Integral University, Lucknow

Department of Mechanical Engineering

Study and Evaluation Scheme

Program: Diploma in Engineering

Semester VI

S. No.	Course code	Course Title	Type of Paper	Period Per hr/week/sem			Evaluation Scheme				Max. Marks	Credit	Total Credits	Attributes						
				L	T	P	CT	TA	Total	ESE				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics
THEORIES																				
1	DME -601	Dynamics of Machine	Core	3	1	0	40	20	60	40	100	3:1:0	4	Y	Y	Y				Y
2	DME -602	Refrigeration & Air Conditioning	Core	3	1	0	40	20	60	40	100	3:1:0	4	Y	Y	Y		Y		Y
3	DME-604	Industrial Engineering & Safety	Core	3	1	0	40	20	60	40	100	3:1:0	4	Y	Y	Y		Y		Y
4	DME-607	Metrology & Quality Control	Core	3	1	0	40	20	60	40	100	3:1:0	4	Y		Y				Y
5	DIM-601	Industrial Management & Entrepreneurship Development	Core	3	1	0	40	20	60	40	100	3:1:0	4	Y	Y	Y				Y
6	DEV-601	Environmental Education & Disaster Management	Core	3	1	0	40	20	60	40	100	3:1:0	4	Y	Y			Y		Y
PRACTICAL																				
7	DME-652	Refrigeration & Air Conditioning Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1	Y	Y	Y		Y		Y
8	DME-653	Metrology. Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1	Y		Y				Y
9	DME-656	Project	Core	0	0	2	--	120	120	80	200	0:0:1	1	Y	Y	Y		Y	Y	Y
10	GP-651	General Proficiency		-	-	-	--	--	60	--	60								Y	Y
Total				**18**	**06**	**06**	**340**	**280**	**660**	**400**	**1060**		**27**							

DYNAMICS OF MACHINES

(DME-601)

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UNIT-I

DYNAMICS OF MACHINES:

Static and dynamic force analysis, Graphical and analytical approaches, Engine mechanisms, Turning moment diagram, Flywheel analysis, Gyroscopic action in machines.

6

UNIT-II

GOVERNORS:

Types and classification, Principle of working of gravity controlled and spring controlled governors, Stability, Isochronisms, Sensitivity and capacity.

7

UNIT-III

UNBALANCE IN MACHINES:

Origin of unbalanced forces and moments and effects of unbalance, Unbalance in rotating bodies and balancing of discs and rotors, Balancing machines, Field balancing ofdiscs and rotors, Unbalance in reciprocating machines -engine, Compressor, Presses. 6

UNIT-IV

ENGINES AND BALANCING:

Unbalance force and moment in a single cylinder engine and balancing, Multi cylinder engine balancing in Line engine, V and Radial engines, Lanchestor balancing techniques. 6

UNIT-V

VIBRATIONS:

Vibration of single degree of freedom, Systems, Free forced, Damped and undamped vibration, Frequency response and resonance, Bare excitation - Transmissibility and Isolation, Free vibration 2 DOF system - Concept of normal mode, vibration absorber, Multi degree of freedom systems, Free vibration of bars, Shafts and beams, Energy methods and approximate methods.

Ref Books:

1. Theory of Machines by : R.S. Khurmi

2. Theory of Machines by : S.S. Ratan

REFRIGERATION AND AIR CONDITIONING

(DME-602)

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Unit 1:

Refrigeration:

Introduction to refrigeration system. Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration effect and C.O.P.

Air Refrigeration Cycle:

Open and Closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system. Classification of aircraft Refrigeration system. Simple air refrigeration system .Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated Temperature (DART).

8

Unit 2:

Vapour Compression System:

Single stage system, analysis of vapour compression cycle , use of T-S and P-H chart , Effect of change in suction and discharge pressures on C.O.P. , Effect of sub cooling of condensate and superheating of refrigerant vapour on C.O.P.of the cycle, Actual vapour compression refrigeration cycle , Multivapour compression system requirement , removal of flash gas, intercooling , Different configuration of multistage, Cascade system.

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Unit 3:

Vapour Absorption System:

Working Principle of vapour absorption refrigeration, Comparison between absorption and Compression system, Elementary idea of refrigeration absorbent mixtures, Temperature- concentration diagram and Enthalpy-concentration diagram, Adiabatic mixing of two streams, Ammonia -water vapour absorption system,

lithium –Bromide water vapour absorption system, Comparison.

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Refrigerants:

Classification, Nomenclature, Desirable properties of refrigerants, Common refrigerants,

Secondary refrigerant and CFC free refrigerants.

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Unit 4:

Air Conditioning:

Introduction to air conditioning, Psychometric properties and their definitions,

Psychometric chart, Different Psychometric processes, thermal analysis of human body

Effective temperature and comfort chart , cooling and heating load calculation ,

Selection of inside and outside design conditions, Heat transfer through Walls & Roofs,

Infiltration and ventilation, Internal heat gain , sensible heat factor(SHF),By-pass factor,

Grand Sensible heat factor (GSHF),Apparatus dew point(ADP). 9

Unit 5:

Refrigeration Equipment and Application:

Elementary knowledge of refrigeration and air conditioning equipments e.g. Compressor,

Condensers, evaporators and expansion devices, Air washers, cooling towers and humidifying efficiency,

Food preservation , cold storage, Refrigerates Freezers , Ice plant , Water coolers ,

Elementary knowledge of transmission and distribution of air through ducts and fans ,

Basic difference between comfort and industrial air conditioning. 7

Ref books:

1. Refrigeration and Air conditioning: C.P. Aurora,TMH.
2. Refrigeration and Air conditioning: Manohar Prasad, New Age.
3. Refrigeration and Air conditioning: R.S. Khurmi.
4. Refrigeration and Air conditioning: P.L.Baloney.

INDUSTRIAL ENGINEERING AND SAFETY

(DME-604)

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UNIT-I

INSPECTION AND WORK STUDY:

Inspection, Need and its planning, objective. Types of inspection. Inspection standards. Duties of inspector in inspection. Inspection needs. Method Study-Process chart, Flow process chart, Flow diagram, Man and Machine chart, Gang process Chart. Work Measurement-Time study, Tools used in time study, Performance rating, Allowance and use of time standard, Time and Motion study. Principle of human motion economy,

Micro motion study, Memo motion study, Therbligs, left hand and right hand chart. 7

UNIT-II

PRODUCTION, PLANNING AND CONTROL, MATERIAL HANDLING AND MATERIAL HANDLING EQUIPMENT:

Methods of production-Unit, Batch, mass. Sales forecasting and its use. Planning-Products, process parts, materials, Optimum Batch quantity for production and Inventory, Theory and Analysis of M/C capacity, Batch quantity, Loading and balancing-Scheduling M/C loading. Preplanning activities, Routing, Dispatching, Follow up activities

Factors in material handling problems, Cost reduction through improved material handling, Reduction in time of material handling, Material handling equipments –Lifting lowering devices, Transporting devices, Combination devices, Maintenance of material handling equipments. 7

UNIT-III

PLANT LAYOUT, STANDARD AND CODE:

General plant location factors, Influence of location on plant layout, selection of plant site, Product layout, Process layout. Advantages and disadvantage of process

Layout. National and International code, value of standardization. Standardization programme, Role of

Standardization department, standardization techniques and problems.ISO-9000 - Concept and its evolution and implications. 6

UNIT-IV

QUALITY CONTROL AND COST ESTIMATION:

Concept of quality control, Quality assurance elements of quality control, Statistical quality control, Acceptance sampling, control chart for variable and attributes, Uses of

X, R, "P" and "C" chart - O.C. curve, Concept of Total Quality Management Introduction and function of cost estimation, estimation procedure, elements of cost, depreciation - methods of calculating depreciation, overhead expenses, distribution of over head expenses, calculation of cost for machining and metal forming process and break even analyzer. 8

UNIT-V

VALUE ENGINEERING, ACCIDENTS AND SAFETY:

Concept of value engineering and technique Classification of accidents, causes of accidents, Effects of accidents, Action to be taken in case different types of

Accidents, Safety - needs, consciousness, procedures, measures. General safety devices used on machines, Safe working condition and productivity. 6

Ref Books:

1. Industrial Engineering: M.I. Khan.
2. Industrial Engineering: J.C. Varshney , Deepak Prakashan.

METROLOGY AND QUALITY CONTROL

DME-607/ DAE-607

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UNIT-1

INTRODUCTION TO METROLOGY

Metrology Basis: Definition of metrology, objectives, categories, scientific metrology, Industrial metrology, legal metrology, need of inspection, precision, accuracy, sensitivity, readability,

calibration, traceability, reproducibility, sources of errors.

Linear and Angular Measurements: Definition of standards, line & end standards, end and length bars, wave length standards. Instruments used for angular measurements:

(a) Vernier and optical Bevel Protractor. (b) Sine bars angle gauges, clinometer, Auto collimator. 8

UNIT-2

SURFACE FINISH

Meaning of surface texture, surface roughness, methods of measuring surface finish, stylus probe instruments,tomlinson surface meter, root mean square value, center line average value, symbols for designating the surface roughness on drawings.

MACHINE TOOL TESTING

Parallelism, straightness, squareness, coaxiallity, roundness, alignment testing of machine tools such as lathe machine, milling machine & drilling machine. Study of optical flat for flatness testing. 8

UNIT-3

LIMITS, FITS, TRANSDUCERS, COMPARATORS

Concept of limits, fits and tolerances, interchangeability, hole & shaft basis system, Taylor principle. Transducers: classification of transducers, active & passive,resistive,inductive,capacitive,piezo resistive, thermo-resistive.

Comparators: classification of comparators, use & working principle of comparators, dial indicator, sigma comparator, pneumatic comparator-high pressure differential type, electrical (LVDT) advantages & disadvantages. 8

UNIT-4

TEMPERATURE MEASUREMENT

Non electrical methods- Bimetallic, liquid in glass and pressure thermometer .

Electrical methods- Platinum resistance thermometer, thermistor, RTD.

Pyrometers- radiation & optical.

MEASUREMENT OF VIBRATIONS

Seismic Accelerometer, Potentiometric type, L.V.D.T. Type, Piezoelectric type accelerometer. 6

UNIT-5

QUALITY CONTROL

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 network & repair, Quality & Inspection, Inspection stages.

Total Quality Management: Principles & concept of total quality 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 & TS 16949.

Statistical Quality Control: Basics of Statistical concepts, Meaning & importance of SQC, Variable & attribute Measurement. Control charts-inherent & assignable sources of variation, control charts for variables-X & R charts, control charts for attributes, p, np, C charts, process capability of machines, Cp & Cpk calculations, determination of statistical limits, different possibilities, Rejection area, statistically capable & incapable processes. 10

References:

1. D. S. Kumar: Mechanical Measurement & Control

Publication:- Metropolitan, New Delhi.

2. R. K. Jain: Mechanical & industrial Measurements

Khanna Publication, New Delhi.

3. S. K. Singh Industrial Instrumentation & Control: - Tata

McGraw Hill.

4. R.K. Rajput Mechanical Measurement &

Instrumentation: - KATSON Publication.

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

(DIM-601)

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UNIT-I

PRINCIPLES OF MANAGEMENT:

Definition of management, Administration organization, Functions management, Planning, Organizing, Co-ordination and control, Structure and function of industrial organizations, Leadership- Need for leadership, Factors to be considered for accomplishing effective leadership, Communication -Importance, Processes, Barriers to

communication, Making communication, Effective, formal and informal communication, Motivation - Factors determining motivation, Positive and negative motivation, Methods for improving motivation, Incentives, Pay promotion and rewards, Controlling - Just in time, Total quality management, Quality circle, Zero defect concept. Concept of Stress Management.

7

UNIT-II

HUMAN RESOURCE DEVELOPMENT AND HUMAN AND INDUSTRIAL RELATIONS:

Introduction, Staff development and career development, Training strategies and methods. Human relations and performance in organization, Understand self and others for effective behavior, Industrial relation and disputes, Characteristics of group behavior and Trade unionism, Mob psychology, Labour welfare, Workers participation in management.

6

UNIT-III

PERSONEL AND FINANCIAL MANAGEMENT:

Responsibilities of human resource management - Policies and functions, Selection - Mode of selection - Procedure - training of workers, Job evaluation and Merit rating -

Objectives and importance wage and salary administration - Classification of wage, Payment schemes, Components of wage, Wage fixation. Fixed and working capital - resource of capital, Shares, types preference and equity shares, Debenture types, Public deposits, Factory costing, Direct cost, Indirect cost, Factory over head, Fixation of selling price of product, Depreciation- Causes, Methods.

8

UNIT-IV

MATERIAL MANAGEMENT, LABOUR, INDUSTRIAL AND TAX LAWS:

Objective of a good stock control system - ABC analysis of inventory, Procurement and consumption cycle, Reorder level, Lead time, Economic order quantity, Purchasing procedure, Stock keeping, Bin card. Importance and necessity of industrial legislation, Types of labour laws and dispute, Factory Act 1948, Payment of Wages Act 1947, Employee State Insurance Act 1948, Various types of taxes - Production Tax, Local Tax, Trade tax, Excise duty, Income Tax.

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UNIT-V

ENTREPRENEURSHIP DEVELOPMENT AND INTELLECTUAL PROPERTY RIGHTS :

Concept of entrepreneurship, need of entrepreneurship in context of prevailing employment conditions of the country. Successful entrepreneurship and training for entrepreneurship development. Idea of project report preparation.

Introduction to IPR (Patents, Copy Right, Trade Mark), Protection of undisclosed information, Concept and history of patents, Indian and International Patents Acts and Rules, Patentable and Non patentable invention including product versus Process.

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Ref Books:

1. O.P. Khanna : Danpat Rai &Sons.
2. D.C. Mittal :Asian Publication.

ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

(DEV-601)

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UNIT-I

INTRODUCTION:

Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.

- Lowering of water level , Urbanization.

- Biodegradation and Biodegradability, composting, bio remediation, Microbes .Use of biopesticidies and biofungicides.

- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain, etc Sources of pollution, natural and man made, their effects on living environments and related legislation.

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UNIT-II

WATER POLLUTION & NOISE POLLUTION:

Factors contributing water pollution and their effect.

- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.

- Physical, Chemical and Biological Characteristics of waste water.

- Indian Standards for quality of drinking water.

- Indian Standards for quality of treated waste water.

- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal Sources of noise pollution, its effect and control.

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UNIT-III

AIR POLLUTION AND RADIOACTIVE POLLUTION:

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, GO, CO2, NH3, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.

A. Settling chambers

B. Cyclones

C. Scrubbers (Dry and Wet)

D. Multi Clones

E. Electro Static Precipitations

F. Bog Fillers.

- Ambient air quality measurement and their standards.

- Process and domestic emission control

- Vehicular Pollution and Its control with special emphasis of

Euro-I, Euro-II, Euro-III and Euro IV. Sources and its effect on human, animal, plant and material, means to control and preventive measures.

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UNIT-IV

SOLID WASTE MANAGEMENT AND LEGISLATIONS:

Municipal solid waste, biomedical waste, Industrial and Hazardous waste, Plastic waste and its management. Preliminary knowledge of the following Acts and rules made there under-

- The Water (Prevention and Control of Pollution) Act - 1974.

- The Air (Prevention and Control of Pollution) Act - 1981.

- The Environmental Protection (Prevention and Control of

Pollution) Act -1986. Rules notified under EP Act – 1986 Viz.

The Manufacture, Storage and Import of Hazardous

Chemical (Amendment) Rules, 2000

The Hazardous Wastes (Management and Handling)

Amendment Rules, 2003.

Bio-Medical Waste (Management and Handling) (Amendment)

Rules, 2003.

The Noise Pollution (Regulation and Control)

(Amendment) Rules, 2002.

Municipal Solid Wastes (Management and Handling) Rules,

2000.

The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003. 6

UNIT-V

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND DISASTER MANAGEMENT:

Basic concepts, objective and methodology of EIA. Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

REFRIGERATION AND AIR CONDITIONING LAB

(DME-652)

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1. Experiment on the refrigeration test-rig and calculation of various performance parameters.

2. To study different types of expansion devices used in a refrigeration system.

3 To study different types of evaporators used in a refrigeration system.

4. To study basic components of an air conditioning system.

5. Experiment on air conditioning test-rig and calculation of various performance parameters.

6. To study air washers.

7. Study and determination of volumetric efficiency of a compressor.

8. Visit of a central air conditioning plant.

9. Visit of a cold storage plant.

10. Study of a window air conditioner

METROLOGY LAB

(DME-653)

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1. Measurement of angle with the help of sine bar/ vernier Bevel protractor.

2. Study and sketch of various types of optical projectors.

3. Use of comparators for measurement

4. To measure the diameter of a hole with the help of precision balls.

5. Measurement of Taper by standard balls and rollers.

6. To test the squareness of a component with autocollimeter.

7. To measure the pitch, angle and form of thread of a screw.

8. Measurement of gear elements by using gear tooth vernier.

9. To measure the straightness of the edge of a component with the help of autocollimeter.

10. Use of linear measuring instrument such as vernier caliper

and micrometer.

11. Use of height gauge and vernier calipers.