Indira Gandhi University, Meerpur, Rewari

SCHEME OF STUDIES AND EXAMINATION

B.TECH (MECHANICAL ENGINEERING)

SEMESTER 7th & 8th

Scheme effective from 2020-21
# Indira Gandhi University, Meerpur, Rewari

## SCHEME OF STUDIES & EXAMINATIONS

**B.Tech. 4th YEAR MECHANICAL ENGINEERING, SEMESTER- VII**

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Title</th>
<th>Teaching schedule</th>
<th>Marks For class work</th>
<th>Marks for Examination</th>
<th>Total Marks</th>
<th>Duration of Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>Total</td>
<td>Theory</td>
</tr>
<tr>
<td>ME-401</td>
<td>Strength of Material-II</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>ME-403</td>
<td>Refrigeration &amp; Air-Conditioning</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>ME-405</td>
<td>Operation Research</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>ME-407</td>
<td>Power Plant Engineering</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>ME-409</td>
<td>Mechanical Vibration</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>----------</td>
<td></td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>ME-411</td>
<td>Refrigeration &amp; Air-Conditioning Lab</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>ME-413</td>
<td>Advanced CAD/CAM Lab</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>ME-415</td>
<td>Practical Training-II</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>GFME-435</td>
<td>General Fitness for the Profession</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>18</td>
<td>6</td>
<td>6</td>
<td>30</td>
<td>400</td>
</tr>
</tbody>
</table>

## LIST OF ELECTIVES

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>SUBJECT CODE</th>
<th>DEPTT. ELECTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ME-417</td>
<td>QUALITY ENGINEERING</td>
</tr>
<tr>
<td>2.</td>
<td>ME-419</td>
<td>FINITE ELEMENT METHODS</td>
</tr>
<tr>
<td>3.</td>
<td>ME-421</td>
<td>ENERGY MANAGEMENT PRINCIPLES</td>
</tr>
<tr>
<td>4.</td>
<td>ME-425</td>
<td>COMPUTER INTEGRATED MANUFACTURING</td>
</tr>
<tr>
<td>5.</td>
<td>ME-429</td>
<td>RELIABILITY ENGINEERING</td>
</tr>
<tr>
<td>6.</td>
<td>ME-431</td>
<td>SOLAR ENERGY ENGINEERING</td>
</tr>
</tbody>
</table>
Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

**SECTION A**
Strain Energy & Impact Loading: Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beams in bending, beam deflections, strain energy of shafts in twisting, energy methods in determining spring deflection, Castigliano’s & Maxwell’s theorems, Numericals.
Theories of Elastic Failure: Various theories of elastic failures with derivations and graphical representations, applications to problems of 2- dimensional stress system with (i) Combined direct loading and bending, and (ii) combined torsional and direct loading, Numericals.

**SECTION B**
Unsymmetrical Bending: Properties of beam cross section, product of inertia, ellipse of inertia, slope of the neutral axis, stresses & deflections, shear center and the flexural axis Numericals.
Thin Walled Vessels : Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels & their derivations under internal pressure, wire wound cylinders, Numericals.

**SECTION C**
Thick Cylinders & Spheres : Derivation of Lame’s equations, radial & hoop stresses and strains in thick, and compound cylinders and spherical shells subjected to internal fluid pressure only, wire wound cylinders, hub shrunk on solid shaft, Numericals.
Rotating Rims & Discs: Stresses in uniform rotating rings & discs, rotating discs of uniform strength, stresses in ( I) rotating rims, neglecting the effect of spokes, (ii) rotating cylinders, hollow cylinders & solids cylinders. Numericals.

**SECTION D**
Bending of Curved Bars : Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature, stresses in crane hooks, rings of circular & trapezoidal sections, deflection of curved bars & rings, deflection of rings by Castigliano’s theorem stresses in simple chain link, deflection of simple chain links, Problems.
Springs: Stresses in open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs, concentric springs, Numericals.

**Text Books:**

**Reference Books :**
Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION A
Introduction: Definition of refrigeration & air conditioning; Necessity; Methods of refrigeration; Unit of refrigeration; Coefficient of performance (COP), Fundamentals of air-conditioning system; Refrigerants-Definition, Classification, Nomenclature, Desirable properties, Comparative study, secondary refrigerants, Introduction to eco-friendly Refrigerants; Introduction to Cryogenics.

Air Refrigeration System: Carnot refrigeration cycle. Temperature. Limitations; Brayton refrigeration or the Bell Coleman air refrigeration cycle; Necessity of cooling the aero plane; Air craft refrigeration systems, Simple cooling and Simple evaporative types, Boot strap and Boot strap evaporative types, Regenerative type and Reduced Ambient type system, Comparison of different systems, problems.

SECTION B
Vapour Compression (VC) Refrigeration Systems: (A) Simple Vapour Compression (VC) Refrigeration systems-Limitations of Reversed Carnot cycle with vapour as the refrigerant; Analysis of VC cycle considering degrees of sub cooling and superheating; VC cycle on p-v, t-s and p-h diagrams; Effects of operating conditions on COP; Comparison of VC cycle with Air Refrigeration cycle.
Multistage Ref. Systems- Necessity of compound compression, Compound VC cycle , Inter-cooling with liquid sub –cooling and / or water inter cooler: Multistage compression with flash inter-cooling and / or water inter-cooling; systems with individual or multiple expansion valves; Individual compression system with individual or multiple expansion valves; Individual compression systems with individual or multiple expansion valves but with and without intercoolers.

SECTION C
Air- Conditioning Load Calculations: Outside and inside design conditions; Sources of heating load; Sources of cooling load; Heat transfer through structure, Solar radiation, Electrical applications, Infiltration and ventilation, Heat generation inside conditioned space; Apparatus selection; Comfort chart, Problems.

SECTION D
Air Conditioning Systems with Controls & Accessories: Classifications, Layout of plants; Equipment selection; Air distribution system; Duct systems Design; Filters; Refrigerant piping; Design of summer air-conditioning and Winter air conditioning systems; Temperature sensors, Pressure sensors, Humidity sensors, Actuators, Safety controls; Accessories; Problems.
Refrigeration and Air Conditioning Equipments: Type of compressors and their performance curves; Types of Condensers, Heat transfer in condensers; Types of expansion devices; types of evaporators, Cooling and Dehumidifying coils, Problems.

Text Books :

Reference Books:
ME-405 OPERATIONS RESEARCH

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Sessional : 50 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>-</td>
<td>Theory : 100 Marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total : 150 Marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Duration of Exam : 3 Hrs.</td>
</tr>
</tbody>
</table>

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION A

Introduction: Definition, role of operations research in decision-making, applications in industry. Concept on O.R. model building –Types & methods.


SECTION B

Deterministic Model: Transportation model-balanced & unbalanced, north west rule, Vogel’s Method, least cost or matrix minimal, Stepperg stone method, MODI methods, degeneracy, assignment, traveling salesman, problems.


SECTION C

Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.

Project Line Models: Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimal project cost by crashing of network, resources leveling in project, problems.

SECTION D

Simulation: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, problems.

Decision Theory: Decision process, SIMON model types of decision making environment- certainty, risk, uncertainty, decision making with utilities, problems.

Text Books:

Reference Books:
2. Quantitative Techniques- Vohra, TMH, New Delhi
5. Operation Research – Philips, Revindran, Solgeberg, Wiley ISE.
Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION-A
Introduction: Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles used in power plants.
Hydro Electric Power Plants: Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, power plants design, construction and operation of different components of hydro-electric power plants, site selection, comparison with other types of power plants.

SECTION-B
Steam Power Plants: Flow sheet and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator.
Combined Cycles: Constant pressure gas turbine power plants, Arrangements of combined plants (steam & gas turbine power plants), re-powering systems with gas production from coal, using PFBC systems, with organic fluids, parameters affecting thermodynamic efficiency of combined cycles. Problems.

SECTION-C
Nuclear Power Plants: Principles of nuclear energy, basic nuclear reactions, nuclear reactors-PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal.
Power Plant Economics: load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-output curves, efficiency, heat rate, economic load sharing. Problems.

SECTION-D
Non-Conventional Power Generation: Solar radiation estimation, solar energy collectors, low, medium & high temperature power plants, OTEC, wind power plants, tidal power plants, geothermal power plants.

Text Books:

Reference Books:
ME-409 MECHANICAL VIBRATIONS

L T P Sessional : 50 Marks
3 1 - Theory : 100 Marks
Total : 150 Marks
Duration of Exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION A
Free and Damped Vibrations: Single Degree of Freedom system, D’Alemberts Principal, Energy Methods, Rayleighs Method, Application of these Methods, Damped Free Vibrations, Logarithmic Decrement, Under Damping, Critical and Over Damping, Coulomb Damping.

SECTION B

SECTION C
Multi degrees of Freedom Systems and Numerical Methods Introduction, Influence Coefficients, Stiffness Matrix, Flexibility Matrix, Natural Frequencies and Normal Modes, Orthogonality of Normal Modes, Dunkerley’s Equation, Method of Matrix Iteration, The Holzer Type Problem, Geared and Branched Systems, Beams.

SECTION D
Normal Mode Vibration of Continuous System: Vibrating String, Longitudinal Vibrations of Rod, Torsional Vibrations of Rod, Lateral Vibrations of Beam.

Text Books:

Reference Books:
ME- 411 REFRIGERATION & AIR CONDITIONING LAB.

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Sessional : 50 Marks
Practical : 50 Marks
Total : 100 Marks
Duration of Exam : 3Hrs.

List of Experiments :

1. To study the vapour compression Refrigeration System and determine its C.O.P. and draw P-H and T-S diagrams.
2. To Study the Mechanical heat pump and find its C.O.P.
3. To study the Air and Water heat pump and find its C.O.P.
4. To study the cut- sectional models of Reciprocating and Rotary Refrigerant compressor.
5. To study the various controls used in Refrigerating & Air Conditioning systems.
6. To study the Ice- plant, its working cycle and determine its C.O.P and capacity.
7. To study the humidification, heating, cooling and dehumidification processes and plot them on Psychrometric charts.
8. To determine the By-pass factor of Heating & Cooling coils and plot them on Psychrometric charts on different inlet conditions.
9. To determine sensible heat factor of Air on re-circulated air-conditioning set up.
10. To study the chilling plant and its working cycle.

Note : 1. At least ten experiments are to be performed in the semester.
2. At least seven experiments should be performed form the above list. Remaining three experiments may either be performed from the above list or as designed & set by the concerned institute as per the scope of the syllabus.
The students will be required to carry out the following exercises using software packages (e.g. 3D modeling package / Pro Engineer/ I-Deas/ Solid Edge etc.)

1. CAD Modeling Assignments
   (i) Use and learn import/export techniques and customization of software.
   (ii) Construction of simple machine parts and components like Coupling, Crankshaft, Pulley, Piston, Connecting rod, nuts, bolts, gears and helical springs
   (iii) Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe Tail stock, Machine vice, Pedestal bearing, Drill jigs and Milling fixture.
   (iv) Make the part family/family table of a bolt.

2. CAM Assignments
   Tool path generation, Part programming, G & M codes development for machining operations, Physical interpretation of machining features and tool geometries
At the end of Sixth semester each student would undergo six weeks Practical Training in an industry/Professional organization / Research Laboratory with the prior approval of the Director-Principal/Principal of the concerned college and submit a written typed report along with a certificate from the organization. The report will be evaluated during VII Semester by a Board of Examiners to be appointed by the Director-Principal/Principal of the concerned college who will award one of the following grades:

- **Excellent:** A
- **Good:** B
- **Satisfactory:** C
- **Not satisfactory:** F

A student who has been awarded ‘F’ grade will be required to repeat the practical training.
ME-417 QUALITY ENGINEERING

L T P Theory Total Duration of Exam
3 1 - : 100 Marks : 150 Marks : 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION-A
Basic Concept Quality Costs: Fitness for Use, Quality Characteristics, Parameters of Fitness for use, Definition of quality and its meaning and importance in industry, Control and Quality control, Quality Tasks, Quality functions, The system Concept, Quality systems, quality assurance and ISO 9000 quality system standards, Quality costs concept, Quality cost categories, Examples of Quality cost studies, Securing the Cost figures, Pareto Analysis, Cost reduction Programs and economics of quality.

SECTION-B

SECTION-C
Basic statistical concepts: Descriptions of Binomial, Poisson and Normal distribution with practical examples basics of sampling distribution. Acceptance Sampling: Principle of acceptance sampling, Acceptance sampling by attributes: single multiple and sequential sampling plans, lot quality protection and average outgoing quality protection, Acceptance sampling by variables sampling plans of process parameters

SECTION-D
Total quality Management: Basic concepts of TQM, historical review, leadership, concepts, role of senior management, quality statements, plans for process parameters, Modern Quality Management Techniques: TQM tools: Benchmarking, QFD, Taguchi quality loss function TPM, FMEA. Lean Manufacturing continuous improvement techniques, JIT systems, pareto diagrams, cause and effect diagrams, scatter diagram, run charts, affinity diagrams, inter-relationship diagram, process decision program charts

TEXT BOOKS:
1. Quality planning and Analysis, Juran and Gryna, TMH, New Delhi
2. Quality Management, Kanishka Bed, Oxford University Press, New Delhi
3. Introduction to SQC, Montgomery DC, 3e, Wiley, New Delhi

REFERENCE BOOKS:
ME 419 FINITE ELEMENT METHODS

L T P Theory : 100 Marks
3 1 - Total : 150 Marks

Duration of Exam : 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION-A

SECTION-B

SECTION-C

SECTION-D

Text Books:
1. Introduction to Finite Elements in Engineering Analysis by Tirupathi R. Chandrupatla and Ashok R. Belagundu. Prentice Hall

Reference Books:
Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION-A
Planning for Energy Management: Initiation phase, Audit and analysis phase; Implementation phase; General methodology for building and site energy audit; Site survey, Methodology; Site survey-Electrical system, Steam & water systems; Building survey methodology; Basic energy audit instrumentation; Measurements for building surveys.
Management of Heating and Cooling General Principles: The requirements for human comfort; Description of typical systems—dual duct HVAC system, Multi zone HVAC systems, Variable air volume system, Terminal reheat system, Evaporative HVAC systems; Modeling of heating and cooling loads in buildings; Problems.

SECTION-B
Electrical load and Lighting Management: General principles; Illumination and human comfort; Basic principles of lighting system; Typical illumination system and equipment; Fundamentals of single phase and 3-phase A.C. circuits; Energy management opportunities for lighting systems, Motors and electrical heat; Electrical load analysis and their parameters; Peak, demand control.
Management of Process Energy: General Principles; Process heat; Combustion; Energy saving in condensate return, Steam generation & distribution, auto-motive fuel control, hot water and water pumping, direct & indirect fired furnaces over; Process electricity; Other process energy forms – compressed air & manufacturing processes; Problems.

SECTION-C
Economics of Efficient Energy Use: General Consideration Life Cycle Costing, Break Even Analysis, Cost of Money, Benefit / Cost Analysis, Pay Back Period Analysis, Present Worth Analysis, Equivalent Annual Cost Analysis, Capital Cost Analysis, Perspective Rate of Return.
Integrated Building System: General Principles; Environmental conformation; Passive design consideration; Building envelope design consideration; Integration of building system; Energy storage; Problems.

SECTION-D
Use of Computer for Energy Management: Energy management; Energy management principle involving computers, Basics of computer use; Analysis – Engineering & Economic calculations, Simulation, Forecast, CAD/CAM; Controls – Microprocessor & minicomputers, Building cycling & control, Peak demand limiting & control; Industrial Power management; Problems.

Text Books:
1. Energy management Principles by Craig B. Smith, Published by Pergamon Press.

Reference Books:
1. Energy – resources, demand and conservation with reference to India – Chaman Kashkari, TMH.
2. Integrated renewable energy for rural development– Proc. of natural solar energy convention, Calcutta.
ME- 425 COMPUTER INTEGRATED MANUFACTURING

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Theory</th>
<th>: 100 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>-</td>
<td>Total</td>
<td>: 150 Marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Duration of Exam</td>
<td>: 3 Hrs.</td>
</tr>
</tbody>
</table>

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION -A
Introduction : CAD/CAM Definition, Computer Technology-central processing unit (CPU), types of emory, input/output, the binary number system, computer programming languages. Automation- Types of Automation, CIM, reasons for automating, automation strategies. Conventional Numerical Control: Basic components of NC system, the NC procedure, NC coordinate systems, NC motion control system, applications of numerical control, advantages and disadvantages of NC, computer controls in NC, problems with conventional NC, NC controller technology, computer numerical control, functions of CNC, advantages of CNC, Direct numerical control, components of a DNC system, functions of DNC, advantages of DNC.

SECTION -B
NC Part Programming: Introduction, the punched tape in NC, tape coding and format, NC words, manual part programming, computer assisted part programming, the part programmer’s job, the computer’s job, NC part programming languages. The APT language: Geometry, statements, motion statements, post processor statements, auxiliary statements.

SECTION C
Robotics Technology : Joints and links, common robot configurations, work volume, drive systems, types of robot control, accuracy and repeatability, end effectors, sensors in robotics, applications of robots.
Automated Material Handling & FMS: The material handling function, types of material handling equipment, conveyor systems, types of conveyors, automated guided vehicle systems, applications. FMS-Components, types of systems, applying FMS technology, FMS workstation, planning.

SECTION D
Computer Aided Quality Control: Introduction, terminology in Quality Control, the computer in QC, contact and non-contact inspection methods-optical and non-optical, and computer aided testing.

Text Books:

Reference Books:
ME-429 RELIABILITY ENGINEERING

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Theory</th>
<th>: 100 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>-</td>
<td>Total</td>
<td>: 150 Marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Duration of Exam</td>
<td>: 3 Hrs.</td>
</tr>
</tbody>
</table>

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION-A
Reliability: Definition; Probability Concept; Addition of Probabilities; Complimentary Events; Kolmogorov Axioms.
Failure Data Analysis: Introduction, Mean Failure Rate, Mean Time to Failure (MTTF), Mean Time between Failures (MTBF), Graphical Plots, MTTF in terms of Failure Density, MTTF in Integral Form.

SECTION-B

SECTION-C
Reliability Improvement & Repairable Systems: Redundancy, Element, Unit and standby Redundancy, Optimization; Reliability – cost trade-off, Introduction to Repairable Systems, Instantaneous Repair Rate, MTTR, Reliability and Availability Functions, Important Applications.

SECTION-D

Text Books:

Reference Books:
ME-431 SOLAR ENERGY ENGINEERING

L   T   P   Theory   : 100 Marks
3   1   -   Total   : 150 Marks
                Duration of Exam   : 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

SECTION-A

SECTION-B

SECTION-C
Cooling Applications of Solar Systems: Continuous and Intermittent vapour absorption systems for cooling applications, absorbent – refrigerant combination, passive cooling systems.

SECTION-D

Text Books:

Reference Books:
At the end of each year, students will be evaluated on the basis of their performance in various fields. The evaluation will be made by the panel of experts/examiners/teachers to be appointed by the principal/Director of the College. A specimen performance indicating the weightage to each component/activity is given below:

Name: ___________________________ College Roll No. ___________________________
Univ.Roll No. ___________________________ Year of Admission ____________

I. Academic Performance (15 Marks):
(a) Performance in University Examination:

<table>
<thead>
<tr>
<th>Sem.</th>
<th>Result</th>
<th>%age of Marks obtained</th>
<th>Number of Attempt in which the Sem. exam. has been cleared</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

II. Extra Curricular Activities (10 Marks):

<table>
<thead>
<tr>
<th>Item</th>
<th>Level of Participation</th>
<th>Remarks (Position Obtained)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor Games</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Specify the Games)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor Games</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Specify the Games)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Essay Competition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scientific Technical Exhibitions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drama</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine Arts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Painting
________________________________________
________________________________________

Hobby Club
________________________________________
________________________________________

N.S.S.
________________________________________
________________________________________

Hostel Mgt
Activities
________________________________________

Any other activity (Please Specify)
________________________________________

III. Educational tours/visits/Membership of Professional Societies (5 Marks)
1. ______________________________________
2. ______________________________________
3. ______________________________________
4. ______________________________________
5. ______________________________________
6. ______________________________________

IV. Contribution in NSS Social Welfare Floor Relief/draught relief/Adult Literacy mission/Literacy Mission/Blood Donation/Any other Social Service (5 Marks)
1. ______________________________________
2. ______________________________________
3. ______________________________________
4. ______________________________________
5. ______________________________________
6. ______________________________________

V. Briefly evaluate your academic & other performance & achievements in the Institution (5 Marks)
_________________________________________________________________________

VI. Performance in Viva voce before the committee (10 Marks)
_________________________________________________________________________

*Marks obtained 1.( )+II( )+III( )+IV( )+V( )+VI( ) =

**Total Marks :

Member       Member       Member       Member       Member       Member
### Scheme of Studies & Examinations

**B.Tech. 4th Year Mechanical Engineering, Semester- VIII**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Subject</th>
<th>Internal Marks</th>
<th>External Marks</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ME-402</td>
<td>Industrial Training/Institutional Project Work</td>
<td>150</td>
<td>150</td>
<td>300</td>
</tr>
</tbody>
</table>

**Note:**

The students are required to undergo Industrial Training or Institutional Project Work of duration not less than 4 months in a reputed organization or concerned institute. The students who wish to undergo industrial training, the industry chosen for undergoing the training should be at least a private limited company. The students shall submit and present the mid-term progress report at the Institute. The presentation will be attended by a committee. Alternately, the teacher may visit the Industry to get the feedback of the students.

The final viva-voce of the Industrial Training or Institutional Project Work will be conducted by an external examiner and one internal examiner appointed by the Institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the Board of Studies in Engg. & Technology. Assessment of Industrial Training or Institutional Project Work will be based on seminar, viva-voce, report and certificate of Industrial Training or Institutional Project Work obtained by the student from the industry or Institute.

The internal marks distributions for the students who have undergone Industrial Training consist of 50 marks from the industry concern and 100 marks by the committee members consisting of faculty members of concerned department of the parent institute.

The teachers engaged for Institutional Project work shall have a workload of 2 hours per group (at least 4 students) per week.