

B.N. MANDAL, UNIVERSITY, MADHEPURA

Details Of Theory & Sessional Papers Code Of 4th Year B.Tech. Course

Branch:- Mechanical Engineering

Sl. No.	Subject	Subject Code	Branch Code	L	T	P	Th. Ext.	Th. Int.	Sessional
01	Refrigeration And Air Conditioning	RAC	ME-401	2	1	0	70	30	Refrigeration And Air Conditioning - 50
02	Internal Combustion Engine And Gas Turbine	ICE	ME-402	2	1	3	70	30	Internal Combustion Engine And Gas Turbine - 50
03	Computer Aided Design And Manufacturing	CAD/CAM	ME-403	2	1	3	70	30	Computer Aided Design And Manufacturing - 50
04	Mechanical System Design	MSD	ME-404	2	1	3	70	30	Mechanical System Design - 50
05	Industrial Engineering And Management	IEM	ME-405	3	1	3	70	30	-----
06	Advance Manufacturing Process	AMP	ME-406	3	1	0	70	30	-----
07	Elective - I	Elective - I	ME-407	3	1	0	70	30	-----
08	Elective - II	Elective - II	ME-408	3	1	0	70	30	Elective - 50
09	Project	Project	ME-409	0	0	3			Project-100
10	Seminar	Seminar	ME-410	0	0	3			Seminar-50

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Expert - II

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4th YEAR MECHANICAL ENGINEERING

ME-401

Refrigeration and Air Conditioning

1st Term :-

1. **Air refrigeration system** : Refrigeration machine, heat pump, coefficient of performance, ideal refrigeration cycle, Bell – Coleman, refrigeration cycle, open and closed systems, application of air-refrigeration in air-crafts.

6 Lecture

2. **Vapour compression systems** : Simple vapour compression refrigeration cycle, merits and demerits of this system over air refrigeration system, factors affecting the performance of a vapour compression refrigeration system, sub cooling and superheating of vapour, wet and dry compression, multistage vapour compression system, intercooler, flash chamber, accumulator and heat exchanger.

8 Lecture

3. **Vapour absorption system** : Simple and modified vapour absorption refrigeration system, Electrolux refrigerator, COP of heat operated refrigeration system.

6 Lecture

4. **Special refrigeration system**, absorption, cascade, vortex, thermoelectric and steam jet refrigeration system.

4 Lecture

2nd Term :-

5. **Refrigerants** : classification and nomenclature of refrigerants, primary and secondary refrigerants, properties of some common refrigerants, physical, chemical and thermodynamic properties, selection of refrigerants, leakage of refrigerants and methods of detection.

8 Lecture

6. **Equipment** : Elementary discussion of refrigerating equipment, ice plant and cold storage.

2 Lecture

7. **Psychrometry** : Properties of air vapour mixture, wet bulb, dew point & dry bulb temperatures, humidity, specific humidity, humidity ratio, degree of saturation, relative humidity, total heat psychrometric relation, psychrometric charts and its uses, psychrometric processes evaporative cooling.

6 Lecture

8. **Air conditioning** : General principle and requirement for comfort and air conditioning, thermodynamics of human body, estimation of heating and cooling loads, capacity of cooling coils, humidification and dehumidification unit and conditioner, central air conditioner, year around air condition, humidity and temperature control, industrial application of air conditioning system.

8 Lecture

Text Book:

1. Refrigeration and air conditioning by C P Arora
2. Refrigeration and air conditioning by Manohar Prasad
3. Refrigeration and air conditioning by Jordon & Priester

Reference Book:

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ME-402

Internal Combustion Engine And Gas Turbine

1. Introduction : classification : Two strokes, four stroke (SI and CI) engines, engine parts, working principle of engines and valve timing diagram. 2 Lecture

2. Engine performance-test : purpose and types, measurement of power, & fuel consumption Engine system & evaluation of performance parameters. 4 Lecture

3. Theory of combustion, principle of combustion, S.I. & C. I. Engine combustion process & parameters their dependence on engine variables and operating parameters. 6 Lecture

4. Adiabatic flame temperature, combustion processes & combustion chamber for SI and CI engines pollution formation and control, effect of engine variables on combustion processes, knocking in SI & CI engines. 6 Lecture

5. Petroleum based fuel, gasoline & diesel fuel and their properties. Chemically correct air-fuel ratio and load variation. 3 Lecture

6. Carburetors & modern air fuel systems, compensating devices, ventury and jet dimension calculation, Injection system. 3 Lecture

2nd Term :-

7. Super charging, engine lubrication and cooling. 4 Lecture

8. Gas turbine : Principle. Simple, open gas turbine cycle, effect of operating variables on thermal efficiency. 6 Lecture

9. Regenerative reheat cycles, gas turbine applications, closed cycle gas turbine. 6 Lecture

10. Jet propulsion : working principle, thrust power, propulsive force and efficiency. 6 Lecture

11. Rocket engine : Theory of operation and its applications, propellant. 2 Lecture

Text Book:

- 1. Internal Combustion Engines by V Ganesan (Tata McGraw-Hill)
- 2. Internal Combustion Engines by Arcoumaris (Academic Press)
- 3. Internal Combustion Engines - Fundamentals by Heywood

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ME-403

Computer Aided Design And Manufacturing

1st Term :-

1. Introduction concept of CAD/CAM

6 Lectures

2. Computer system, Hardware in computer – Aided Design system, Product cycle Automation, part programming.

9 Lectures

3. Computer aided design system software, Transformation, geometric modeling, Drafting applications.

9 Lectures

2nd Term :-

4. CAD/CAM technology to finite element data preparation, concept of data structures.

8 Lectures

5. NC, CNC, DNC programming.

12 Lectures

6. Introduction to AGV.

4 Lectures

Text Books :

1. Computer Aided Design and Manufacture By C.B. Besant & C.W. K LW

2. Principle of Computer aided Design By Joe Rooney & Philip Steamman

3. Computer Aided Design and Manufacture CAD/CAM - Groover & Jinner

Practical: 5 to 8 journals (including experiments & assignment) based on theory

ME-404

MECHANICAL SYSTEM DESIGN

Design and IC Engine parts

1st Term :-

1. Cylinder, trunk piston, connecting rod, crank shaft, value gear.

16 Lectures

2. Design of centrifugal pump.

4 Lectures

3. Design of fly wheel.

6 Lectures

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2nd Term :-

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| 4. Design of hydraulic press. | 4 Lectures |
| 5. Bearing types, selection, design of journal, ball and roller bearing. | 6 Lectures |
| 6. Design of gears (spur and helical) & gear boxes. | 8 Lectures |
| 7. Chain drive and brackets. | 6 Lectures |

Text Book:

1. IC Engine by Maleev
2. Machine design by Maleev & Hartman.
3. Design of M/C elements by V B Bhandari
4. Design of M/C elements by Sharma & Purohit
5. Design data book by PSG institute of Technology
6. Design data book by Kale
7. Machine design data book by Jordon, Suresh Verma

Reference Book:

1. Mechanical Engg. Design by Shigely
2. Machine Design by Black & Adams

- Practical: 5 to 8 journals (including experiments & assignment) based on theory

FIRST TERM:

1. Material management Inventory managements: Inventory function Models (deterministic) inventory analysis and control

2 Lectures

2. Work Study: (a) Motion study - Flow process charts, motion economy, therbligs (b) Time study, Work measurement techniques, equipments, performance rating, standard time, (c) Work sampling: Principles, procedure and application, Ergonomics, fatigue.

6 Lectures

3. Production planning and control: (a) Production batch size, Buffer stock, production range, minimum cost Batch size, (b) Machine loading, machine interference, Man Machine charts, (c) Production control, Progressing Feed Back, control charts.

6 Lectures

4. Quality Management : (a) Statistical methods : Probability and probability, distribution functions confidence limits, estimation, analysis of variance.

(b) Statistical quality control; Sampling inspection, Acceptance sampling plans, control charts for variables.

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(c) Operating characteristic (O.C.) Curve; Average outgoing Quality (A. O. Q.) Curve and limits (AOQL), producers Risk, consumer Risk (LTPD), acceptable quality level (AQL).

(d) Quality circles: Quality organisation, quality education, problem solving techniques, brain storming, (e) Quality standards, Bureau of Indian Standards, ISI, ISO, 900.

10 Lectures

SECOND TERM:

1. Elementary Operation research: (a) Transportation problems (b) Assignment problems (c) Linear programming problems, simplex methods, Quality, (d) Queuing theory (Signal channel)

6 Lectures

2. Project Management: (a) Net-work technique PERT and CPM, Crashing the Network, application, c ant't chart, (b) Small scale industry ; Feasibility study, Financing the project, Govt, incentives, industrial policy, preparation of project report.

7 Lectures

3. Industrial Safety : (a) Industrial accidents, Causes and costs (b) Process risks, Mechanical, Chemical and Electrical (c) Accident prevention; Safety education, preventive measures, protective equipments, machine safe guarding, (d) First aid.

5 Lectures

4. Pollution control : (a) Industrial Hygiene : Fatigue causes, fatigue reduction, (b) Clean environment, (c) Land pollution, scrap and waste control, (d) Water pollution, water treatment and sewage disposal, (e) Air pollution : Control of fumes, smoke; toxic material, noise, temperature.

6 Lectures

BOOK RECOMMENDED:

1. Hand book of industrial engineering and management by W. Grant Ireason and E.L. Grant (Prentice Hall of India, New Delhi).

2. Elements of Production planning and control by Samuel Eilon.

3. Industrial Engineering and management By O.P. Khanna (Dhanpat Rai and Sons.)

4. Industrial Organisation and Engg. Economics By Banga and Sharma (Khanna Publishers, New Delhi)

5. Industrial Engineering - By P.K. Khurana .

6. Quality control and Application by Hansen and Ghare (Prentice Hall India, New Delhi)

7. Purchasing and Materials Management by Lee and Doublers (Tate Mc Graw Hill Publishing Co. Ltd. New Delhi)

8. Statistical Quality control - By E.L. Grant (Wiley Eastern)

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1st Term:-

1 > Machine Tools :-

- Lathe : Principl, Types, Operations, Turret/Capstan, semi/automatic, Tool Layout.
- Shaper, Slotted, Planer, Operation, Drive.
- Milling, Milling Cutter, Up & Down milling, dividing head indexing, max chip thickness, power required.
- Drilling and boring , drilling, boring, reaming tools, geometry of twist drill.
- Grinding, Grinding wheel Abrasive, cutting action, grinding wheel specification, Grinding wheel wear, alterations, wear, fracture wear, dressing and truing. Max chip thickness and guest criteria. Flat and cylindrical grinding. Centreless grinding.
- Super finishing, Honing, Lapping, polishing. **14 lectures**

2 > **Metal Cutting** : Mechanics of metal cutting, Geometry of tool and nomenclature. Tool materials, Orthogonal vs oblique cutting, Mechanics of chip formations, types of chips, tools angles, Merchant's force circle diagram. Cutting forces, power required. Cutting fluids/lubricants. Tools wear and tool life. **10 lectures**

2nd term:-

3 > **Newer Machining Technique** : Benefits, application and survey of non-conventional machining process, Mechanics of metal removed, tooling and equipments, process parameters, working & application of Abrasive jet machining, Ultrasonic machining, Electro discharge machining, Electro chemical & Grinding, Chemical milling, Plasma arc machining etc.

8 lectures

4 > **Metrology** : Tolerance and limit systems, limit gauges, Measurement of surface roughness, Inspection of gears and screw threads, Individual and commutative error measurement.

5 > **Computer Controlled Manufacturing Process**: NC, CNC, DNC, Part Programming, Introduction to CAM and Robotics. **4 lectures**

6 lectures

6 > **Jigs and Fixtures** : Locating elements, Clamping devices, Principles of jigs and fixtures design.

6 lectures**TEXT BOOKS:**

- Manufacturing process and materials for Engineers- by Doyle, Keyser, Leach Schrader and Singer (Prentice Hall)
- Production Technology - by Gupta & Jain (Khanna Publishers)
- Elements of Workshop Technology Vol.II- by Hazare, Choudhary and Bose

REFERENCE BOOKS:

- Principle of Machine Tools (Vol I and II) by Sen & Bhattacharya (New Central Book Agency)

ME-407

Operation Research (Elective -I)

1st Term :-

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| 1. Scope and application of operation research. | 4 Lectures |
| 2. Linear programming, graphical and simplex method. | 6 Lectures |
| 3. Transportation and assignment models. | 5 Lectures |
| 4. Simulation and Monte-Carlo techniques. | 5 Lectures |
| 5. Queuing theory (single and double channel). | 4 Lectures |

2nd Term :-

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| 6. CPM and PERT and CPM-crashing networks. | 10 Lectures |
| 7. Dynamic programming. Sequencing model (n jobs-2 machines), Replacement problems and Reliability theory, Inventory models with probabilistic demands and area, quantity constraints, Game theory (competitive strategies). | 10 Lectures |
| 8. Non-Linear Programming (Kuhn and Tucker condition). | 4 Lectures |

Text Book :

1. Operation Resarch: A.P. Verma
2. Operation Resarch: Natrajan
3. Operation Resarch: Sharma
4. Operation Resarch: Prem Kumar Gupta
5. Operation Resarch: D.S. Hira
6. Operation Resarch: S. Kalavathy

ME-408

Control System & Measurement (Elective-II)

1st Term :-

1. Introduction concept of automatic controls open loop and closed loop system- servomechanism block diagram transfer functions.


8 Lectures

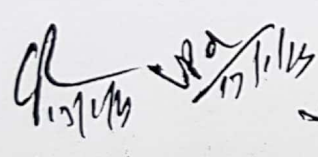
2. Representations of control component and systems translational and rotational mechanical components electrical components. Series and parallel combinations comparator for rotational and linear motions integrating devices hydraulic servomotor temperature control, system response speed control system.

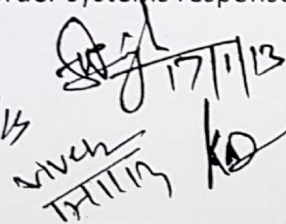
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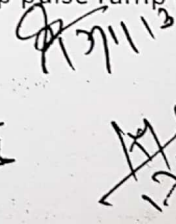
3. System response first and second order systems response to step pulse ramp and sinusoidal input system with distance velocity lag.

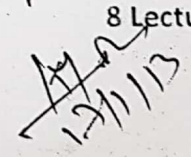
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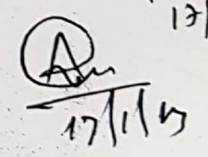
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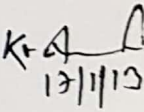
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2nd Term :-

4. Pressure use of monometers Bourdon gauge, bellows type gauge, measurements of vacuum and pressure transducer, static and dynamic, response of pressure measuring instruments.

6 Lectures

5. Flow use of obstruction type meters, Variable and meters, Probes. Positive displacements type meters, Hot wire anemometry.

4 Lectures

6. Temperature use of thermocouples, resistance thermometer, pyrometer, thermostats static and dynamics response of temperature measuring instrumentation. Thermocouple errors and compensation. Heat flux measurements and meters.

6 Lectures

7. Strain, use of strain gauge, static and dynamic response, displacement, velocity, acceleration, Jerk linear and angular, piezoelectric pick ups. inductive type pick up. Force, torque, time, frequency and phase angle, use of CRO. Electronic counters, Density and viscosity of gauges and liquids, Calorific value of solid, liquid and gaseous fuels, noise, humidity flow visualization, demonstration of shadow and schlieren technique, introduction to metrology.

8 Lectures

Text Book :

1. Automatic Control System: Hasan Saeed
2. Linear Control System: B.S. Manke
3. Control system Engineering: I.J. Nagrath
4. Control System & Measurement: R.K. Rajput
5. Mechanical Measurement and Control: Dr. D.S. Kumar
6. Mechanical Measurement and Instrumentation & Control: A.K. Sawhney

Practical: 5 to 8 journals (including experiments & assignment) based on theory

ME-409

Project

ME-410

Seminar

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