Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)

Scheme of Studies & Examinations under Choice Based Credit System

Programme: B. Tech. in Mechanical Engineering; Year – 4th (Semester – VII); w.e.f. Session: 2021-22

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ME 401C	Automation in Manufacturing	3	0	0	25	75	-	100	3	3
2	ME 403C	Refrigeration and Air Conditioning	3	0	0	25	75	-	100	3	3
3		Professional Elective – III	3	0	0	25	75	-	100	3	3
4		Open Elective-II	3	0	0	25	75	-	100	3	3
5	ME 405C	Laboratory – V (Manufacturing)	0	0	2	25	-	75	100	1	3
6	ME 407C	Professional Training (Level III)	0	0	2	100	-	-	100	2	3
7	ME 409C	Minor Project	0	0	10	100	-	-	100	5	3
Total			12	0	14	325	300	75	700	20	

List of OPEN ELECTIVE-II courses (A Student has to select any one)

S. No.	Course Code	Course Title
1	CSE305C	Computer Network
2	CSE431C	Cyber Security
3	CHE457C	Industrial Safety
4	CE406C	Disaster Management
5	ECE327C	Consumer Electronics

List of Professional Electives – III Courses (A Student has to select any one)

S. No.	Course Code	Course Title
1	ME 421C	Power Plant Engineering
2	ME 423C	Mechanical Vibration
3	ME 425C	Supply Chain Management
4	ME 427C	Mechatronic Systems

ME 401C Automation in Manufacturing

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	:	**25 Marks**
Examination	:	**75Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

Course Objectives: This course is intended to provide the knowledge of tools and technologies for automation of manufacturing processes and systems. This course gives students the knowledge of hardware tools that enable automation as well as the software tools and systems that help in the integration of different manufacturing resources and functions including FMS, Robots and CIMS.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Underline the importance of automation for manufacturing industries. CO2: Describe the elements and tools that facilitate manufacturing automation.

CO3: Illustrate the advantages of integration of different types on automation tools in NC based systems.CO4: Describe the functional tools for CIMS: CAM, CAD, MRP, ERP, CAPP etc.

UNIT I

Automation Tools: Automation and types, reasons for automation, Automation, Manufacturing Flexibility and Competitiveness, Basic elements of an Automated System: Sensors, Actuators, Analog-to-Digital and Digital- to-Analog Converters, Input/ Output Devices for Discrete Data, PLC and Micro-controllers

Low Cost Automation: Mechanical & Electro-Mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies

UNIT II

Computer Aided Design: Fundamentals of CAD -Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods

Numerical Control (NC): Fundamentals of NC Technology and advantages in Manufacturing, NC Machines and types, Computer Numerical Control, Distributed Numerical Control, Machining Centers, Brief introduction of NC Part Programming. Adaptive Control in CNC

UNIT III

Robotic Technology: Common robot configurations, types of robot control, accuracy and repeatability, interlocks, advantages and disadvantages. Brief review of Robot programming languages, Applications of Robots, AGV, AS/RS systems

Automated Flow Lines: methods of work part transport, Transfer Mechanisms, buffer storage, automation for machining operations, part feeding devices, Brief review of automated assembly systems and types

UNIT IV

Flexible Manufacturing Systems (FMS): Components of an FMS, FMS work stations. Material handling and storage systems for FMS, FMS layout configurations, Computer control system in FMS and its functions, Planning the FMS, FMS applications and benefits

Computer Integrated Manufacturing Systems (CIMS): Elements of CIMS, Brief Review of Computer aided process Planning, MRP, Capacity Planning, MRPII and ERP, Computer aided quality control, Brief review of Shop floor Control systems and Computer Process Monitoring

TEXT BOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing: Groover M.P, Prentice Hall ofIndia.
2. CAD/CAM: Groover M.P, Zimmers E.W, Prentice Hall of India.

REFERENCE BOOKS:

1. Approach to Computer Integrated Design and Manufacturing: Nanua Singh, John Wiley and Sons, 1998.
2. Production Management Systems: A CIM Perspective: Browne J, Harhen J, Shivnan J, Addison Wesley, 2nd Ed. 1996.
3. Computer control of manufacturing system, Yoram Koren, 1st edition, McGraw Hill Education
4. CAD/CAM: Theory & Practice, Ibrahim Zeid , 2nd edition, McGraw Hill Education

ME 403C Refrigeration and Air Conditioning

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	:	**25 Marks**
Examination	:	**75Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

Course Objectives: A student who has done the course will have a good understanding of the workingprinciples of refrigeration and air-conditioning systems.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Explain the basic refrigeration processes, refrigerants and their environmental impacts. CO2: Discuss the basics of psychrometry and the practices in applied psychrometrics.

CO3: Describe the uses of sorption technologies in refrigeration and Air-conditioning.

CO4: Model and analyze refrigeration cycles and design different refrigeration as well as air conditioningprocesses.

Unit I **(10)**

Chapter 1: Fundamentals of Refrigeration and Air-conditioning (A/C); unit of refrigeration; COP of refrigeration systems; Methods of refrigeration; Classification of refrigeration systems; Refrigerant's nomenclature and classification; refrigerants and their mixtures: properties and characteristics; Eco friendly refrigerants; Ozone depletion and global warming issues of refrigerants.

Chapter 2: Necessity of cooling the aeroplane; Reversed Brayton air refrigeration cycle; Different Air craft refrigeration systems- Simple cooling and Simple evaporative types, Boot strap and Boot strap evaporative types, Regenerative type and Reduced Ambient type system.

Unit II **(11)**

Chapter 3: Limitations and Modifications of Reversed Carnot cycle; Vapor compression refrigeration (VCR) cycle; analysis and effect of operating conditions on VCR cycle like subcooling, superheating, using Liquid vapor regenerative heat exchanger etc; actual VCR cycle; introduction to advanced vapour compression cycles.

Chapter 4: Multipressure systems- multistage, multi evaporator and cascade sysyem.VCR System components: Compressors, Condensers, Expansion devices and Evaporators; Performance matching of components of refrigeration systems.

Unit III **(11)**

Chapter 5: Review of Psychrometry and Air-conditioning: Psychrometric properties of moist air, Psychrometric chart, Bypass factor,efficiency of cooling coil, Various Air-conditioning processes; A/C load calculations ; andapplied Psychrometrics; Comfort air conditioning, Indoor air quality.

Chapter 6: Heat and moisture transfer in A/C apparatus - Enthalpy potential; Air washers, Cooling towers, Evaporative condensers; Cooling and dehumidifying coils. Duct design.

Unit IV **(10)**

Chapter 7: Absorption Refrigeration Systems – COP of the System, Performance, Relative merits and demerits as compared to VCR system; Aqua ammonia based vapor absorption refrigeration (VAR) system and LiBr-H2Obased VAR system and components like absorber, generator etc.

Chapter 8: Introduction to advanced Sorption refrigeration systems - absorption and adsorption type systems; Desiccant based refrigeration system and components. Applications of A/C systems in different industries like food processing and preservation etc.

Text Books:

1. Gosney, W.B*, Principles of Refrigeration*, Cambridge University Press,1982
2. Stoecker, W.F. and Jones, J.W., *Refrigeration and Air conditioning*, Tata McGraw Hill, 1986.
3. Arora, C.P*., Refrigeration and Air conditioning*, Tata McGraw Hill, 2nd Edition, 2000.
4. Kuehn, T.H., Ramsey, J.W. and Threlkeld, J.L., *Thermal Environmental Engineering*, 3rd Edition,Prentice Hall, 1998

Reference books:

1. R.C. Jordan and G.B. Priester ,*Refrigeration & Air conditioning*, Prentice Hall of India.
2. Arora & Domkundwar ,*A course in Refrigeration & Air Conditioning*, Dhanpat Rai & Sons,2018.
3. Manohar Prasad ,*Refrigeration & Air conditioning*, New Age International Publisher 2nd edition, 2003.

ME 405C Mechanical Engineering Laboratory III (Manufacturing)

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
0	**0**	**2**	**1**	Class Work	:	25 Marks
				Examination	**:**	**75Marks Total**
					:	**100 Marks**

Duration of Examination: 3 Hours

Course objectives:

1. To understand and interpret drawings of machine components and assembly leading to preparation of production drawings manually and using CAD software (e.g. AutoCAD).
2. To get an idea of the dimensional & form accuracy of products
3. To provide an understanding of advanced manufacturing methods.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Prepare part and assembly drawings manually and using any drafting software tool.CO2: Draw and draft manuscript for production of jobs.
CO3: Apply appropriate limits and tolerances on parts and decide the type of fits on assemblies.CO4: To perform different operations on conventional, NC machines, EDM and robots.

List of Experiments:

1) Draw and Draft the orthographic views of any two of the following components:
   a) Hexagonal Square bolt, nut and washer assembly.
   b) Collar Joint
   c) Knuckle Joint
   d) Flanged Coupling
2) Draw the orthographic views of any two of the following assemblies using drafting software.
   a) Universal Coupling
   b) Split Muff Coupling
   c) Oldham Coupling
   d) Tailstock of Lathe
   e) Tool-post of the Lathe
3) Prepare the Process plan and Fabricate/Manufacture one product, which has been drawn and drafted bythe student from the list given at exp. No. 1.
4) Disassemble/assemble the product physically on shop floor for which the drawing has been prepared atexp. No. 2 as per appropriate disassembly/assembly plan.
5) Perform Taper turning and external thread cutting using lathe.
6) Perform Contour milling using vertical milling machine.
7) Develop part program for a sample part containing point-to-point and contouring tool movements.
8) Perform Drilling of a hole using EDM.

9) Perform robot programming and operation of a robot for pick & place operation.

10) Measure the dimension and surface finish of the product fabricated at experiment no. 3 / 4.

Books:

1. Machine Drawing with AutoCAD, by Gowtham Pohit and Goutam Ghosh, Pearson Education, Delhi
2. Fundamentals of machine drawing, by Sadhu Singh, PHI New Delhi
3. Machine drawing Includes AutoCAD supplements, by Basudeb Bhattacharyya, Oxford New Delhi,2015
4. Textbook of machine drawing, by P S Gill, S K Kataria New Delhi, 2016
5. Machine drawing, by N.D Bhatt, India Charotar, 1987

ME 407C Professional Training (Level – III)

B. Tech. Semester – VII (Mechanical Engineering)

Duration of Training	**Credits**	**Class Work**	**:**	**100 Marks**
4-6 weeks	2	**Total**	**:**	**100 Marks**

Professional Training is aimed to provide practical experience to the interns in his/her field or discipline toachieve the following objectives:

- To expose Technical students to the industrial environment, which cannot be simulated in the classroomand hence, creating competent professionals in the industry.
- To Provide possible opportunities to learn, understand and sharpen the real time technical / managerialskills required in the job.
- To gain experience in writing Technical reports/projects.
- To expose students to the engineer's responsibilities and ethics.
- To familiarize with various materials, processes, products and their applications along with the relevantaspects of quality control.
- To promote academic, professional and/or personal development.
- To expose the students to future employers.
- To understand the social, economic and administrative considerations that influence the workingenvironment of industrial organizations
- To understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Course Outcomes:

CO1: Capability to execute and report industrial projects as a team with moral and ethical standard.CO2: Ability to draft technical/ project reports.

CO3: Ability to use academic expertise in industrial/professional domain.CO4: Communicate effectively on professional issues.

At the end of 6th semester each student would undergo four to six weeks Professional Training in an Industry/ Institute/ Professional / Organization/ Research Laboratory etc. with the prior approval of the Chairman of the department/Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.

Every student is required to submit a typed report in a prescribed format. The report should contain the activitiesdone by him. The report should also contain the student's Diary / Daily log. The students should record day-to- day account of the observations, impressions, information gathered and suggestions given, if any in the training diary. It should contain the sketches & drawings related to the observations made by the students. The diary should also be shown to the Faculty Mentor visiting the industry from time to time.

The evaluation of Professional Training/Project will be done by a departmental committee in the 7th semester as per time table allocated by the department. The evaluation committee will consist of teachers from different specialization to be constituted by the Chairperson of the department. The student will interact with the committee through presentation to demonstrate his/ her learning. Evaluation will be done on the basis of the following criteria/weightage:

- Regularity in maintenance of the diary (20%)
- Quality of training report (40%)
- Presentation (Quality of content (20%)
- Effectiveness of presentation/Communication skill (20%)

ME 409C Minor Project

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
0	0	10	5

Class Work	:	**100 Marks**
Examination (Practical)	:	**0 Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

This course is a group activity to be undertaken by a group of 4-5 students under the guidance of a faculty supervisor assigned by the department. The primary objective of this course is to develop in students the professional quality of synthesis employing technical knowledge obtained in the field of Engineering & Technology through a project work involving design, analysis augmented with creativity, innovation and ingenuity. Minor Project involving design/ fabrication/ testing/ computer simulation/ case studies etc. is to be undertaken in the VII Semester. In this semester thestudent is expected to complete the study/modeling/ design part of the project. The students, who opt to undertake course work during the VIIIth semester can extend the same project as Major Project in VIIIth Semester.

Course Outcomes: At the end of the course, the student will be able to: CO1: Apply academic knowledge to complete technical project as a team.

CO2: Use professional capability towards Design, Innovation and creative solution.CO3: Prepare project reports.

CO4: Effectively communicate on projects undertaken.

The assessment of the class work for Major Project will be evaluated through two presentations, with equalweightage, before the committee consisting of the following:

a. Chairman of the Department or his nominee
b. Major Project coordinator
c. The Project supervisor: Member

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher). The format of the cover page and the organization of the body of the report will be finalized and circulated by Project coordinator.

The Assessment will comprise of the following elements for evaluation:

- Quality of Modeling and Technical Detail: 40 Marks
- Adequacy and quality of Project: 20 Marks
- Quality of project reports: 20 Marks.
- Effectiveness of presentation/Communication skill and Team Work: 20 Marks

Project coordinator will be assigned the project load of maximum of 2 hours per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

ME 421C Power Plant Engineering

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	:	**25 Marks**
Examination	:	**75Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

Course Outcomes: At the end of the course, the student will be able to:

CO1: Explain the basics of Power Plants and Power Plant Economics.CO2: Analyze the thermodynamic cycles for power generation.
CO3: Describe power generation in different types of Power Plants by renewable and non-renewable energyresources.
CO4: Discuss the developments in Power Plants, their applications, Safety and Environmental issues.

UNIT-I

INTRODUCTION: Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles like Rankine, Brayton, Binary vapor power cycle, Combined cycle etc used in power plants. Environmental aspects of power generation

POWER PLANT ECONOMICS: Load curve, different terms and definitions, principles of power plantdesign, location of power plant, layout and cost analysis

UNIT II

STEAM POWER PLANTS: Flow sheet and working of modern-thermal power plants, requirements of steam stations, site selection; Coal storage, Preparation, Coal handling systems, Feeding and burning of pulverized fuel, Ash handling systems, Dust collection system; electrostatic precipitator.

COMBINED STEAM AND GAS CYCLES: Constant pressure gas turbine power plants, Arrangements of combined plants, re-powering systems with gas production from coal, using PFBC systems; Integrated Gasification based Combined Cycle (IGCC) systems.

UNIT III

HYDRO ELECTRIC POWER PLANTS: Introduction: classification, typical layout and components, site selection, Advantages and disadvantages, Rainfall and run off Measurements, Hydrograph.

NUCLEAR POWER PLANTS: Principles of nuclear energy, basic components of nuclear reactors, site selection, nuclear reactors-PWR,BWR, CANDU, Fast breeder, gas cooled and liquid metal cooled reactors Advantages and limitations, safety measures for nuclear power plants.

UNIT IV

NON-CONVENTIONAL POWER GENERATION: Solar energy -Solar radiation estimation, solar energy collectors, low, medium & high temperature power plants; OTEC; Wind power plants; Tidal power plants and Geothermal power plants.

DIRECT ENERGY CONVERSION SYSTEMS: Fuel cell, MHD power generation-principle, open & closed cycle's systems; thermoelectric power generation; thermionic power generation.

TEXT BOOKS:

1. Power Plant Engineering : Manoj kumar Gupta, PHI learning ,First Edition 2012
2. Power Plant Engineering : R.K. Rajput, Laxmi Publication ,Fourth Edition 2008
3. Power station Engineering and Economy by Bernhardt G.A. Skrotzki and William A. Vopat – Tata McGrawHill Publishing Campany Ltd., New Delhi .

REFERENCE BOOKS:

1. Power Plant Engg. : M.M. El-Wakil, McGraw Hill 1985.
2. Power Plant Engineering : P.K. Nag Tata McGraw Hill second Edition 2001

ME 423C Mechanical Vibrations

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Outcomes: At the end of the course, the student will be able to:

CO1: Analyze the vibration of mechanical systems with single degree of freedom system and theimplications of vibration.
CO2: Calculate different vibration parameters under forced vibration.
CO3: Use numerical technique to analyze vibration in two & multi degree of freedom system.
CO4: Discuss different types of equipments and processes for vibration measurement and conditionMonitoring.

UNIT I

Basic Concept & Single Degree Of Freedom System - Undamped and Damped

Classifications of Vibrations: Free and Forced, Undamped and Damped, Linear and Non-linear, Deterministic and Random Harmonic Motion, Vector and Complex Number Representations Single Degree of Freedomsystem

Governing equations using D'Alembert's Principal Determination of natural frequency of vibratory systems using Energy Method, Equivalent systems concept of viscous damping, response of Free Damped Vibrations (Under Damping, Critical and Over Damping), Logarithmic Decrement

UNIT II

Forced Vibrations

Governing equation under harmonic excitation and response using techniques of calculus and phasor diagram, Magnification factor, Active and passive vibration isolation, Forced and Motion Transmissibility, Rotating and Reciprocating unbalance, Critical Speeds and Whirling of Rotating Shafts, Vibration isolation materials, Transient Response Impulse Excitation, Response to Step Excitations

UNIT III

Multi Degree Freedom System and Numerical Techniques

Two Degrees of Freedom Systems, Normal Mode Vibrations, Coordinate Coupling, Principal Coordinates, Free Vibrations in Terms of Initial Conditions, Forced Harmonic Vibrations, Simple Vibration Absorber, Multi degrees of Freedom Systems, Eigen value problems-close coupled system and far coupled systems using influence coefficient, Natural Frequencies and Normal Modes, Orthogonality of Normal Modes

Method of Matrix Iteration, Introduction to vibration of continuous system with the help of lateral vibration of Beam, Dunkerley's method, Rayleigh's method

UNIT IV

Vibration Measurement and Condition Monitoring

Principle of seismometer and accelerometer, Basic Vibration measuring setups- amplitude and phase measurement; vibration pick-ups, Working principle of piezoelectric accelerometer, Eddy current based displacement probe, Bending critical speed of simple shaft, Fourier series and Fourier transform, Condition monitoring- its need and types; vibration signals in a rotating machines.

Books:

1. Theory of Vibrations with Applications W.T. Thomson, Prentice Hall of India.
2. Mechanical Vibration : G.K. Grover and S.P. Nigam, Nem Chand and Sons
3. Theory and Practice of Mechanical Vibrations J.S. Rao and K. Gupta, Wiley Eastern Ltd.
4. Mechanical Vibrations S.S. Rao, Addison – Wesely Publishing Company

ME425C Supply Chain Management

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	:	**25 Marks**
Examination	:	**75 Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

Course Outcomes: At the end of the course, the student will be able to:

CO1: Explore the processes, drivers, initiatives and tools for the management of Supply chain (SC) Systems. CO2: Explore SC distribution network and methods for management of supply and Demand.
CO3: Model forecasting, Aggregate Planning and Inventory planning issues in SC.
CO4: Describe transportation and sourcing decisions and related performance improvement initiatives in SC.

Unit-I

Introduction: Supply Chain (SC), Objectives and Role of SC in competiveness of firms, SC processes, Decision Phases in SC and their Importance, Process Views of a Supply Chain, process of achieving Strategic Fitness, SC levers to manage uncertainty, Scope for strategic fitness in SC and its Challenges, Case examples of Supply Chains.

SC Drivers and Matrices: SC Performance Measures, Drivers of SC Performance: Facilities, Inventory, Transportation, Information, Sourcing, Pricing; their matrices, Framework for Structuring SC Drivers.

Unit-II

SC Distribution Networks: Role of Distribution, Factors affecting Distribution Network Design, Distribution Networks types and performance characteristics, brief review of online sales and the Distribution Network, Factors Influencing Network Design Decisions, Specific features of Global SC networks

Planning in SC:; Role and Characteristics Forecasting in SC, Forecast components, Forecasting methods and Error, Aggregate Planning (AGP); Role and Strategies, Linear Programming model for AGP, Management of supply through Capacity change, inventory control, subcontracting, risk pooling and backlogs, Management of demand through price discount and promotion, numerical problems.

Unit-III

SC Coordination: Importance of Coordination in SC, Bullwhip Effect and its impact on SC performance, Obstacles to Coordination in a Supply Chain, Managerial Decisions to Achieve Coordination, Continuous Replenishment, Vendor-Managed Inventories, Collaborative Planning, Forecasting, and Replenishment, Different IT initiatives for SCM

Inventory Management in SC: Role of Cycle and Safety Inventory and their models, Economies of Scale to Exploit Fixed Costs, Quantity Discounts, Short-Term Discounting, Trade Promotions, Managing Multi-echelon Cycle Inventory, Impacts of Supply Uncertainty, Aggregation and Replenishment Policies on Safety Inventory, Safety Inventory in a Multi-echelon Supply Chain, Postponement and its effects on SC performance.

Unit-IV

Transportation in SC: The Role of Transportation in a SC, Modes of Transportation and Their Performance Characteristics, Design Options and Trade-off in Transportation Network Design, Risk Management in Transportation, Closed-Loop Supply Chains.

Sourcing Decision in SC: The Role of Sourcing in a Supply Chain, In-House or Outsource decision, Third- and Fourth-Party Logistics Providers, Supplier Selection—Auctions and Negotiations, Contracts, Risk Sharing, and Supply Chain Performance. Risk Management in Sourcing.

TEXT BOOKS:

1. Supply Chain Management- Chopra S., Meindl P., and Kalra D.V., 7e, Pearson Education
2. Designing And Managing the Supply Chain: Concepts, Strategies and Case studies- Simchi Levi D., SimchiLevi E., Kaminsky P., and Shankar R., 3e, TMH

REFERENCES BOOKS:

1. Logistics & Supply Chain Management – Martin Christopher, 5e, FT Publishing

Note:

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

ME427C **Mechatronic Systems**

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	**Class Work**	:	**25 Marks**
				Examination	:	**75 Marks**
				Total	:	**100 Marks**
				Duration of Examination	:	**3 Hours**

Course Outcomes: At the end of the course, the student will be able to:

CO1: Describe the structure of microprocessors and their applications in mechanical devices
CO2: Explain the principle of automatic control and real time motion control systems, with the help ofelectrical drives and actuators
CO3: Discuss the types of drives & actuators and their applications in various fields
CO4: Explain the uses of smart materials, micro-sensors and microprocessors in medical and Industrialapplications.

UNIT I

Introduction: Definition of Mechanical Systems, Philosophy and approach; Systems and Design: Mechatronic approach, Integrated Product Design, Modeling, Analysis and Simulation, Man-Machine Interface;

Sensors and transducers: classification, Development in Transducer technology, Optoelectronics-Shaftencoders, CD Sensors, Vision System, etc.

UNIT II

Drives and Actuators: Hydraulic and Pneumatic drives, Electrical Actuators such as servomotor and Steppermotor, Drive circuits, open and closed loop control; Embedded Systems:

Hardware Structure, Software Design and Communication, Programmable Logic Devices, Automatic Controland Real Time Control Systems;

UNIT III

Smart materials: Shape Memory Alloy, Piezoelectric and Magnetostrictive Actuators: Materials, Static and dynamic characteristics, illustrative examples for positioning, vibration isolation, etc.

Micromechatronic systems: Microsensors, Microactuators; Micro-fabrication techniques

UNIT IV

LIGA Process: Lithography, etching, Micro-joining etc. Application examples; Case studies, Examples of Mechatronic Systems from Robotics Manufacturing, Machine Diagnostics, Road vehicles and Medical Technology.

Text Books:

1) Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (ThomsonLearning Inc.)
2) Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education
3) A Textbook of Mechatronics ,R.K.Rajput, S. Chand & Company Private Limited
4) Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton,Prentice Hall

Open Elective II: CSE 305C Computer Networks

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	:	**25 Marks**
Examination	:	**75 Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

Unit 1 (10 Lectures)

OSI Reference Model and Network Architecture: Introduction to Computer Networks, Example Networks ARPANET, Internet, Private Networks, and Network Topologies: Bus, Star, Ring, Hybrid, Tree, Complete, Irregular –Topology; Types of Networks: Local Area Networks, Metropolitan Area Networks, Wide Area Networks; layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer.

Unit 2 (10 Lectures)

TCP/IP: Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, TransmissionControl Protocol , User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Internet Control Protocols, ARP, RARP, ICMP, Application Layer, Domain Name System, Email – SMTP, POP,IMAP; FTP, NNTP, HTTP, Overview of IP version 6.

Unit 3 (10 Lectures)

Local Area Networks: Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.

Unit 4 (10 Lectures)

Wide Area Networks: Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed Queue Dual Bus (DQDB), Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), Frame Relay, Wireless Links.

Introduction to Network Management: Management, Class of Service, Quality Firewalls, VLANs, Proxy Servers. Remote Monitoring Techniques: Polling, Traps, Performance of Service, Security management, Digital signatures, SSL.

Text/Reference Books:

1. Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996.
2. Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley,Low Price Edition.
3. Business Data Communications, Fitzgerald Jerry, Computer Networks – A System Approach, Larry L. Peterson &Bruce S. Davie, 2nd Edition.

Course Outcomes: After completing the course, student will demonstrate the ability to:

1. To understand the organization of computer networks, factors influencing computer network development and the

reasons for having variety of different types of networks.

2. To apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
3. To design a network routing for IP networks.
4. To demonstrate proper placement of different layers of ISO model and illuminate its function and determine properusage of the IP address, subnet mask and default gateway in a routed network.

Open Elective II: CSE 431C Cyber Security

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	:	**25 Marks**
Examination	:	**75 Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

Unit 1 (10 Lectures)

Introduction To Cybercrime:- Cybercrime and Information Security, Classificationsof Cybercrimes, The need for Cyber laws, The Indian IT Act Challenges to Indian Law and Cybercrime Scenario in India, Weakness in Information Technology Act and it consequences, Digital Signatures and the Indian IT Act, Cybercrime and Punishment; Technology, Students and Cyber law; Survival tactics for the Netizens, Cyber-offenses: Cybers talking, Cyber cafe and Cyber crimes, Botnets, Attack Vector, Cloud Computing.

Unit 2 (10 Lectures)

Tools And Methods Used In Cybercrime:- Proxy Servers and Anonymizers, Phishingand identity theft, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Stenography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow; Cybercrime: Mobile and Wireless Devices: Trends in Mobility, Attacks on Wireless Networks, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges, Registry Settings for Mobile Devices, Authentication Service Security Attacks on Mobile/Cell Phones.

Unit 3 (10 Lectures)

Understanding Computer Forensics:- The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Computer Forensics and Stenography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Forensics Auditing, Anti forensics.

Unit 4 (10 Lectures)

Cyber security Organizational Implications:- Cost of Cybercrimes and IPR Issues,Web Threats for Organizations, Security and Privacy Implications from Cloud Computing, Social Media Marketing, Social Computing and the Associated Challenges for Organizations, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling, Forensics Best Practices, Media and Asset Protection, Importance of Endpoint Security in Organizations.

Text/Reference Books:

1. "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole, SunitBelapur, Wiley India Publications, April, 2011.

Course Outcomes: After completing the course, student will demonstrate the ability to:

1. Able to demonstrate cyber crime its laws and related terms.
2. Work with SQL injection, DOS attacks etc.
3. Explain computer forensic, Network forensic cyber forensic.
4. Understand safe computing guidelines, usage policies and incident handling.

Open Elective II: CHE457C Industrial Safety

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	:	**25 Marks**
Examination	:	**75 Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

Unit 1 (10 Lectures)

Introduction: Concept of loss prevention, origin of process hazards, types of process hazards, acceptable risks, accident and loss statics, nature of accident process, concepts of inherent safety in plants or Factories, dose Vs response curve, toxicants entry route, thresh limit values, safety regulations.

Unit 2 (10 Lectures)

Hazards: Fire, Chemical (industrial and laboratory scale), electrical, mechanical, biohazards (natural and anthropogenic), toxic materials, their types and preventive measures, Liquid and vapor phase hazardous methods, storage and handling, containment, precautions, Personal safety precautions.

Unit 3 (10 Lectures)

Risk management principles, risk analysis techniques, risk control, hazards operability studies, hazard analysis, Fault tree analysis, Consequences analysis, human error analysis, accidental error analysis, economics of risk management, check list, reliability theory, event tree, HAZOP, safety reviews, what if analysis.

Unit 4 (10 Lectures)

Safety audit, procedure for safety auditing, audit report, safety report, safety training, emergency planning and disaster management, introduction to security risk factors tables.

Text Books:

1. Chemical Hazards and safety, 2nd Edition, DawandeDenet& Co. , 2012
2. Loss preventions in process industries, Lees Butterworth-Heinemann, 1980.
3. Industrial safety Handbook, William and Handley, McGraw Hill.

Reference Books:

1. Safety and Hazard management in Chemical Industries, Vyas, Atlantic 2013.
2. Industrial safety, health environment & Security, Basudev Panda, Laxmi publication ISBN- 97893-81159-43-9.
3. Industrial Safety and Health Management, 4th Edition, C. Ray Asfahl, Prentice Hall International Series, 1984.
4. Industrial Accident Prevention : A Safety Management Approach, Herbert William Heinrich.

Course Outcomes: After completing the course, student will demonstrate the ability to:

1. Analyze the effect of release of toxic substances.
2. Understand the industrial laws, regulations and source models.
3. Understand the methods of hazard identification and preventive measures and develop safety programs to prevent the damage or loss.
4. Conduct safety audits and improve safety practices

Open Elective II: CE406C Disaster Management

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	:	**25 Marks**
Examination	:	**75 Marks**
Total	:	**100 Marks**
Duration of Examination	:	**3 Hours**

Unit 1 (10 Lectures)

Introduction to Disaster Management: Disaster, Emergency, Hazard, Mitigation, Disaster Prevention, Preparedness and Rehabilitation, Risk and Vulnerability, Classification of Disaster, Natural and Man-made Disasters, International day and Decade of Disaster Reduction.

Risk and Vulnerability to disaster mitigation and management options: Warning and Forecasting.

Unit 2 (12 Lectures)

Hydro-meteorological based disasters I: Disaster Management Act 2005, Role of NDMA, NDRF, NIDM, Tropical Cyclones, Floods, droughts, mechanism, causes, role of Indian Metrological Department, Central Water Commission, structure and their impacts, classifications, vulnerability, Early Warning System, Forecasting, Flood Warning System, Drought Indicators, recurrence and declaration, Structural and Non-structural Measures.

Hydro-meteorological based disasters II: Desertification Zones, causes and impacts of desertification, Characteristics, Vulnerability to India and Steps taken to combat desertification, Forest Fires; Causes of Forest Fires; Impact of Forest Fires, Prevention.

Unit 3 (10 Lectures)

Geological based disasters: Earthquake, Reasons, Compression, Shear, Rayleigh and Love Waves; Magnitude and Intensity Scales, Direct and Indirect Impact of Earthquake; Seismic Zones in India, Factors, Indian Standards Guidelines for RCC and Masonry Structures, Prevention and Preparedness for Earthquake, Tsunamis, Landslides and avalanches: Definition, causes and structure; past lesson learnt and measures taken; their Characteristic features, Impact and prevention, Atlas (BMTRPC); structural and non-structural measures.

Unit 4 (10 Lectures)

Manmade Disasters I: Chemical Industrial hazards; causes and factors, pre- and post-disaster measures; control; IndianStandard Guidelines and Compliance;

Traffic accidents; classification and impact, Fire hazards; Classification as per Indian Standards;

Fire risk assessment; Escape routes; fire-fighting equipment; classification of buildings, fire zones, occupancyloads; capacity and arrangements of exits,

Use of remote sensing and GIS in disaster mitigation and management.

Text Books:

1. Thomas D. Schneid , Disaster Management and Preparedness, CRC Publication, USA, 2001.
2. Patrick Leon Abbott, Natural Disasters, Amazon Publications, 2002.
3. Ben Wisner., At Risk: Natural Hazards, People vulnerability and Disaster, Amazon Publications, 2001.
4. Oosterom, Petervan, Zlatanova, Siyka, Fendel, Elfriede M., "Geo-information for Disaster Management", Springer Publications, 2005.

5. Savindra Singh and Jeetendra Singh, Disaster Management, Pravalika Publications, Allahabad.
6. Nidhi Gauba Dhawan and Ambrina Sardar Khan, Disaster Management and Preparedness, CBS Publishers & Distribution.

Reference Books:

1. Selected Resources Published by the National Disaster Management Institute of Home Affairs, Govt. of India, NewDelhi.

Course Outcomes: After completing the course, student will demonstrate the ability to:

1. Understand the significance of disaster management.
2. Analyze the occurrences, reasons and mechanism of various types of disaster.
3. Understand the preventive measures as Civil Engineer with latest codal provisions.
4. Apply the latest technology in mitigation of disasters.

ECE327C Consumer Electronics

B. Tech. Semester – VI (Computer Science and Engg.)

L	T	P	Credits
3	0	0	3

Class Work	**:**	**25 Marks**
Examination	**:**	**75Marks**
Total	**:**	**100 Marks**
Duration of Examination	**:**	**3 Hours**

Unit I (12 Lectures)

Monochrome TV (Introduction): Elements of a TV System, Picture transmission, Sound transmission, Picture reception, Sound reception, Synchronization, Receiver control, Image continuity, Scanning Process, Aspect Ratio, Flicker, Composite Video Signal, Picture Elements, Kell factor, Vertical Resolution, Horizontal Resolution, Video bandwidth, Interlacing, 625 Line System, Bandwidths for TV Transmission, Vertical and horizontal synch detail, Vestigial Side Band transmission(Advantages and Disadvantages)

Monochrome TV (Picture and Camera Tubes): Monochrome picture tube, beam reflection, Beam focusing, Screen Phosphor, Faceplate, Picture tube characteristics, picture tube circuit controls, Monochrome Camera Tubes: Basic principle, Image Orthicon, Vidicon, Plumbicon

Unit II (12 Lectures)

Colour TV Essentials: Compatibility , Colour perception, Three Colour theory, Luminance, Hue and Saturation, Dispersion and Recombination of light, Primary and secondary colours, luminance signal, Chrominance Signal, Colour picture tube, colour TV Camera, Colour TV display Tubes, colour Signal Transmission, Bandwidth for colour signal transmission, Colour TV controls. Cable TV, Block Diagram and principle of working of cable TV.

Plasma and LCD: Introduction, liquidcrystals, types of LCD's,TN, STN, TFT, Power requirements, LCD working, Principle of operation of TN display, Construction of TN display, Behaviour of TN liquid crystals, Viewing angle, colour balance, colour TN display, limitatons, advantages, disadvantages, applications.

Unit III (10 Lectures)

LED and DMD : Introduction to LED Television , comparison with LCD and Plasma TV's, schematic of DMD, introduction to Digital Micro Mirror device, Diagram of DMD, principle of working, emerging applications of DMD.

Microwave Ovens and Air Conditioners: Microwaves, Transit Time, Magnetron, Waveguides, Microwave Oven, Microwave Cooking. Air conditioning, Components of air conditioning systems, all water Air conditioning systems, all air conditioning Systems, Split air conditioner.

Unit IV (11 Lectures)

Microphones: Introduction, characteristics of microphones, types of microphone: carbon, movingcoil, wireless, crystal, introduction to tape recorder.

Loudspeaker: Introduction to ideal and basic loudspeaker, loudspeaker construction types of loudspeaker: Dynamic and permanent magnet, woofers, tweeters, brief introduction to baffles, equalisers.

Text Books :

1. **Consumer Electronics by S. P. Bali, Pearson Education.**
2. Complete Satellite and Cable T.V by R.R Gulati, New Age International Publishers