content:

SECTION-I								
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level	
1	1.1	Fundamentals of machine design: General considerations for selection of materials and manufacturing processes.	4	8	1	50	50	0
	1.2	Stress, strain, elastic limit, yield point, ultimate strength with the help of stress strain diagram. Thermal stresses, creep.						
	1.3	Stress v/s time curve for completely reverse bending cycle, endurance limit.						
	1.4	Stress concentration, its causes and remedies.						
	1.5	Working stresses, factor of safety, general conditions in choosing a factor of safety .						
	1.6	Types of external loads and types of induced stresses.						
	1.7	Use of design data book and standardization., ergonomics.						
	1.8	Theories of failures, maximum principle stress theory and maximum shear stress theory.						
2	2.1	Forces resulting in bending stresses: Design of lever safety valve, bell crank lever, rocker arms, hand and foot operated levers, bearing caps.	4	8	3,4	0	50	50
3	3.1	Forces resulting into torsion, combined bending and torsion: Design of shafts on the basis of strength and torsional rigidity, solid and hollow shafts, design of muff couplings, rigid flange couplings, flexible couplings.	12	14	3,4	0	50	50
4	4.1	Design of power screws: Different types of thread profiles used in power screws.	1	2	2	0	50	50

	4.2	Design of power screws with the consideration of maximum principle and shear stress theory, buckling, efficiency and self locking conditions. Design of bolted type screw jacks, toggle jack, screw clamp, sluice valve, design of turn buckle.	9	12	3,4	0	50	50
5	5.1	Design of Springs: Design of closed coil springs with Wahl's stress concentration factor. Applications such as I.C. engine valves, boiler safety valves, railway buffers, weighing balance, springs in series and parallel	6	10	2,4	0	50	50
SECTION-II								
6	6.1	Forces resulting in direct tension, compression and shearing: Design of cotter joint, knuckle joint and their applications.	8	14	3,4	0	50	50
7	7.1	Forces resulting in combined direct and bending stresses: Design of clamp frame, offset links, bracket cross sections.	6	10	3,4	0	50	50
8	8.1	Design of welded joints: Joints subjected to axial loading and eccentric loading.	6	12	2,4	0	50	50
9	9.1	Design of bolted connections: Stress in screw fastening, bolt of uniform strength	6	12	2	0	50	50
	9.2	Design of bolted joints arranged symmetrically and subject to eccentric loading.			2,4	0	50	50
	9.3	Bolts for cylinder covers.			2,4	0	50	50
10	10.1	Bearings: Types of bearings, sliding and rolling contact bearings and comparison, selection of bearings from handbooks, causes of bearing failures, mounting of bearings.	2	8	2	50	25	25
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).								

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

List of Practicals/Assignments/Tutorials:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
Assignments on following topics				
1	7.1	Design of C Frame	2	1,2
2	8.1	Design of Welded Joints	2	1,2
3	9.1	Design of Bolted Joints	2	1,2
4	5.1	Design of Springs	2	1,2
5	3.1	Design of Shafts	2	1,2
Graphical work on following topics:				
6	6.1	Design of Cotter Joint	4	3,4
7	6.1	Design of Knuckle Joint	4	3,4
8	2.1	Design of Levers	4	3,4
9	3.1	Design of Rigid Coupling	3	3,4
10	3.1	Design of Flexible Coupling	3	3,4
11	4.2	Design of Screw Jack	4	3,4

Text Books:

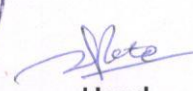
Sr. No.	Author	Title	Publisher and Edition
	R.S.Khurmi & J,K,Gupta	Machine Design	S. Chand Publications,39th edition2010

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	S.T.Ghan	Machine Design	Vrinda Publications. 3rd edition 2005


Curriculum Coordinator




Head
Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: SIXTH
COURSE TITLE	: REFRIGERATION AND AIR CONDITIONING
COURSE CODE	: 174ME62

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	25	10	-	-	25	10	150

Course Outcomes:

Student should be able to

CO1	Understand the fundamental principles of theory, operation and applications of refrigeration and air conditioning systems and its components.
CO2	Understand the cooling capacity of refrigeration systems and analyze air refrigeration systems.
CO3	Understand working of different refrigeration systems and it's maintenance and be able to analyze performance of vapour compression refrigeration systems using refrigeration tables, P-h diagrams and experimentation.
CO4	Learn and use concepts of psychrometry, psychrometric charts and apply the same in solving problems of psychrometry.
CO5	Able to understand and apply the concepts of psychrometric processes and simple cooling load calculations and component selection in air conditioning systems.

Course Content:

SECTION – I								
Unit & Sub-Unit	Topics / Sub-topics		Hrs	Marks	CO	R Level	U Level	A Level
1		Refrigeration:	2	3	CO 1,2	20	70	10
	1.1	Definition, Necessity of refrigeration, Heat Engine, Heat Pump and Refrigerator						
	1.2	Refrigeration effect, Ton of refrigeration, COP, EER & ISEER.						
	1.3	Refrigeration systems.						
2		Vapour Compression Refrigeration Systems	8	14	CO 1,3	20	30	50
	2.1	Vapour compression refrigeration						

		cycle.						
	2.2	Application of I Law of Thermodynamics to the cycle and major components Viz. compressor, condenser, expansion device and evaporator.						
	2.3	Vapour compression Cycle on P-h and T-s diagrams.						
	2.4	Reversed Carnot Cycle for vapour as refrigerant.						
	2.5	Carnot COP for Refrigerator and Heat Pump.						
	2.6	Limitations of Reversed Carnot cycle.						
	2.7	Numerical problems on Vapour compression cycle, Use of refrigeration tables and charts for solving the problems.						
	2.8	Effects of Suction and Discharge pressures, Subcooling of the liquid refrigerant, Superheating of Vapour refrigerant on the COP of system. (No numerical Problems)						
3		Refrigeration System Equipments (No numerical Problems)	7	10	CO 1,3	10	30	60
	3.1	Compressors: Classification, Construction and working of different types of compressors Viz. open, hermetic, semi hermetic, reciprocating, rotary, Screw, Scroll, Centrifugal compressors used in refrigeration systems. Applications and comparisons. Capacity control of Compressors.						
	3.2	Condensers: Classification, Construction and working of Air cooled, Water cooled, Evaporative condensers. Applications and comparisons.						
	3.3	Expansion Devices: Capillary Tube, Hand operated valve, Automatic Expansion Valve, Thermostatic expansion valve, High side and low side floats. Applications and comparisons.						
	3.4	Evaporators and Chillers: Bare tube, Plate surface, Finned, Shell						

		and tube, Flooded, Dry Expansion type Evaporators. Construction, applications and comparisons.						
	3.5	Use of strainer dryer, receiver, accumulator, oil separator in refrigeration systems.						
	3.6	Controls used in refrigeration systems like Thermostat, HP and LP cutouts, Overload Protectors etc.						
	3.7	Variable Refrigeration Flow (VRF) systems, Variable Frequency Drive (VFD), Radiant cooling, Inverter Air Conditioners						
4		Vapour Absorption Refrigeration Systems (No Numericals)	2	4	CO 1,3	20	30	50
	4.1	Principle, components and working of aqua ammonia, lithium bromide-water and Electrolux systems.						
5		Air Refrigeration Systems	4	6	CO 1,2	20	30	50
	5.1	Reversed Carnot cycle, P-V and T-s diagram						
	5.2	Application of Air Refrigeration system						
	5.3	Necessity of refrigeration in air craft air conditioning						
	5.5	Bell Coleman air refrigeration cycle, P-V and T-s diagram, COP, Simple Numerical Problems.						
	5.4	Air refrigeration systems- Simple air cooling system, simple air evaporative cooling system, bootstrap air cooling system (No Numerical Problems) Air cycle Machines and Air conditioning Packs (pressurized air conditioning kits)						
	5.5	Comparison of Vapour compression, Vapour absorption and air refrigeration systems						
6		Refrigerants	2	4	CO 1	40	20	40
	6.1	Property requirements, Comparisons, Primary and Secondary refrigerants CFC, HCFC, HFC and HC as refrigerants, Inorganic refrigerants.						
	6.2	Refrigerant Nomenclature.						
	6.3	Ozone Depletion Potential (ODP) and Global Warming Potential						

		(GWP), Eco friendly refrigerants.						
SECTION – II								
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level	
7	Air Conditioning:	4	8	CO 1,4	30	50	20	
	7.1							Psychrometry – DBT, WBT, DPT, humidity ratio, specific Humidity, relative Humidity, absolute Humidity.
	7.2							Specific enthalpy and specific volume of moist air, Psychrometric chart comfort conditions. Bypass Factor, SHF (Simple numerical).
8	Psychrometric Processes:	6	10	CO 1,4	20	50	30	
	8.1							Simple process such as sensible heating and cooling, humidification, dehumidification and combinations.
	8.2							Arrangements for heating, cooling, humidification and dehumidification etc.
	8.3							Adiabatic Mixing of two air streams.
	8.4							Simple numericals using psychrometric chart.
9	Cooling load calculations:	4	6	CO 1,5	20	40	40	
	9.1							Indoor and outdoor design conditions.
	9.2							Comfort Conditions, Factors affecting human comfort, Effective temperature
	9.3							Components of cooling Load.
	9.4							Sensible and Latent Heat gain.
	9.5							Room Sensible Heat Factor
	9.6							Calculations of cooling load, Simple applications, Simple Numericals.
10	Air conditioning Systems and Equipments: (No Numericals)	6	8	CO 1,5	10	40	50	
	10.1							Summer, winter and year round air conditioning systems.
	10.2							Central and unitary air conditioning systems.
	10.3							Industrial and commercial air conditioning systems
	10.4							Window A/C, Split A/C, Packaged A/C
	10.5							Centralized Air conditioning systems
	10.6							Dehumidifiers, humidifiers, heating and cooling coils.
	10.7							Air washers.

	10.8	Dessert Air coolers.						
	10.9	Chillers, AHU						
11		Air and water distribution systems: (No Numericals)	2	4	CO 1,5	10	40	50
	11.1	Duct systems, duct materials, duct losses						
	11.2	Fans and Blowers						
	11.3	Insulation, Acoustic and Thermal Insulation, Insulation Materials.						
	11.4	Cooling tower, cooling and chilled water piping.						
12		Applications of Refrigeration and Air conditioning Systems:	1	3	CO 5	10	40	50
	12.1	Domestic Applications.						
	12.2	Commercial Applications.						
	12.3	Industrial Applications.						
	12.4	Automobile Applications.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).								

List of Practicals / Assignments / Tutorials :
(Minimum eight practicals should be conducted out of the followings.)

Sr. No.	Practical /Assignment	CO
1	Identification of refrigeration system components and their locations in applications like window A/c, domestic refrigerators, water cooler and Ice plant.	CO 1
2	Identification of different types of refrigeration compressors and its components.	CO 1
3	Visit to cold storage/central air conditioning/package unit installation.	CO 1
4	Trial on a/c tutor to study cooling and dehumidification process.	CO 4
5	Trial on a/c tutor to study sensible heating process.	CO 4
6	Trial on a/c tutor to study process of mixing of two air streams.	CO 4
7	Trial on refrigeration tutor to study vapour compression cycle.	CO 3
8	Trial on refrigeration tutor to study effect of condensing load on performance of vapour compression cycle.	CO 3
9	Identification of various controls in refrigeration and air conditioning.	CO 1
10	Trial on water cooler to study its performance by variation of cooling load.	CO 1
11	Cooling load estimation using Excel sheet for an application.	CO 5

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	R.S. Khurmi, J.K. Gupta	A text book of Refrigeration & Air conditioning	S. Chand Publications, Fifth Edition
2	Ananthanarayanan	Basic Refrigeration & Air conditioning	Tata McGraw Hill, Fourth Edition

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	Domkundwar, Arora and Domkundwar	A course in Refrigeration & Air conditioning	Dhanpatrai & Co , Eighth Edition
2	C.P.Arora	Refrigeration and air conditioning	Tata Mc GrawHill, Third Edition
2	Roy J. Dossat	Principles of Refrigeration	Pearson Education-Fifth edition.
3	Manohar Prasad	Refrigeration & Air conditioning	New Age Publishers, Second Edition-2005.
4	Edward Pita	Air conditioning principles and systems- an energy approach	Tata McGraw Hill, Fourth Edition
5	Stoecker & Jones	Refrigeration & Air-conditioning	Tata McGraw Hill, Second Edition
	Websites	https://onlinecourses.nptel.ac.in/noc16_me12	


Curriculum Coordinator




Head

Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: SIXTH
COURSE TITLE	: METROLOGY AND QUALITY CONTROL
COURSE CODE	: 174ME63

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Outcomes:

Student should be able to

CO1	To describe various instrument and their characteristics.
CO2	To apply knowledge of instruments to used and interpret the data.
CO3	To apply knowledge for solving problems on limits, fits and tolerances.
CO4	To solve the type of control chart and acceptance sampling use depending on given data.

Course Content:

SECTION – I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
1	Introduction to Metrology	8	12	1	30	30	40
1.1	Metrology Basics Definition of metrology, objectives of metrology, Categories of metrology, Scientific metrology, Industrial metrology, Legal metrology, Need of inspection, Revision of –Precision, Accuracy, Sensitivity, Readability, Calibration, Traceability, Reproducibility, Sources of errors, Factors affecting accuracy, Selection of instrument, Precautions while using an instruments for getting higher precision and accuracy. Concept of						

	least count of measuring instruments (No questions to be set on revision).						
1.2	Standards and Comparators Definition and introduction to line standard end standard, Wavelength standard and their comparison, Slip gauge and its accessories. Definition, Requirement of good comparator, Classification, use of comparators, Working principle of comparators, Dial indicator, Sigma comparator, Pneumatic comparator- high pressure differential type, Electrical (LVDT), Relative advantages and disadvantages						
2	Limits, Fits ,Tolerances and Gauges	6	10	3	20	40	40
2.1	Concept of Limits, Fits, And Tolerances, Selective Assembly, Interchangeability, Hole And Shaft Basis System, Taylor's Principle, Design of Plug, Ring Gauges, IS919-1993 (Limits, Fits & Tolerances, Gauges IS 3477-1973), Study of relation gauges, concept of multigauging and inspection.						
3	Angular Measurement	4	8	2	20	40	40
3.1	Concept, Instruments For Angular Measurements, Working And Use of Universal Bevel Protractor, Sine Bar, Spirit Level, Principle of working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges), Angle dekkor as an angular comparator						
4	Threads and Gear Metrology	6	10	2	20	40	40
4.1	Screw thread Measurements ISO grade and fits of thread, Errors in threads, Pitch errors. Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch for internal and external threads. Three wire method, Thread gauge, screw thread micrometer, Working principle of floating carriage micrometer						
4.2	Gear Measurement & Testing Analytical and functional						

		inspection, Measurement of tooth thickness by constant chord method, base tangent method, gear tooth vernier. Errors in gears such as backlash, run out, composite, concentricity. Parkinson gear tester.						
SECTION – II								
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level	
5	Testing Techniques	6	10	2	0	50	50	
5.1	Measurement of Surface Finish Primary and secondary texture, Sampling length, Lay, terminology as per IS 3073- 1967, direction of lay, Sources of lay and its significance, CLA, Ra, RMS values and their interpretation, Symbol for designating surface finish on drawing, Various techniques of qualitative analysis							
5.2	Machine Tool Testing Parallelism, Straightness, Squareness, Coaxiality, roundness, run out, alignment testing of machine tools such as lathe, milling machine and drilling machine as per IS standard procedure. Study of optical flat for flatness testing.							
6	Quality Control	8	12	4	30	30	40	
6.1	Quality : Definitions, meaning of quality of produce & services, Quality characteristics, Quality of design, Quality of conformance, Quality of performance, Concept of reliability, Cost, Quality assurance, Cost of rework & repair, Quality & Inspection, Inspection stages							
6.2	Total Quality Management : Principles and concept of total quantity management. a) Quality Audit: Concept of audit practices, lead assessor certification. b) Six sigma: Statistical meaning, methodology of system Improvement. c) Introduction of ISO 9001-2008. ISO-14000 and TS 16949							

7	Statistical Quality Control	10	18	4	20	40	40
7.1	Statistical Quality Control Basics of Statistical concepts, Meaning and importance of SQC, Variable and attribute Measurement. control charts – inherent and assignable sources of variation, control charts for variables – X & R charts, control charts for attributes p, np, C charts, process capability of machine, Cp and Cpk calculations, determination of statistical limits, different possibilities, Rejection area, Statistically capable and incapable processes						
7.2	Acceptance Sampling Concept, Comparison with 100% inspection, Different types of sampling plans, sampling methods, merits and demerits of acceptance sampling. OC Curve						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).							

List of Practicals / Assignments / Tutorials :

Sr. No.	Unit	Practical /Assignment	CO
1	1	Measure various dimensions & dimensional parameters of component using radius gauge, screw pitch gauge, filler gauge, vernier caliper, vernier height gauge, vernier depth gauge, dial type vernier caliper, micrometer, inside micrometer, tube micrometer.	1
2	1	Use of dial indicator as mechanical comparator to inspect given components.	1
3	1	Inspect the given component using high pressure dial type pneumatic comparator.	1
4	2	Set the adjustable snap gauge Go end and No-Go end for a give dimension using slip gauges combination.	3
5	3	Measure an angle of a component using Bevel Protractor and verify it by using Sine bar.	2
6	3	Measure the angle of component with the angle dekkor / autocollimator	2
7	4	Measure the screw thread elements by using screw thread micrometer and the same using optical profile projector or tool maker's microscope.	2
8	4	Measure the gear tooth elements using gear tooth vernier caliper and verify it by using optical profile projector.	2
9	5	Measure the surface roughness of sample turning, milling, shaping, grinding and lapping surfaces by using surface roughness measuring instruments	2
10	5	Testing lathe machine / drill machine for parallellism, squareness, trueness, alignment test by using test dial indicator.	2
11	6	Draw the frequency histogram, frequency polygon for the samples and calculate mean, mode and median for same.	3

12	7	Draw the normal distribution curve and curve and calculate deviation, variance, range and determine the process capability.	3
13	7	Draw and interpret the control charts (X&R-bar, P-chart and C-chart) for given data.	4

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	M. Mahajan	Text Book of Metrology	Second Reprint-2010 Dhanpat Rai & Co
2	M. Mahajan	Statistical Quality Control	Dhanpat Rai and Sons-2010

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	R. K. Jain	Engineering Metrology	Khanna Publisher, Delhi, 2010
2	I.C. Gupta	A text book of Engineering Metrology	Dhanpat Rai and Sons
3	Douglas C. Montgomery	Statistical Quality Control	Sixth reprint 2011 Wiley India Pvt. Ltd
4	Dale H. Esterfield and others	Total Quality Management	Third Reprint 2012 Pearson

Whison
Curriculum Coordinator



Shete
Head

Diploma in Mechanical Engineering

S.P.
Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: SIXTH
COURSE TITLE	: INDUSTRIAL MANAGEMENT
COURSE CODE	: 174ME64

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	0	3	3	80	32	20	100	40	-	-	-	-	-	-	100

Course Outcomes:

Student should be able to

CO1	To understand importance of management process in Business
CO2	To understand the functioning of manufacturing organizations
CO3	To understand the need and importance of safety and financial management in industries
CO4	To understand importance of quality improvement techniques.

Course Content:

SECTION – I							
Unit & Sub-Unit	Topics / Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
1	Management Process	07	12	1	20	40	40
1.1	What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions of management • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 						
1.2	Principles of Management (14 principles of Henry Fayol)						
1.3	Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing 						

		<ul style="list-style-type: none"> Controlling Decision Making 						
2		Organisational Management	07	12	2	20	40	40
	2.1	Organization : <ul style="list-style-type: none"> Definition Steps in organization 						
	2.2	Types of organization <ul style="list-style-type: none"> Line Line & staff Functional Project 						
	2.3	Departmentation <ul style="list-style-type: none"> By product By process By function 						
	2.4	Principles of Organisation <ul style="list-style-type: none"> Authority & Responsibility Span of Control Effective Delegation Balance ,stability and flexibility Communication 						
	2.5	Forms of ownership <ul style="list-style-type: none"> Proprietorship Partnership Joint stock Co-operative Society Govt. Sector 						
3		Industrial Safety and Legislative Acts	05	08	3	20	40	40
	3.1	Safety Management <ul style="list-style-type: none"> Causes of accidents Types of Industrial Accidents Preventive measures Safety procedures 						
	3.2	Industrial Legislation - Necessity of Acts Important Definitions & Main Provisions of following acts: <ul style="list-style-type: none"> Indian Factory Act Workman Compensation Act Minimum Wages Act 						
4		First Aid Fire Fighting Equipments	05	08	3	20	40	40
	4.1	First Aid <ul style="list-style-type: none"> Fire Prevention versus Fire Protection Importance of Fire Safety 						
	4.2	Types of Fire Extinguishers (i) Water(gas cartridge) type extinguisher: (ii) Water(Stored Pressure) Extinguisher:						

		(iii) Mechanical Foam Extinguisher; (iv) Dry powder extinguishers; (v) CO ₂ extinguishers; (vi) Halon alternative type extinguishers.						
SECTION – II								
5		Financial Management	08	12	3	20	40	40
	5.1	Financial Management- Objectives & Functions						
	5.2	Capital Generation & Management <ul style="list-style-type: none"> Types of Capitals - Fixed & Working Sources of raising Capital - Features of Short term, Medium Term & Long Term Sources 						
	5.3	Budgets and accounts <ul style="list-style-type: none"> Types of Budgets Fixed & Variable Budget - Concept Production Budget - Sample format Labour Budget - Sample format Profit & Loss Account & Balance Sheet - Meaning, sample format, meaning of different terms involved. 						
	5.4	Introduction to GST						
6		Materials Management	08	14	4	20	40	40
	6.1	Inventory Concept, its classification, functions of inventory						
	6.2	ABC Analysis - Necessity & Steps						
	6.3	Economic Order Quantity Concept, graphical representation, determination of EOQ						
	6.4	Standard steps in Purchasing						
	6.5	Modern Techniques of Material Management <ul style="list-style-type: none"> Material Resource Planning (MRP) - Functions of MRP, Input to MRP, Benefits of MRP Enterprise Resource Planning (ERP) - Concept, list of modules, advantages & disadvantages of ERP 						
7		Quality Management	08	14	4	20	40	40
	7.1	Meaning of Quality <ul style="list-style-type: none"> Quality Management System - Activities, Benefits Quality Control - Objectives, Functions, Advantages 						

	<ul style="list-style-type: none"> Quality Circle - Concept, Characteristics & Objectives Quality Assurance – Concept, Quality Assurance System 						
7.2	Meaning of Total Quality and TQM Components of TQM – Concept, Elements of TQM, Benefits						
7.3	Modern Technique & Systems of Quality Management like Kaizen, 5'S, 6 Sigma						
7.4	ISO 9001:2000 - Benefits, Main clauses.						

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	Dr. O.P. Khanna	Industrial Engineering & Management	Dhanpat Rai & Sons New Delhi
2	Martand Telsang	Industrial Engineering & Management	S. Chand & Company Ltd., New Delhi
3	G.B.Menon, J.N.Vakil	Handbook on Building Fire Codes	IITK-GSDMA Project on Building Codes

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	Banga & Sharma	Industrial Engineering & Management	Khanna Publication
2	Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
3	W.H. Newman, E. Kirby Warren, Andrew R. McGill	The process of Management	Prentice- Hall
4	Lon H.Ferguson, Christopher A. Janicak	Fundamentals of Fire Protection for the Safety Professional	Government Institutes An imprint of The Scarecrow Press, Inc. Lanham, Maryland • Toronto • Oxford

Mhmm
Curriculum Coordinator



Vote
Head
Diploma in Mechanical Engineering

g.f
Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: SIXTH
COURSE TITLE	: ENTREPRENEURSHIP DEVELOPMENT AND ECONOMIC ANALYSIS
COURSE CODE	: 174ME65

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
1	-	2	3	-	-	-	-	-	-	-	-	25	10	25	10	50

Course Outcomes:

Student should be able to

CO1	Appreciate the concept of Entrepreneurship and Identify entrepreneurship opportunity.
CO2	Collect and use the information to prepare project report for business venture and develop awareness about enterprise management.
CO3	Understand the role Entrepreneurship Economic development
CO4	Understand the concept of mechanical estimation and costing

Course Content:

SECTION – I								
Unit & Sub-Unit	Topics / Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level	
1	Entrepreneurship, Creativity & Opportunities	2	-	1	30	40	30	
	1.1							Concept, Classification & Characteristics of Entrepreneur
	1.2							Creativity and Risk taking.
	1.3							Business types and Reforms
	1.4							SWOT Analysis
2	Information and Support Systems for Development of Entrepreneurship	2	-	1	20	40	40	
	2.1							2.1 Information Sources: Information related to project, procedures and formalities
	2.2							2.2 Support Systems

		1) Business Planning & Requirements for setting up an SSI 2) Govt. & Institutional Agencies (Like MSFC, DIC, MSME, MCED, MSSIDC, MIDC, LEAD BANKS) Statutory Requirements and Agencies.							
3		Market Assessment and feasibility	1	-	2	20	40	40	
	3.1	3.1 Marketing -Concept and Importance, Market Identification.							
	3.2	3.2 Customer need assessment, Market Survey, Product feasibility analysis							
4		Business Finance & Accounts	1	-	2	20	40	40	
	4.1	Business Finance: Costing basics, Sources of Finance, Break Even Analysis.							
	4.1	Business Accounts: Book Keeping, Financial Statements, Financial Ratios and its importance, Concept of Audit.							
SECTION – II									
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level		
5	Project Report Preparation	2	-	2	0	50	50		
	5.1 Business plan: Steps involved from concept to commissioning								
	5.2 Project Report 1) Meaning and Importance 2) Components of project report/profile								
	5.3 Project Feasibility Study: 1) Meaning and definition 2) Technical, Market, Financial feasibility								
6	Enterprise Management And Modern Trends	2	-	3	20	40	40		
	6.1 Enterprise Management 1) Essential roles of Entrepreneur in managing enterprise 2) Probable causes of sickness								
	6.2 E-Commerce: Concept								
	6.3 Role of Entrepreneurship in								

7		Economic Development Mechanical Estimation	1	-	4	20	40	40
	7.1	Definition, Importance and aim, objectives, functions,						
	7.2	Different types, Methods adopted for estimation, Use of Standard data, parameter estimating, statistical estimating, feedback systems,						
	7.3	Organization of Estimating department, Estimating						
	7.4	Procedure, Constituents of Estimation						
8		Costing	1	-	4	20	40	40
	8.1	Costing - Definition, aims, procedure for Costing, types of costs, Costing controls, Difference between Estimating and Costing, Control of Costs,						
	8.2	Elements of Costs, Costing methodology for raw materials, Products and Services, Nature of Costs-Direct, Traceable and Non traceable, Wastage. Determining of Cost of raw materials, manufactured products, labor, indirect expenses, methods of overhead allocation.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).								

List of Practicals / Assignments / Tutorials:

Sr. No.	Unit	Assignment	CO
1	1	Assess yourself-are you an entrepreneur?	1
2	1	An Interview with an Entrepreneur.	1
3	2	Feasibility study of a product	2
4	4	Business Finance & Accounts	2
5	5	Prepare a Project Report for starting a small scale business.	2
6	6	Role of Entrepreneurship in Economic Development	3
7	7	Mechanical Estimation	4
8	8	Costing	4

Text Books:

Sr. No.	Author	Title	Publisher
1	Trehan	Entrepreneurship	Dream Tech Press
2	Rajeev Roy	Entrepreneurship 2/e	Oxford University Press
3	B.P. Sinha	Mechanical Estimating and Costing	Tata McGraw Hill Publishing Co. Ltd. New Delhi
4	T.R. Banga and S.C.Sharma,	Mechanical Estimating and Costing	Khanna Publishers, Delhi-6

Reference books and Websites:


Sr. No.	Author	Title	Publisher and Edition
1	Schaper	Entrepreneurship and Small Business	Wiley India Publication
2	Colombo plan staff college for Technical education.	Entrepreneurship Development	Tata McGraw Hill Publishing co. Ltd. New Delhi.
3	Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises	Pearson Education
4	E. Gorden K.Natrajan	Entrepreneurship Development	Himalaya Publishing. Mumbai


Curriculum Coordinator




Head

Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: SIXTH
COURSE TITLE	: PROJECT-II
COURSE CODE	: 174ME66

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME													
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS	
					Max	Min		Max	Min	Max	Min	Max	Min				
-	-	6	6	-	-	-	-	-	-	-	-	50	20	100	40	150	

Course Objectives:

1. To apply the knowledge of basic engineering into practical application.
2. To work on the machines independently.
3. To learn to work in a team so that the students understand the work culture of an organisation.

Course Outcomes:

Student should be able to

CO1	Work on machines with responsibility
CO2	Application of theoretical knowledge into practical skills
CO3	Should be able to generate ideas & express the same

INTRODUCTION: As the students will continue their project during this semester after completing certain amount of the work in the earlier semester

There are a wide range of project types such as service learning projects, work-based projects, task-oriented projects, problem-solving projects and so forth, but authentic projects all have in common these defining features:

Student centered, student directed, a definite beginning, middle, and end, content meaningful to students; directly observable in their environment, real-world problems, firsthand investigation, sensitivity to local culture and culturally appropriate, specific goals related to curriculum and institute, district, or state standards, a tangible product that can be shared with the intended audience, connections among academic, life, and work skills opportunity for feedback and assessments from expert sources, opportunity for reflective thinking and student self-assessment, authentic assessments (portfolios, journals, etc.)

Course Content:

Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1	Performance criteria				30	30	40
	1.1 Selection of project assignment	10	5	1			
	1.2 Planning and execution of considerations	10	10	2			
	1.3 Quality of performance	10	5	1			
	1.4 Providing solution of the problems or production of final product	10	10	3			
2	Sense of responsibility	5	5	1			
	2.1 Self expression communication skills coil Interpersonal skills/human relations/viva voce	5	10	2			
	2.2 Report writing skills.	10	5	3			
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).							

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

Important Notes . This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination


The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria. 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 nearby industries are approached for instituting such awards. The teachers are free to evolve another criteria of assessment, depending upon the type of project work. It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial/field organization 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


Curriculum Coordinator




Head

Diploma in Mechanical Engineering


Dean - Diploma

Programme: Diploma in Mechanical Engineering (DME)

Implemented from: 2017

\$ List of Electives for V and VI Semester

Sr. No.	Course Code	Course Name
1	174MEE1	Alternate Energy Systems
2	174MEE2	Robotics and Automation
3	174MEE3	Tool Engineering
4	174MEE4	CAD / CAM
5	174MEE5	Material Handling Systems
6	174MEE6	Mechatronics
7	174MEE7	Power Plant Engineering
8	174MEE8	Automobile Engineering
9	174MEE9	Advanced Mathematics
10	174MEE10	Piping Engineering


Curriculum Coordinator




Head
Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: ALTERNATE ENERGY SYSTEMS
COURSE CODE	: 174MEE1

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Objectives:

1. Understand the need and importance of Alternate Energy Systems.
2. Know various Biomass Conversion processes.
3. Understand wind and hydrogen energy conversion techniques.
4. Understand the methodologies to execute preliminary energy audit.

Course Outcomes:

Student should be able to:

CO1	Understand the need and importance of alternate energy sources.
CO2	Learn working principle of different direct solar energy conversion methods.
CO3	Study functioning of various indirect solar energy conversion systems.
CO4	Utilize different methods for conversion and conservation of energy.

Course Content:

SECTION – I								
Unit & Sub Unit	Topics / Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level	
1	Introduction to Energy Sources and Need for Alternative Energy Sources	5	10	1	40	30	30	
	1.1 Major sources of energy: Renewable and Non-renewable. Primary and							

		secondary energy sources.						
	1.2	Energy Scenario: Energy Crisis, Energy Supply and Demand - understanding a gap.						
	1.3	Climate Change Challenge. Need of Alternate energy sources. Prospects of alternate energy sources.						
2		Solar Energy	10	14	2	30	30	40
	2.1	Applications of Solar energy, Principle of conversion of solar energy into heat and electricity. Solar Radiation: Solar Radiations at earth's surface. Instruments used for measuring solar radiation and duration of sunshine day: Pyranometer, Pyrheliometer and sunshine Recorder. Solar Radiation Geometry: Declination, hour angle, altitude angle, incident angle, zenith angle, solarazimuth angle.						
	2.2	Solar Thermal Technology (STT): Construction and working of typical flat plate collector and solar concentrating collectors and their applications, advantages and limitations. Space heating and cooling. Solar distillation, solar cooking and drying. Solar pumping and Green House.						
	2.3	Solar Photovoltaic Technology (SPT): Definition of solar/PV cell with its working, PV module and different types of PV modules with efficiencies. Applications of Solar Photovoltaic Technology.						
3		Bio Mass Energy and Bio Gas Energy	4	08	3	30	30	40
	3.1	Introduction to Biomass energy, Biomass energy resources, Biomass conversion processes: Thermo chemical conversion 2) Bio chemical conversion 3) Oil Extraction.						
	3.2	Construction and working of Biomass Gasification plant and Biogas plant. Differentiate Biomass and biogas energy.						
	3.3	Introduction to conversion of biomass to Bio-Ethanol and Bio-Diesel production.						
4		Overview of Ocean Energy	5	08	3	40	40	20
	4.1	Ocean Thermal Energy Conversion (OTEC): Construction and working of closed and open Rankine cycle						

		OTEC systems.						
	4.2	Tidal Energy: Introduction to tidal energy, Principle of tidal electric power generation system.						
	4.3	Wave energy: Introduction and different devices for wave energy conversion. Construction and working of Oscillating water column (OWC) system and Pelamis system.						
SECTION – II								
Unit & Sub-Unit	Topics/Sub-topics		Hrs	Marks	CO	R Level	U Level	A Level
5		Wind Energy	6	10	3	30	40	30
	5.1	Basic Principle of wind energy conversion: Power in wind, Available wind power formulation, Power coefficient and Maximum power.						
	5.2	Main considerations in selecting a site for wind energy conversion system (WECS).						
	5.3	Advantages and limitations of WECS.						
	5.4	Introduction and working of wind energy conversion system (WECS).						
	5.5	Main applications of wind energy: Power generation and pumping.						
6		Hydrogen Energy	6	08	3	20	40	40
	6.1	Properties of hydrogen. Hydrogen a Source of renewable energy.						
	6.2	Sources of hydrogen, Production of hydrogen.						
	6.3	Storage and transportation of hydrogen.						
	6.4	Introduction to carbon capture and storage (CCS)						
	6.5	Applications of hydrogen.						
7		Energy Conservation and Management	6	10	4	20	40	40
	6.1	Global and Indian energy market, Energy scenario in various sectors and Indian economy.						
	6.2	Need and importance of energy conservation and management.						
	6.3	Concept of Payback period, Return on investment (ROI), Life cycle cost, Sankey diagrams, specific energy consumption.						
8		Energy Conservation Techniques and energy audit	6	12	4	20	40	40

7.1	Distribution of energy consumption, Need for energy conservation, Methods of energy conservation: Cogeneration and Combined cycle system.						
7.2	Concept of energy management, study of different energy management techniques: Analysis of input, reuse, recycling and reclamation of waste and energy education.						
7.3	Energy audit and its benefits. Different steps involved in energy audit.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).							

List of Practicals / Assignments / Tutorials:

Sr. No.	Unit	Practicals /Assignments	CO
1	I	Collect information about global and Indian energy market from websites and prepare report.	1
2	II	To demonstrate and measure global and diffuse solar radiations on horizontal surface by using Pyranometer.	2
3	II	Visit to any Solar water heating plant and write report about collector layout, piping’s/fittings and measurement, method of manufacturing, cost and performance of the system.	2
4	II	Visit to I.C.T. Mumbai to demonstrate working of solar assisted refrigeration and air conditioning plant and write a report.	2
5	II	Visit to I.I.T.B. Mumbai to demonstrate working of solar paraboloid concentrating collector, box type solar cooker, paraboloid concentrating cooker, solar still, solar pump and prepare report of the visit.	2
6	II	Visit to V.J.T.I. Mumbai PV module assisted power plant and prepare report regarding plant layout with cabling/wiring and measurement of voltage and current by using different energy instruments, method of manufacturing, cost and performance of the system.	2
7	III	Writing a report on plant structural details and components by visits to abiogas plant or biomass gasification facility.	3
8	IV	Collect information about different tidal power plants from websites and prepare report.	3
9	V	Collect information about construction and working of windmill or to visit a nearest wind farm and write a report.	3
10	VIII	Practical study of energy audit instruments used for measurement of electric energy, temperature, flow, exhaust gas analysis etc.	4

Text Books:

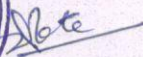
Sr. No.	Author	Title	Publication
1	S. P. Sukhatme and J.K. Nayak	Solar energy: Principles of Thermal Collection & Storage	Tata McGraw Hill, New Delhi
2	C. S. Solanki	Solar photovoltaic: Fundamentals, Technologies, and Applications	PHI Learning PVT LTD, New Delhi
3	G. D. Rai	Non conventional energy sources	Khanna Publications Delhi
4	B. H. Khan	Non-Conventional Energy Resources	McGraw Hill Companies


Reference books :

Sr. No.	Author	Title	Publication
1	M.M.El-Wakil	Power Plant Technology	McGraw Hill Companies
2	Arora and Domkundwar	A Course in Power Plant Engineering	Dhanpat Rai and Sons
3	R.K. Rajput	A Text book of Power Plant Engineering	Laxmi publications (P) Ltd


Curriculum Coordinator




Head
Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH/SIXTH
COURSE TITLE	: ROBOTICS AND AUTOMATION
COURSE CODE	: 174MEE2

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:-

The need of today's manufacturing industrial world is based on best quality & precision oriented shorter manufacturing cycle time. To satisfy this need the use of Robotics & Automation is inevitable.

For each of the sectors of Manufacturing Industry identify some of the stages where an industrial robot may be used

- a) Automotive
- b) Aerospace
- c) Space
- d) Biotechnology
- e) Chemical
- f) Electrical and Electronics
- g) Food and Drink processing

Now a day's most of the Industry associated with automated plant like computer integrated manufacturing, Flexible Manufacturing System. Hence Students are also expected to work on in a manufacturing context, in association with the downstream applications.

It is therefore necessary to acquaint the students, through lectures and practical to all the above aspects, with best of the software and hardware available.

Course Objectives:

1. To understand concepts of Robotics.
2. To understand constructional aspects for robot.
3. Application of robot in Manufacturing Industry.
4. To know the various automation process available in Industry.

Course Outcomes:

Student should be able to

CO1	Understand the history, present status and future / trends of robotics system.
CO2	Understand the functioning and working of robotics system.
CO3	Understand the functioning and working of applications of robotics system.
CO4	Understand concept of automation and its applications in industry.

Course Content:

SECTION - I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
1	Robotics: History, Present Status And Future /Trends	08	12		40	40	20
	1.1 Historical Background Laws of Robotics Robot Definitions.			1			
	1.2 Robotics Systems and Robot Anatomy Human Systems and Robotics Classifications of Robots.			1			
	1.3 Basic robot motions Technical features such as - work volume, precision and speed of movement, weight carrying capacity.			1			
2	Robot Drives And Control	06	10		40	30	30
	2.1 Functions of Drive Systems General Types of Fluids. Introduction to Pneumatic Systems.			2			
	2.2 Electrical Drives Mechanical Drive Advantages and limitation of various drives.			2			
3	Robot End-Effectors	06	10		40	30	30

	3.1	Introduction Classification of End-effectors Drive System for Grippers			2			
	3.2	Mechanical Grippers Magnetic Grippers Vacuum Grippers and Adhesive Grippers			2			
	3.3	Hooks, Scoops and Other Miscellaneous Devices			2			
4		Vision and Sensors	04	08		40	30	30
	4.1	Need for Sensing Systems Sensory Devices Types of Sensors Robot Vision Systems			2			
. SECTION - II								
Unit & Sub- Unit	Topics/Sub-topics							
5		Applications Of Robots	06	10		40	30	30
	5.1	Introduction Capabilities of Robot Robotics Applications Material Handling, Welding, Assembly, Processing Advantages and limitations of Robot			3			
6		Concept of automation in industry	08	10		40	30	30
	6.1	Mechanization and automation, Classification of automation systems. Difference between hard automation and robotic automation			4			
7		Group Technology	02	06		40	40	20
	7.1	Group Technology Define Part Family, Parts Classification and Coding, Benefits of Group Technology			4			
8		Flexible manufacturing system	08	14		40	40	20

8.1	Introduction, FMS Components, FMS Layout, FMS equipment.			4			
8.2	FMS application, Introduction to CIM (Computer Integrated Manufacturing System).			4			
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).							

PRACTICALS

SECTION - I							
Unit & Sub- Unit	Topics / Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1	Demonstration of Cartesian/ cylindrical/ spherical robot.	06	10	1			
1	Demonstration of Articulated/ SCARA robot.			1			
2	Virtual modelling for kinematic and dynamic verification any one robotic structure using suitable software.			2			
3	Design and cad drawing of two different types of grippers.			3			
4 / 5	Study of robotic system design.			3			
6 / 7	Setting robot for any one industrial application after industrial visit.			4			
8	Case study on any one Automated Industry			4			

Books:

Sr. No.	Author	Title	Publisher
1	Groover M.P. &Zimmers	CAD/CAM	Prentice hall of India
2	Groover M.P	Automation, Production systems and Computer Aided Manufacturing	Prentice hall of India
3	R K Rajput	Robotics and Industrial Automation	S Chand New Delhi

Mhwan
Curriculum Coordinator



Vote
Head

Diploma in Mechanical Engineering

[Signature]
Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: TOOL ENGINEERING (Elective)
COURSE CODE	: 174MEE3

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Outcomes:

Student should be able to

CO1	To understand & differentiate types of presses & press operation.
CO2	To understand types of dies & their working principles.
CO3	To understand the functions and design principles of Jigs and fixtures
CO4	To understand design principles for milling fixtures and Indexing

Course Content:

SECTION – I								
Unit & Sub-Unit	Topics / Sub-topics		Hrs	Marks	CO	R Level	U Level	A Level
1		Introduction to press working:	10	16	1	30	30	40
	1.1	Press working terminology, Basic operations, types of presses-mechanical, hydraulic, pneumatic and their mechanisms, elements of die sets, types of die sets, types of dies simple, compound, progressive, combination and inverted dies, types of punches.						

	1.2	Methods of reduction of shear force, types of strip layouts, types of strippers, types of pilots, types of stoppers, selection of dowel pins and allen screws.						
	1.3	Design of blanking die.						
2		Design of Drawing and Bending Dies	7	12	1	20	40	40
	2.1	Design of shallow and deep drawing die calculation of blank size by area and graphical method and standard formula, evaluate percentage reduction in each stage ,number of draws, drawing force, blank holding force, press capacity, ironing force.						
	2.2	Types of Bending dies, developed length calculation, bending force, spring back & methods used to overcome it in a press brake.						
3		Design of Forging Dies	7	12	2	20	40	40
	3.1	Design of forging die for multi-impression die-: selection of parting line, drafts, fillet & comer radii, ribs and webs, stock size calculation and flash.						
	3.2	Design of fullering, edging, blocking, finishing impressions, trimming dies, Die block dimensions, die inserts. Rules for upset forging.						
SECTION – II								
Unit & Sub-Unit	Topics/Sub-topics		Hrs	Marks	CO	R Level	U Level	A Level
4	Jigs & Fixture		10	16	3	20	40	40
	4.1	Introduction, locating & clamping – principle of location, principle of pin location, locating devices, radial or angular location, V-location , bush location.						
	4.2	Design principle for location purpose, principle for clamping purposes, clamping devices,						
	4.3	Design principles common to jigs & fixtures.						
5	Drilling Jigs		7	12	3	20	40	40
	5.1	Design principles, drill bushes, design principles for drill bushings.						
	5.2	Types of drilling jigs – Template jig,						

		plate type jig, open type jig, swinging leaf jig, Box type jig, channel type jig. Jig feet.						
6		Milling Fixtures	7	12	4	0	50	50
	6.1	Essential features of a milling fixtures , milling machine vice						
	6.2	Design principles for milling fixtures, Indexing jig & fixtures, Automatic clamping devices.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).								

List of Practicals / Assignments / Tutorials :

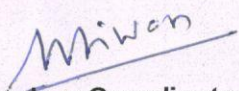
Sr. No.	Unit	Practical /Assignment	CO
1	1	Sketches of Combination Die, Progressive Die, Compound die, Inverted Die, Drawing Die, Bending Die.	1
2	1	Drawing of strip layout of simple component and calculation of material utilization factor.	1
3	2	One assignment each on development of blank length for bending operation and single stroke drawing operation.	1
4	2	Design of Drawing die	2
5	3	Design of Forging die	2
6	4	Assignment on locating & clamping, principle of location, principle of pin location, locating devices.	3
7	4	Assignment on Design principles common to jigs & fixtures.	3
8	5	Assignment on Design principles, drill bushes, design principles for drill bushings.	3
9	5	Assignment on Types of drilling jigs.	3
10	6	Assignment on milling fixture.	4

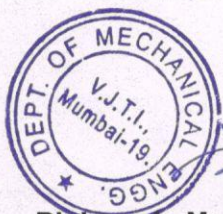
Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	P. C. Sharma	Production Engineering	S. Chand Publishers
2	Cyril Donaldson	Tool Design	McGraw Hill Education; 4th Edition

Reference books and Websites:

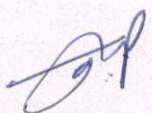
Sr. No	Author	Title	Publisher and Edition
1	Kempster	An introduction to jigs and tool design	English Universities Press
2	ASTME	Fundamentals of tool design	Englewood Cliffs, N.J., Prentice-Hall, 1962.
3	Arshinov	Metal cutting theory and cutting tool design	MIR Publishers.
4	Donald F. Earh and Edward A. Reed.	Techniques of press working sheet metal	Prentice Hall (1965)
5	P. H. Joshi	Press Tool: Design and Construction	S. Chand Publishers


Curriculum Coordinator




Head

Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: CAD / CAM (Elective)
COURSE CODE	: 174MEE4

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Outcomes:

Student should be able to

CO1	To understand basics of CAD/CAM
CO2	To understand concepts of computer graphics and geometric modelling for effective use of CAD software
CO3	To understand concepts of computer graphics and geometric modelling for effective use of CAD software
CO4	To understand basics of NC/CNC/DNC machines
CO5	To understand construction and programming aspects of CNC machines

Course Content:

SECTION – I							
Unit & Sub-Unit	Topics / Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
1	Introduction to CAD/CAM	2	04	1	30	30	40
	1.1 Use of Computers in industrial design and manufacturing						
	1.2 Product life cycle and CAD/CAM						

2		Computer Aided Design	4	10	2	30	30	40
	2.1	The design process, Computers for Design process, concurrent engineering						
	2.2	CAD Hardware - basic structure, CPU, Memory, I/O devices, Storage devices and system configuration						
3		Computer Graphics	6	10	3	20	40	40
	3.1	Scan conversion – Line, circle and 2-D transformations						
	3.2	Concepts of windowing, clipping, 3-D transformations, hidden surface Algorithms						
4		Geometric Modelling.	12	16	3	20	40	40
	4.1	Requirement of geometric modelling, Types of geometric models, Advantages and disadvantages of 3 types of modelling						
	4.2	Wireframe Modelling – Mathematical representation, non-parametric, Parametric, Analytical entities, synthetic entities- Hermite, Bezier. B-Spline curves						
	4.3	Surface Modelling – Types of surfaces, analytic and synthetic (No numerical treatment)						
	4.4	Solid modelling – Geometry and topology, Solid representation schemes- Sweep, B-Rep, CSG, Hybrid, Parametric modelling, feature based modelling						
	4.5	Graphics standards- IGES, DXF, STEP						
	4.6	Concept of finite element method						
SECTION – II								
Unit & Sub-Unit		Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
5		Introduction to computer numerical Control	8	14	4	20	40	40
	5.1	Introduction - NC, CNC, DNC, Basic components of NC, NC procedure, The						

		coordinate system in CNC						
	5.2	Motion control system - point to point, straight line, Continuous path (Contouring).						
	5.3	Advantages and disadvantages of CNC, Application of CNC						
6		Manual Part Programming	8	12	4	20	40	40
	6.1	Fundamentals, NC – Words, G codes, M codes						
	6.2	Programming format, Selection of cutting parameters like speed, feed etc., Machining centre programming, turning centre programming, fixed cycles.						
	6.3	Use of subroutines, macros and do loops						
7		Computer aided Part programming	8	14	5	30	40	30
	7.1	Introduction to APT language, geometry, tool motion, postprocessor, auxiliary statements, Macro						
	7.2	CNC Hardware						
	7.3	DNC, Adaptive control and Coordinate Measuring Machine						
	7.4	Introduction to Rapid Prototype manufacturing method						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).								

List of Practicals / Assignments / Tutorials :

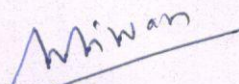
Sr. No.	Unit	Practical /Assignment	CO
1	2,3,4	Two assignments on CAD for 2D drafting.	1,2
2	3,4	Two assignments on CAD for 3D Modelling.	2,3
3	5	Manufacturing one turning and one Milling component on CNC.	3,4
4	6,7	At least four assignments on part programming using subroutines do loops for turning and milling component.	4
5	5,6,7	Report writing on visit to industry having CNC machine	5

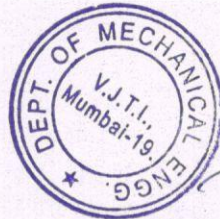
Text Books:

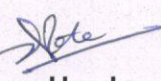
Sr. No.	Author	Title	Publisher and Edition
1	Groover M.P. & Zimmers	CAD/CAM	Prentice hall of India
2	Groover M.P	Automation, Production systems and Computer Aided Manufacturing	Prentice hall of India

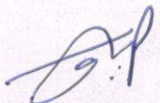
Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	P.N.Rao	CAD/CAM	Tata McGraw-Hill,
2	Sareen & Grewal	CAD/CAM	S. Chand Publications
3	Ibrahim Zeid	CAD/CAM	Tata McGraw-Hill,


Curriculum Coordinator




Head
Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: MATERIAL HANDLING SYSTEM (Elective)
COURSE CODE	: 174MEE5

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Outcomes:

Student should be able to

CO1	Understand constructional & operational features of various materials handling systems.
CO2	Identify, compare & select proper material handling equipment for specified applications.
CO3	Understand the mechanism used in material handling equipment,.

Course Content:

SECTION – I								
Unit & Sub-Unit	Topics / Sub-topics		Hrs	Marks	CO	R Level	U Level	A Level
1	Introduction to Material Handling System		04	08	1	30	30	40
	1.1	Main types of material handling equipments & their applications						
	1.2	Types of load to be handled, types of movements, methods of stacking, loading & unloading systems						
	1.3	Principles of material handling systems.						
	Hoisting Machinery & Equipments		12	18	2	20	40	40
	2.1	Construction, working &						

2		maintenance of different types of hoists such as lever operated hoist , portable hand chain hoist, differential hoists, worm geared and spur geared hoists, electric & pneumatic hoists, jumerfer.						
	2.2	Construction, working & maintenance of different types of cranes such as rotary cranes, trackless cranes, mobile cranes, bridge cranes, cable cranes, floating cranes & cranes traveling on guide rails.						
	2.3	Construction, working & maintenance of elevating equipments such as stackers, industrial lifts, freight elevators, passenger lifts, mast types elevators, vertical skip hoist elevators.						
3		Surface Transportation Equipment	08	14	2	20	40	40
	3.1	Construction, function, working of trackless equipment such as hand operated trucks, powered trucks, tractors, AGV- Automatic Guided vehicle, industrial Trailers.						
	3.2	Construction, function, working of cross handling equipment such as winches, capstans, Turntables, Transfer tables, monorail conveyors.						
SECTION – II								
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level	
4		Conveying Machinery	06	10	2	20	40	40
	4.1	Construction, working & maintenance of traction type conveyors such as belt conveyors, chain conveyors, bucket elevators, escalators.						
	4.2	Construction, working & maintenance of traction less type conveyors such as gravity type conveyors, vibrating & oscillating conveyors, screw conveyors, pneumatic & hydraulic conveyors, hoppers gates & feeders.						
5		Components of material handling systems	08	14	1	40	30	30
	5.1	Flexible hoisting appliances such as welded load chains, roller chains, hemp ropes, steel wire ropes, fastening methods of wire & chains, eye bolts ,lifting tackles lifting						

	& rigging practices.						
5.2	a) Various types of hooks-forged, triangular eye hooks, appliances for suspending hooks, b) Crane grab for unit & piece loads c) Electric lifting magnet, vacuum lifter. d) Grabbing attachment for loose materials e) Crane attachment for handling liquids / molten metals						
5.3	Arresting gear & Brakes. a) Arresting gear – construction & working b) Construction & use of electromagnetic shoe brakes c) Thruster operated shoe brakes, control brakes.						
	Mechanism used in material handling equipment	06	10	3	20	40	40
6	6.1 Steady state motion, starting & stopping of motion in following mechanisms. - Hoisting mechanism - Lifting Mechanism - Traveling Mechanism - Slewing Mechanism - Rope & chain operated Cross- Traverse Mechanism.						
	Selection of material handling equipment	04	06	2	30	30	40
7	7.1 Factors affecting choice of material handling equipment such as type of loads, hourly capacity of the unit, direction & length of travel, methods of stocking at initial, final & intermediate points, nature of production process involved, specific load conditions & economics of material handling system.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).							

List of Practicals / Assignments / Tutorials :

Sr. No.	Unit	Practical /Assignment	CO
1	1	Study & demonstration of any one type of conveyor – belt, Screw, pneumatic, hydraulic.	1
2	1	Study and demonstration of any one type of crane (working model or actual).	1
3	2	Study and demonstration of fork lift truck (using electric drive or diesel engine) Or hoisting equipment.	1
4	2	Study of preventive maintenance schedule of any one major material handling equipment using operation manual.	2
5	3	Visit to coal handling plant of thermal power plant or cement industry to observe working of different types of bulk material handling devices (at least three equipments). Write report of the visit. OR	2
6	4	Visit to steel industry or automobile manufacturing unit or sugar industry to observe different types of roller conveyors, Bucket elevators, overhead cranes load handling attachments, electric lifting magnet (at least 3 equipments). Write report of the visit	2
7	4	Collect and write detail specifications of any two major material handling devices.	3
8	5	Collect and write information about manufacturer, Cost, Capacity range, mechanism, availability, application of any one material handling equipment from the following. a) Hoisting equipment. b) Conveying equipment. c) Surface transportation equipment.	3
9	5	Write name of material handling devices and their utility after visiting any big industry nearby area.	3

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	N. Rundenko	Material handling equipment	Peace Publisher, Moscow
2	M. P. Alexandrov	Material handling equipment	MIR Publisher, Moscow

Reference books and Websites:

Sr. No	Author	Title	Publisher and Edition
1	Y. I. Oberman	Material handling	MIR Publisher, Moscow
2	R. B. Chowdary & G. R. N. Tagore	Material handling equipment	Khanna Publisher, Delhi
3	Allegri T. H.	Material handling (Principles & Practice)	. CBS Publisher, Delhi


4	Apple j. M	Plant layout & materials handling	John Wiley Publishers.
5	Immer J. R.	Material handling	McGraw Hill, New York
6	Parameswaran M. A.	Material handling equipment	C.D.C. in Mechanical Engg., I.I.T., Chennai


Curriculum Coordinator




Head

Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: MECHATRONICS
COURSE CODE	: 174MEE6

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:-

The integration of electronics engineering, electrical engineering, computer technology and control engineering with mechanical engineering is increasingly forming a crucial part in the design, manufacture and maintenance of wide range of engineering products and processes. As a consequence there is a need for diploma engineers to understand systems used in automation.

Course Objectives:

1. To understand the applicability of electronic, electrical and computer components in mechanical engineering.
2. To understand the working of microprocessor and its applications.
3. To understand the working of programmable logic controller.

Course Outcomes:

Student should be able to

CO1	Understand the functioning of various electrical system such as sensors, transducers and actuators.
CO2	Understand the working of microprocessor and its applications and introduction to ICs used for interfacing.
CO3	Understand the functioning and working of Programmable Logic Controller (PLC).
CO4	Application of Programmable Logic Controller (PLC) and Introduction to advanced PLC.

Course Content:

SECTION - I									
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level		
1		Introduction to Sensors, Transducers and Actuators		12	20		40	40	20
	1.1	Principle, working and applications of-Limit switches, proximity switches like inductive, capacitive and optical (deflecting and through beam type), Thumb wheel switches, magnetic reed switches, Optical encoders-displacement measurement, rotary, incremental, optocouplers.				1			
	1.2	Actuator – solenoids – on-off applications, latching, triggering. Types of relays- solid state.				1			
	1.3	Types of motors – DC motors, DC brushless motors, AC motors, stepper motors , servo motors				1			
2		8085 Microprocessor		12	20		40	30	30
	2.1	Architecture, Pin configuration, working of microprocessor, and applications.				2			
	2.2	Introduction to ICs used for interfacing such as – Programmable peripheral devices , USART, memory, keyboard, display – LCD,LED,I/O device, ADC, DAC.				2			
SECTION - II									
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level		
3		Programmable Logic Controller (PLC)		09	15		40	30	30
	3.1	Introduction, PLC definition, PLC block diagram.				3			
	3.2	Difference between relay panel and PLC,power supply, input/output				3			

		modules (analog, digital). Concepts of sink/source, set/reset, latch/unlatch, advantages and disadvantages.						
	3.3	Installation, troubleshooting and maintenance.			3			
4		Selection of a PLC Programming equipment, Programming formats	09	15		40	30	30
	4.1	Ladder diagrams and sequence listing, large process ladder diagram construction, flowcharting as a programming method.			3			
	4.2	Basic PLC functions Register basics, timer functions, counter functions. Intermediate functions – Arithmetic functions, number comparison and number conversion functions.			3			
	4.3	Data handling functions- SKIP, Master control relay, Jump, Move, Block move, Table to register and register to table move functions. FIFO and LIFO functions, File Arithmetic and Logic function.			3			
5		Advanced PLC functions and their applications	06	10		40	40	20
	5.1	PLC digital bit functions and applications, Sequencer functions and cascading of sequencers, PLC matrix functions.			4			
	5.2	Discrete and analog operation of PLC, Networking of PLCs.			4			
	5.3	PLC auxiliary commands and functions.			4			
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).								

PRACTICALS

Unit & Sub-Unit	Practical /Assignment	CO
1	Identification and demonstration of different sensors and actuators.	1
1/2	Demonstration of the working of various digital to analog and analog to digital converters.	2

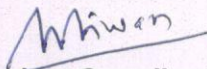
3	Development of ladder diagram, using PLC for motor start and stop by using two different sensors.	3
4/5	Trace, interpret and demonstrate working of at least two electro pneumatic systems.	4
4/5	Trace, interpret and demonstrate working of at least two electro hydraulic systems.	4

Text Books:

1. Electronic control systems in Mechanical and Electrical Engineering ,Bolton W. Mechatronics- Pearson Education Ltd. Tenth Reprint,1989.
2. Introduction to Mechatronics and Measurement systems Istand B.H. and Alciatore D.G. Tata McGraw Hill Publishing, Second Edition.

Reference Book:


1. Programmable Logic Controllers, John W. Webband Ronald Reis, Prentice Hall of India, 4th Edition 1980


Curriculum Coordinator




Head

Diploma in Mechanical Engineering


Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: POWER PLANT ENGINEERING
COURSE CODE	: 174MEE7

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Objectives:

1. Understand present and future power scenario of India.
2. Understand working of various systems and components of power plants.
3. Draw layout and compare different power plants.
4. Know the working of different types of Nuclear power plants.
5. Enlist sources of waste heat and explain method of heat recovery.

Course Outcomes:

Student should be able to

CO1	Understand power scenario & future trends in power sector and analysis of different thermal cycles.
CO2	Know the working of different conventional power plants and various systems associated with them.
CO3	Learn the working of different non-conventional power plants and various systems associated with them.
CO4	Study the waste heat recovery methods and analyse the economics and operational aspects of different power plants.

Course Content:

SECTION – I								
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level	
1	Introduction to Power Plant	06	10	1	30	40	30	
	1.1 Power scenario in India.							
	1.2 Types of power plants-Hydro, Nuclear,							

		Thermal and Future Trends in power sector.						
	1.3	Analysis of steam cycles-Carnot, Rankine, Reheat cycle, Regenerative cycle, Methods of reheating, Advantages and Disadvantages of reheat cycle.						
	1.4	Gas turbine cycles: Closed cycle and open cycle gas turbine.						
	1.5	Criteria for sites selection of power plants						
2		Thermal Power Plant	08	14	2	30	40	30
	2.1	Layout of steam power plant, general features of selection of site.						
	2.2	High pressure boilers-Construction and working of Sub-Critical and Super-critical boilers.						
	2.3	Coal and ash handling system equipment's for in plant handling of coal such as belt conveyor, screw conveyor, bucket elevator, Coal crushing, Pulverized fuel handling system, Ball mill, Pulverized fuel and their advantages, Multi retort stoker, Pulverized fuel burner, Hydraulic and Pneumatic ash handling, Electrostatic precipitator.						
	2.4	Boiler Feed water treatment.						
	2.5	Environmental aspects of steam power plant-water pollution, air pollution, emission standard and its control.						
3		Hydro-Electric Power Plant	04	08	2	30	30	40
	4.1	Classification, Advantages & Limitations of Hydro-Electric Power Plant.						
	4.2	Selection of Site for Hydro-Electric Plants.						
	4.3	Layout & Introduction of Essential Features/ Elements of Hydro-Electric Power Plant.						
	4.4	Hydrology-Runoff; Hydrograph; Flow Duration Curve; Rainfall.						
4		Nuclear Power plant	06	08	2	30	40	30
	3.1	Fusion and fission reaction.						
	3.2	Elements of nuclear power station, layout, types of nuclear reactors.						
	3.3	General criteria for selection of site.						
	3.4	Nuclear fuels, coolant & moderators.						
	3.5	Working of PWR, BWR, CANDU, BREEDER type reactors.						

SECTION – II							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
5	Gas Turbine Power Plant	04	08	2	20	40	40
	5.1 Components of gas turbine power plants, gas turbine fuels.						
	5.2 Comparison of gas turbine plant with diesel and steam power plant.						
	5.3 Environmental impact of gas turbine power plant.						
6	Non-Conventional Power Plants	08	14	2	30	30	40
	6.1 Geothermal power plant-types, economical justification.						
	6.2 Tidal power plant-factors affecting suitability of site, working of different tidal power plants, advantages and Disadvantages.						
	6.3 Wind power plant-different types, advantages and Disadvantages.						
	6.4 Solar Thermal power plants.						
	6.5 Solar Photovoltaic power plants.						
7	Waste Heat Recovery and Environmental Impact of Power Plants	06	10	3	30	40	30
	7.1 Sources of waste heat, Sensible and latent Heat recovery.						
	7.2 Uses of waste heat- Agricultural & green house; Waste Heat recovery boilers.						
	7.3 Global warming, Greenhouse effect and its control, Carbon foot print.						
	7.4 Acid rain- causes, effects and control.						
8	Economics and Operational Aspects of Power Plant	06	08	4	20	40	40
	8.1 Prediction of load, selection of types of generation, number of generating units.						
	8.2 Load duration curves, cost analysis, elements, controlling the cost of power plant.						
	8.3 Major electrical equipment's in power station generator, step-up transformer, switch gear, electrical motors.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).							

List of Practicals / Assignments / Tutorials:

Sr. No.	Unit	Practical /Assignment	CO
1	2,4	Visit to Thermal power plants/Nuclear power plants & prepare a report.	1
2	4	Collect information & Technical details of Nuclear power plants.	1
3	2	Collect information & Technical details of Thermal power plants.	1
4	6	Collect information & Technical details of Solar Thermal and Photovoltaic power plants.	2
5	6	Collect information & Technical details of Wind power plants.	2
6	5	Collect information & Technical details of Gas Turbine Power Plant.	2
7	8	Study of economic and operational aspects of power plants (simplenumerical)	4
8	2	Assignment on Coal & Ash Handling system.	2
9	7	Assignment on Waste Heat recovery systems.	3
10	3,6	Visit to solar Thermal / Photovoltaic power plants / Hydro power plant/ wind power Plants &prepare a report.	2

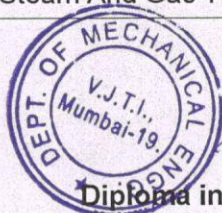
Text Books:

Sr. No.	Author	Title	Publication
1	Arora & S. Domkundwar	A course in Power Plant Engineering	Dhanpat Rai And Sons, New Delhi
2	P. K. Nag	Power plant engineering	Tata McGraw Hill, New Delhi
3	S. P. Sukhatme and J.K. Nayak	Solar energy: Principles of Thermal Collection & Storage	Tata McGraw Hill, New Delhi
4	C. S. Solanki	Solar photovoltaic: Fundamentals , Technologies, and Applications	PHI Learning PVT LTD
5	A. Chakrabarti and M.L. Soni	A text book of Power System Engineering	Dhanpat Rai and Co

Reference books:

Sr. No	Author	Title	Publication
1	Fredrick T. Mosse	Power plant engineering	East-West press
2	M. M. EL- Wakil	Power Plant Technology	Tata McGraw Hill, New Delhi
3	R. K. Rajput	Power Plant Engineering	Laxmi Publications, New Delhi
4	G. D. Rai	Non-Conventional Energy	Khanna Publications, Delhi
5	P. C. Sharma	Power Plant Engineering	S. K. Kataria & Sons
6	R. Yadav	Steam And Gas Turbines	Central Publishing House, Allahabad

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Dean - Diploma

Diploma in Mechanical Engineering

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: AUTOMOBILE ENGINEERING
COURSE CODE	: 174MEE8

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:-

The subject deals with the functioning of an automobile & its various systems in an automobile. This subject will play very important role in understanding the operation and maintenance of a vehicle and changing technological requirements of the modern world.

Automobile engineering, a technology subject, has applications of various subjects taught earlier. All the major global players in automobile sector have launched their products in India. Automotive sector has major employment potential for diploma holders. Automobile servicing in particular offers good job opportunities at village, city & town level. This course in Automobile Engineering will make student understand & apply the knowledge about various system, subsystems & their inter-relationships.

Course Objectives:

1. To understand the working of complete automobile, its engine and various mechanisms in it.
2. To imagine the layout of transmission, control systems, suspension systems and fuel systems in an automobile
3. To understand the working of battery system, charging and lighting in an automobile
4. To have knowledge of maintenance aspects of the automobile and troubleshoot an automobile

Course Outcomes:

Student should be able to

CO1	Understand the functioning of various mechanical systems in an automobile
CO2	Identify various automotive systems & subsystems
CO3	Carry out preventive maintenance & performance testing of vehicle

Course Content:

SECTION - I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
1	Introduction to Automobiles	06	10		40	40	20
1.1	Classification of automobiles Introduction to aerodynamic body shapes			1			
1.2	Vehicle layout & types			1			
1.3	Body construction- Types & Nomenclature of car body			1			
1.4	Automobile market in India of on road vehicles, major manufacturers, their products & their collaborations			1			
2	Automobile transmission	10	16		40	30	30
2.1	Clutch- necessity, construction & working of coil spring, diaphragm spring, single plate, multi plate clutches and centrifugal clutches			2			
2.2	Gear box- tractive effort and tractive resistance, types of G.B, construction & working of sliding mesh G.B, synchromesh G.B, constant mesh G.B. Variator mechanism in scooters & Overdrive, Transfer case.			2			
2.3	Final drive- necessity, construction & working of propeller shaft & differential.			2			
2.4	Axle – Type of rear axles, front axles & their applications			2			
3	Control systems	08	14		30	30	40
3.1	Steering system – Requirement of steering system, construction & working of steering linkage, steering gear box-construction & working of rack & pinion & recirculating ball type gearbox. Introduction to power steering, steering geometry, camber, caster, toe-in, toe-out, kingpin inclination & their effects			2			
3.2	Brake system , construction & working of hydraulic & pneumatic brakes. Comparison of disc & drum brake			2			

SECTION - II							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
4	Suspension systems, wheels & tyres	10	16		40	30	30
	4.1 Necessity & classification of suspension system			1			
	4.2 Working & construction of leaf spring, rigid axle suspension			2			
	4.3 Introduction to air suspension			1			
	4.4 Construction & working of Mcpherson & wishbone, trailing link suspensions			2			
	4.5 Construction & working of telescopic shock absorbers			2			
	4.6 Construction & working of spoked wheel, disc wheel & light alloy cast wheel			2			
	4.7 Types of rims, their construction & working			1			
	4.8 Construction & working & comparison of radial, cross ply & tube type, tubeless tyre, tyre specifications. Factors affecting tyre life			2			
	4.9 Wheel alignment & balancing.			2			
5	Automobile Electrical Systems & body	10	16		40	30	30
	5.1 Battery –working, construction & rating of battery.			2			
	5.2 Ignition system-construction & working of electronic & CDI ignition system.			2			
	5.3 Starting system construction & working of starter motor.			2			
	5.4 Charging system- construction & working of alternator			2			
	5.5 Wiring system-harnessing & colour codes			2			
	5.6 Lighting system-head light, tail light, indicator light & their circuits			2			
	5.7 Gauges- construction & working of fuel level gauges, oil gauge & water temperature gauge			2			
6	Fuel systems (Including tank, fuel taps, fuel supply pumps, vents, over flow arrangements, level indicators etc)	04	08		40	40	20

6.1	Fuel supply systems in petrol vehicles			1			
6.2	Fuel supply systems in diesel vehicles			1			
6.3	Air supply systems in automobiles with types of air filters(dry & wet type)			1			
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).							

PRACTICALS

Unit & Sub-Unit	Topics/Sub-topics	CO
1	Carrying out preventive maintenance of two wheeler as per manufacturers specifications	3
1.1	Carrying out preventive maintenance of four wheeler as per manufacturers specifications to aerodynamic body shapes	3
1.2	Demonstration of single plate coil spring , diaphragm spring type clutch , multiplate clutch & centrifugal clutch	3
1.3	Demonstration of sliding mesh, constant mesh & synchromesh gearbox	3
1.4	Demonstration of final drive & differential Demonstration of rack & pinion steering gearbox	3
1.5	Demonstration of McPherson strut, wish bone type independent and rigid axle vehicles suspension	3
1.6	Demonstration of hydraulic brake system with drum & disc brakes	3
1.7	Testing of battery & charging system	3
1.8	Study of LPG/CNG kit retrofitting	3
1.9	Visit to four wheeler service station & any automobile manufacturing unit	1

Text Books:

Sr. No.	Author	Title	Publication
1	Mahajan,Naphade, Matani, Ghan	Automobile Manufacturing Systems	Fifth Edition, Vrinda Publications
2	K.K.Jain & R.B Asthana	Automobile Engineering	TATA McGraw Hill Publishing Co
3	S.L.Gavhale,	Automobile Engineering	Fifth Edition 1985, Khanna Publishers

4	G.B.S Narang	Automobile Engineering	Fourth Edition 1985, Khanna Publishers
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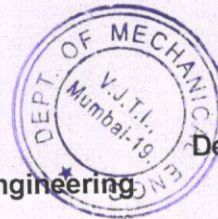
Reference books:

Sr. No	Author	Title	Publication
1	Crouse & Anglin	Automotive mechanics	Tenth Edition, McGraw Hill Book Co
2	Newton Steeds & Garret	Power plant engineering	Tenth Edition 1985 Butterworth & co(publishers) Ltd
3	Harbans singh	The Automobile	Thirteenth Edition 2009 S Chand & Co Ltd
4	Joseph Heitner	Automotive Mechanics,	Second Edition, East West Press Pvt Ltd
5	, Dr.N.K.Giri,	Problems in Automobile Mechanics	Third Edition 1986, Khanna Publishers
6	S Srinivasan	Automotive mechanics	Second edition, TATA McGraw Hill publishing Co
7	K.M Gupta,	Automotive Engineering Vol. - I & II	Fourth Edition 2006, Umesh Publications
8	H.M.Sethi	Automotive Technology	First Edition 1991, TATA McGraw Hill Publishing

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Dean - Diploma

Diploma in Mechanical Engineering

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: ADVANCED MATHEMATICS (Elective)
COURSE CODE	: 174MEE9

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Outcomes:

Student should be able to

CO1	Find solution of algebraic equations, expansion of trigonometric function using complex number
CO2	Use matrices to solve linear system of equations
CO3	Identify different types of curves and using knowledge of multiple integrals find area, volume and mass of lamina of region bounded by various curves.
CO4	Find solution of mathematical integrals using Gamma and beta functions

Course Content:

SECTION – I								
Unit & Sub-Unit	Topics / Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level	
1	Complex Numbers	15	30	1	30	30	40	
	1.1 De'moivre's Theorem							
	1.2 Roots of complex numbers by De'moivre's Theorem							
	1.3 Expansion of $\cos n\theta$ and $\sin n\theta$ in terms powers of $\sin\theta$ and $\cos\theta$							
	1.4 Expansion of $\cos^n\theta$ and $\sin^n\theta$ in terms of sines and cosines of multiple of θ .							
1.5 Hyperbolic Function: Exponential form, Circular function and								

		relation between circular and hyperbolic function, Inverse hyperbolic functions.						
	1.6	Separation of real and imaginary parts of complex numbers.						
	1.7	Logarithm of complex numbers.						
2		Matrices	10	10	2	20	40	40
	2.1	Revision of basic concepts of matrices.						
	2.2	Rank of Matrix, Normal form and Echelon form.						
	2.3	Consistency and solution of simultaneous linear homogeneous and non homogeneous equations						
SECTION – II								
Unit & Sub-Unit	Topics/Sub-topics		Hrs	Marks	CO	R Level	U Level	A Level
3		Integral Calculus	10	20	3	0	50	50
	3.1	Improper Integral, Beta and Gamma functions, properties, relation between Beta and Gamma functions. Reduction and Duplication formulae.						
	3.2	Error function with properties.						
	3.3	Evaluation of integrals using the rule of differentiation under integral sign. Differentiation of Integrals with constant limits of integration						
4		Multiple Integrals	15	20	3	0	50	50
	4.1	Curve Tracing and rectification of plane curves In Cartesian, parametric and polar Co-ordinates.						
	4.2	Double integral over the region in Cartesian, Cylindrical and Polar Co-ordinates, Change of order of integration.						
	4.3	Triple integrals in Cartesian, Cylindrical and Spherical polar co-ordinates.						
	4.4	Area, mass, volume using multiple integrals.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).								

List of Practicals / Assignments / Tutorials :

Sr. No.	Unit	Practical /Assignment	CO
1	1	Complex Numbers	1
2	1	Complex Numbers	1
3	2	Matrices	2
4	2	Matrices	2
5	3	Multiple Integrals	3
6	3	Multiple Integrals	3
7	4	Beta and Gamma functions.	4
8	4	Beta and Gamma functions.	4

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	Dr.B.S.Grewal	Higher Engineering Mathematics	Khanna Publication
2	H.K.Dass	Advanced Engineering Mathematics	S.Chand & Co
3	R.K.Jain & S.R.K. Iyengar	Advanced Engineering Mathematics	Narosa Publication


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Diploma in Mechanical Engineering

DIPLOMA PROGRAMME	: DIPLOMA IN MECHANICAL ENGINEERING
PROGRAMME CODE	: DME
SEMESTER	: FIFTH / SIXTH
COURSE TITLE	: PIPING ENGINEERING
COURSE CODE	: 174MEE10

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:--

Piping is crucial for transport of fluid from one equipment to another in any process plant. There are many aspects to piping and it can be a daunting and time consuming task to understand how everything fits together. This course provides a broad overview of piping engineering from designing to construction.

Course Objectives:

1. To understand and overview of applicability of piping in industry.
2. To understand the process involved for the construction of piping as per application.
3. To understand the equipment and plant layout of industry as per requirements.
4. To understand functions of special parts and various stresses of piping in industry.

Course Outcomes:

Student should be able to

CO1	Understand the functioning of piping engineering.
CO2	Understand the working of the processes and issues involved with designing, procurement and construction.
CO3	Understand the functioning and working of the materials and equipment used for piping engineering
CO4	An understanding of industry terms and acronyms.

Course Content:

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
1	Introduction to Piping	04	06	1	40	40	20
	1.1 Responsibilities of Piping Engineer and Designer - Scope of Piping Input and Outputs						
	1.2 Detail Engineering Company Piping Department Piping documents						
2	Classification based on material of construction	10	18	2	40	20	40
	2.1 Pipe – specifications, material and its class, pipe sizing, schedule and NB, pressure temp rating and thickness calculations, pipe hydraulics and sizing, Economic considerations						
	2.2 End Connections – Socket welded, butt welded, screwed and flanged end.						
	2.3 Types of fittings – Elbows, bends, miter bends, returns, tees, cross, reducers, couplings, reducers and flanges.						
	2.4 Based on facing – Flat face, raised face, tongue and groove, ring type joint. Reinforcement pad, Valves, Gaskets, Bolting, Branch table.						
3	Valves	04	06	2	40	30	30
	3.1 Classification by function.						
	3.2 Construction, features and properties of gate, globe, ball, plug, piston, butterfly, needle valves.						
4	Lay outing Methods	06	10	3,4	40	30	30
	4.1 Representation of piping elements in layout. Symbols used						
	4.2 Branching Methods						
	4.3 Isometric representation of piping systems. Dimensioning and checking.						

SECTION -II							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
5	Equipment and Piping layout	06	10	3	40	30	30
	5.1 Steps in plant design – Conceptual layout equipment layout, piping layout.						
	5.2 Introduction to Pipe rack, Tank farm design, Distillation column design, Construction of Isometrics						
6	Plot plan	06	10	3	40	30	30
	6.1 Civil data, electrical data, non-plant facilities, meteorological data, process data, utilities, statutory requirements. Development of plot plan.						
7	Special parts	04	08	4	40	30	30
	7.1 Function, Requirements and applications of special parts such as Stream strap, Strainer, Flame arrester, Bellows, Rupture disk, Safety shower						
8	Stress Analysis.	08	12	4	40	30	30
	8.1 Types of stresses, Significance of forces and moments. Introduction to Stress Analysis of various loads on pipe, stresses.						
	8.2 Expansion and flexibility of metallic piping.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).							

PRACTICALS

Unit & Sub-Unit	Topics/Sub-topics	CO
1	Identification and demonstration of piping requirements in industry	1
2	Demonstration of the working of various materials of piping.	2
4	Development of plant layout using piping elements in layout and Symbols used.	3

5	Design the layout of any industry plant.	3
6	Demonstration of the working of special parts in piping layout.	4
5/6/7	Visit to industry and case study	4

Text Books:

Sr. No.	Author	Title	Publication
1	G. K. Sahu	Handbook of Piping Design	New age International Publishers
2	-----	Process Piping ASME CODE for Pressure Piping, B 31	An American National Standard, 1996 Edition
3	M. Mahitpour, H. Golshan and M.A. Murray	Pipeline Design and Construction: A Practical Approach	2nd Edition, ASME Press, 2007.
4	Henry Liu	Pipeline Engineering	Lewis Publishers (CRC Press), 2003

Reference Book:

Sr. No	Author	Title	Publication
1	E. Shashi Menon	Piping Calculation Manual,	McGraw-Hill, 2004
2	George A. Antaki	Piping and Pipeline Engineering Design, Construction, Maintenance, Integrity and Repair	CRC Press, 2003
3	E. Shashi Menon	Pipeline Planning and Construction Field Manual	Gulf Professional Publishing, 2011
4	John W. Webb and Ronald Reis	Logic Controllers	Prentice Hall of India, 4th Edition 1980.

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Diploma in Mechanical Engineering

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