SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES
SCHOOL OF ENGINEERING
Outcome based Curriculum for
Undergraduate Degree Courses in Engineering & Technology

Department of Mechanical Engineering

BE-SEMESTER-VIII SYLLABUS

MEA-801	**REFRIGERATION & AIR CONDITIONING**	**3L:0T:0P**	**03 credits**	**3Hrs/Week**

Course Preamble:

1. To know about the different refrigeration cycles
2. Understand the hardware related to the refrigeration systems
3. Understand how the different components harmonize together
4. Understand the importance of the auxiliary systems.

Course Outcomes:

Upon successful completion of the course, students should be able to:

1. Have a review of refrigeration cycles and alternate refrigeration system to enhance their knowledge of refrigeration, and will be able to explain them,
2. Understand and solve the problem of component selection, refrigerant related issues and system balancing and control
3. Apply their knowledge to appraise different refrigeration system components and environmental issues caused by refrigerant.
4. Analyze a refrigeration problem to carryout necessary calculation.

Unit-I

Introduction: Principles and methods of refrigeration, freezing; mixture cooling by gas reversible expansion, throttling, evaporation, Joule Thomson effect and reverse Carnot cycle; unit of refrigeration, coefficient of performance, vortex tube & thermoelectric refrigeration, adiabatic demagnetization; air refrigeration cycles- Joule‟s cycle Boot-strap cycle, reduced ambient cycle and regenerative cooling cycles.

(10 hours)

Unit-II

Vapour compression system: Vapor compression cycle, p-h and t-s diagrams, deviations from

theoretical cycle, sub-cooling and super heating, effects of condenser and evaporator pressure on cop; multi- pressure system: removal of flash gas, multiple expansion & compression with flash inter cooling; low temperature refrigeration: production of low temperatures, cascade system, dry ice, production of dry ice, air liquefaction system.

(10 hours)

Unit-III

Vapour absorption system: Theoretical and practical systems such as aqua- ammonia, electrolux & other systems; (b) Steam jet refrigeration: Principles and working, simple cycle of operation, description and working of simple system, (c) refrigerants: nomenclature & classification, desirable properties, common refrigeration, comparative study, leak detection methods, environment friendly refrigerants and refrigerant mixtures, brine and its properties.

(9 hours)

Unit-IV

Psychrometric: Calculation of psychrometric properties of air by table and charts; psychrometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, heating and humidification, mixing of air stream, sensible heat factor; principle of air conditioning, requirements of comfort air conditioning, ventilation standards, infiltrated air load, fresh air load human comfort, effective temperature & chart, heat production & regulation of human body.

(8 hours)

Unit-V

Air conditioning loads: calculation of summer & winter air conditioning load, bypass factor of coil, calculation of supply air rate & its condition, room sensible heat factor, grand sensible heat factor, effective sensible heat factor, dehumidified air quantity. Problems on cooling load calculation. Air distribution and ventilation systems.

(8 hours)

References Books:

1. Arora CP; Refrigeration and Air Conditioning; TMH
2. Sapali SN; Refrigeration and Air Conditioning; PHI
3. Ananthanarayan; Basic Refrigeration and Air conditioning; TMH.
4. Manohar Prasad; Refrigeration and Air Conditioning; New Age Pub
5. Ameen; Refrigeration and Air Conditioning; PHI

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MEA-801	**REFRIGERATION & AIR CONDITIONING**	**0L:0T:2P**	**1 credits**	**2Hrs/Week**

List of Experiments:-

1. General Study of vapor compression refrigeration system.
2. General Study of Ice Plant
3. General Study and working of cold st
4. General Study One tone Thermax refrigeration unit.
5. General Study of Water cooler
6. General Study of Psychrometers (Absorption type)
7. General Study of window Air Conditioner.
8. General Study and working of Vapor compression Air conditioning Testrig.
9. Experimentation on Cold Storage of Calculate COP & Heat Loss.
10. Experimentation on Vapor compression Air Conditioning test rig.

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MEA-802 (A)	**ADVANCE MACHINE DESIGN**	**3L:0T:0P**	**03 credits**	**3Hrs/Week**

Course Preamble:

To familiarize the various steps involved in the design process of mechanical drives such

1. As belt, chain, rope and gear.
2. To understand the procedure of selection of machine elements from manufacturers
3. Catalogue.
4. To get knowledge of different types of bearings and their selection for a particular
5. Application.
6. Student shall apply design knowledge of the different types of elements used in the
7. Machine design process, for a design project.

Course outcomes

1. Design and analyze belts, brakes, clutches.
2. Understand gear drives and their applications; design procedure and introduction to gear
3. Design standard practices.
4. The construction, working, important features and selection process from manufacturers
5. Catalogue for rolling contact bearings
6. Analyze the pressure distribution and design of journal bearings..
7. Acquire skill in preparing production drawing pertaining to various designs.

Unit I

Design of Belt, Rope and Chain Drives: Methods of power transmission, selection and design of flat belt and pulley; Selection of V-belts and sleeve design; Design of chain drives, roller chain and its selection; Rope drives, design of rope drives, hoist ropes.

(8 hours)

Unit II

Spur and Helical Gears: Force analysis of gear tooth, modes of failure, beam strength, Lewis equation, form factor, formative gear and virtual number of teeth; Gear materials; Surface strength and wear of teeth; strength against wear; Design of straight tooth spur and Helical Gears.

Bevel Gears: Application of bevel, formative gear and virtual number of teeth; Force analysis; Lewis equation for bevel gears; Strength against wear; Design of bevel gear.

(8 hours)

Unit III

Design of I.C. Engine Components: General design considerations in I C engines; design of cylinder; design of piston and piston-rings; design of connecting rod; design of crankshaft.

(8 hours)

Unit IV

Design of Miscellaneous Components: design of Flanged coupling; Rigid coupling, Design of Pressure vessels subjects to internal pressure, external pressure, design of penetration, design of flanges, cone cylinder junctions ,Materials, Fabrication.

(9 hours)

Unit V

Optimization: Basic concept of optimization, classification of optimization, optimization techniques, engineering applications of optimization. Classical optimization techniques: unconstrained optimization single-variable optimization, multivariable optimization, solution by direct search method, solution by Lagrange-multipliers method.

(10 hours)

Note: PSG Design data book and/ or Mahadevan and Reddy's Mechanical design data book are to be provided/ permitted in exam hall (duly verified by authority).

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MEA-802 (B)	**COMPUTER INTEGRATED MANUFACTURING**	**3L:0T:0P**	**03 credits**	**3Hrs/Week**

Course Preamble:

1. Students will be introduced to CAD/CAM/CAE concepts.
2. Student will learn steps in upgrading from FMS to CIM.
3. Students will learn about importance of data generation and management in CIMS.

Course outcomes:

1. Students will be able to apply knowledge about Computer Aided Quality control and Process Planning Control.
2. Students will be able to Design Flexible manufacturing cell after carrying out Group technology study and finally creating FMS.
3. Students will be able to apply knowledge about various methods of communication in CIMS.
4. They will able apply data management and its importance for decision making in CIMS environment.

Unit I

Introduction C. N.C. System : Definition, applications, Historical background Role of Computers in Manufacturing. Computer Numerical control in CAM: Definition, basic components of CAM system, Procedure, Co-ordinate system, motion control systems, Advantages of CNC system.

(9 hours)

Unit II

Introduction of CNC Machine tools, Application of CNC systems, Economics of CNC machining centers, Part Programming : CNC part programming : manual part programming.

(9 hours)

Unit III

Introduction computer aided part programming Robot Technology: Introduction, Industrial Robots, Robot physical Configuration, Basic Robot motions, Technical features, such as work volume,

precision of movement speed o movement, weight carrying capacity, type of drive systems, Programming of the robot, Introduction to robot languages, End erectors, work cell control and interlocks, Robotic sensors, Robot applications & economics, Intelligent robots, interfacing of a vision system with a Robot.

(10 hours)

Unit IV

Introduction Definition and broad characteristics of Flexible Manufacturing Cells, , Group technology Systems FMS hardware CNC machines tools, robots, AGVs, ASRs, Inspection and Cleaning stations - Control aspects of FMS-DNC of machine tools, cutting tools, Types of Flexibility in FMS, Flexible and Dynamic Manufacturing Systems, Computer Aided Inspection.

(9 hours)

Unit V

Introduction Principles and interfacing, software metrology. Applications of Lasers in precision measurements - Laser interferometer, speckle measurements, laser scanners. Coordinate Measuring Machine - Types of CMM - Probes used - Applications - Non contact CMM using Electro optical sensors for dimensional metrology - Non contact sensors for surface finish measurements. Image processing and its application in inspection.

(8 hours)

References Books:

1. Shigley J.E.; Machine Design; TMH
2. BhandariVB; Design of Machine Elments; TMH
3. Sharma CS and Purohit K; Design of Machine Elements; PHI Learning.
4. Hall and Somani; Machine Design; Schaum Series; TMH
5. Wentzell TH; Machine Design; Cegage Learning
6. Sharma & Agrawal; Machine Design; Katson

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MEA-803 (A)	**INDUSTRIAL ORGANISATION & MANAGEMENT**	**3L:0T:0P**	**03 credits**	**3Hrs/Week**

Course Preamble:
This course introduces the basic concepts of management and organization structure of an industry, concept of Entrepreneurship, Material management cost analysis, engineering economics and project management

Course Outcomes:

Student shall be able to:

1. Demonstrate the concepts of Management and organizational structure

2. Understand the economic and operations management concepts useful in the production process.

3. Apply the project management tools in effective development and implementation of the business activities.

4. Develop the entrepreneurial spirit and plan to start their own enterprise.

Unit-I
Industrial Evolution in India: Downfall of early industries, evolution of modern industry, effects of partition, industrial policy and progress after independence. Forms of Industrial Organization: Single Proprietorship, Partnership, Joint Stock companies., Cooperatives and State Enterprises.

(8 hours)

Unit-II

Growth of Industry and Management: Meaning of industrial management, functions and tools of management, growth of management concepts. Principles of Management: Management, different functions of management: Planning, organizing, coordination and control, Structure of an industrial organization.

(8 hours)

Unit-III

Functions of different departments. Relationship between individual departments. Human and Industrial Relations, Human relations and performance in organization. Understand self and others for effective behavior, Behavior modification techniques, Industrial relations and disputes, Relations with sub-ordinates, peers and superiors, Characteristics of group behavior and trade unionism.

(10 hours)

Unit-IV

Professional Ethics: Concept of ethics, Concept of professionalism, Need for professional ethics. Code of professional ethics, Typical problems of professional engineers, Professional bodies and their role.. Motivation: Factors determining motivation, Characteristics of motivation, Methods for improving motivation, Incentives, pay, promotion, rewards, Job satisfaction and job enrichment.

(9 hours)

Unit-V

Leadership: Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader. Human Resource Development: Introduction, Staff development and career development, Training strategies and methods. Accidents and Safety: Classification of accidents; according to nature of injuries i.e. fatal, temporary; according to event and according to place.

(9 hours)

References Books:-

1. Industrial Organization Pepall L., Richards D., and Norman G.
2. The Theory of Industrial Organization. Tirole, J.
3. Industrial Engineering and Management TR Banga.
4. Industrial Engineering and Management OP Khanna,
5. Industrial Management VK Sharma, OP Harkut.

MEA-803 (B)	**COMPUTATIONAL FLUID DYNAMICS**	**3L:0T:0P**	**03 credits**	**3Hrs/Week**

Course Preamble:
To provide brief introduction of Computational Fluid Dynamics along with chemical engineering application specifically, analysis of fluid mechanics and heat transfer related problems.

Course Outcomes:

Upon completion of this course, the students will be able to: 1. Solve PDE. 2. Use Finite Difference and Finite Volume methods in CFD modeling 3. Generate and optimize the numerical mesh 4. Simulate simple CFD models and analyze its results.

Unit-I
Introduction: Mathematical Background: Classification of differential equations, representative differential equations for heat transfer and fluid flow; Boundary and initial condition; Integral forms. Survey of Numerical Methods Used in Heat Transfer and Fluid Mechanics.

(8 hours)

Unit-II

Finite Difference Methods Basic concepts, Direct approximation approach, Taylor series, Control Volume approach, Truncation error, Discretization and round off errors; convergence, numerical stability, Solution of simultaneous equations, Transient diffusion. Finite Element Methods: Steps for FEM solution, Fundamentals, Assembly, Steady Diffusion, Transient Diffusion Finite Volume Methods: Problem formulation for one-dimensional convection diffusion equations.

(10 hours)

Unit- III

Simulation of Transport Process Conduction Heat Transfer: Steady and unsteady state one & two dimensional problems. Explicit, Implicit and Crank-Nicolson scheme, ADI and ADE methods. Convection Heat Transfer: Boundary Layer Flows, Similarity solutions, Derived Variables, Patankar/Spalding Methods for two-dimensional flows.

(8 hours)

Unit- IV

Elliptic Solutions: Control Volume formulation. Energy and other scalar equations, Momentum equations, Segregated Solution method; SIMPLE & SIMPLER schemes, Stream Function – Vorticity.

(8 hours)

Unit-V

Transport method. Turbulence: Examples of turbulent flows, Stress relations, Reynolds stresses, turbulence model computations, Analogy between Heat Transfer and Momentum, Linearization of source terms.

(9 hours)

References Books:-

1. Computational Fluid Dynamics" by Anderson J D
2. Numerical Computation of Internal and External Flows" by Hirsch C
3. Computational Fluid Dynamics and Heat Transfer" by Tenehill J C and Pletcher R H
4. An Introduction to Computational Fluid Dynamics: The Finite Volume Method" by H Versteeg
5. Computational Fluid Dynamics" by Tapan Sen Gupta