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

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 – VIII); w.e.f. Session: 2021-22

A student can opt either Alternative-A or Alternative-B of the VIIIth semester scheme. In Alternative-A, students will undergo regular course work. Alternative-B includes one semester (minimum 16 weeks) internship/industrial training course. Students can opt Alternative-B only if he/she fulfills the pre-requisites as per guidelines given below the scheme.

Alternative - A

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		**Professional Elective-IV**	3	0	0	25	75	-	100	3	3
2		**Professional Elective -V**	3	0	0	25	75	-	100	3	3
3		**Professional Elective -VI**	3	0	0	25	75	-	100	3	3
4		Open Elective-III	3	0	0	25	75	-	100	3	3
5	ME 402C	Major Project	0	0	16	25	-	75	100	8	3
	ME 406C	General Fitness for the Profession	-	-	-			100	100	-	-
Total			**12**	**0**	**16**	**125**	**300**	**175**	**600**	**20**	

Professional Elective – IV Courses (A Student has to select any one)			**Professional Elective – V Courses (A Student has to select any one)**		
S. No.	**Course Code**	**Course Title**	**S. No.**	**Course Code**	**Course Title**
1	ME 422C	Industrial Engineering and Management	1	ME 432C	Computing Techniques
2	ME 424C	Energy Conservation and Management	2	ME 434C	Finite Element Analysis
3	ME 426C	Machine Tool Design	3	ME 436C	Modern Manufacturing and Materials

Professional Elective – VI Courses (A Student has to select any one)		
1	ME 442C	Automobile Engineering
2	ME 444C	Design of Transmission Systems
3	ME 446C	Principles of Management
4	ME448C	Process Planning and Cost Estimation

List of Open Elective-III (A Student has to select any one)					
S. No.	Course Code	Course Title	S. No.	Course Code	Course Title
1	CSE340C	Artificial Intelligence & Expert Systems	4	ME452C	Fundamentals of Sustainable Manufacturing
2	EE452C	Electrical and Hybrid Vehicles	5	CHE459C	Nano-Science and Nano-Technology
3	MGT401C	Entrepreneurship	6	EE454C	Smart Grid

Alternative – B

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 404C	Internship	-	-	-	250	-	250	500	20	3
2	ME 406C	General Fitness for the Profession	-	-	-			100	100	-	-
Total			**-**	**-**	**-**	**250**	**-**	**350**	**600**	**20**	

A) Guidelines for Internship

A student can opt for Internship (minimum 16 weeks) in 8th semester, in lieu of course work of 8th semester, in joint supervision of internal supervisor (allotted by the Department) and the supervisor/official of the organization under whom the candidate is associated for internship. A student can arrange the internship at his/her own and arranging internship for a student by the Department is never his/her right.

Pre-requisite conditions:

The student has got selected through on-campus/off-campus placement and the same employer is willing to take that student for the Internship.

The student has got offer of pursuing Internship from Government research organization/govt. sponsored projects IIT'S/IIIT'S/IIMs/CDAC.

The student has got offer of pursuing Internship from reputed private organization.

For pursuing Internship, student will require the prior approval of the Director/Principal of the institute or Chairperson of the University Department. While allowing Internship, the institute/department concerned must insure that the proposed Internship schedule does not disturb the academic calendar in force. The candidate should submit a synopsis of the proposed work to be done during Internship. This synopsis should be submitted to the Department before the start of the internship semester. The synopsis received will be examined/evaluated by the Departmental committee. The student will be allowed for internship only after approval of synopsis by the Departmental committee.

Intimation of commencement of internship shall be submitted to the Chairperson concerned before the commencement of the ongoing semester.

They will have to further deposit the 8th Semester fee. The internship will not be permitted through online mode

If a student feels that the internship work is not of high quality/not-related to their field of interest, then he/ she should submit the application to the Department within two weeks and can re-join the institute to carry out the course work of 8th Semester.

The internal supervisor will monitor the student specific progress of the internship. The overall monitoring of industrial training has to be done by a Departmental Faculty Co-coordinator for Internship.

The Departmental Faculty Co-coordinator will be allotted total weekly teaching load of 2 periods, while each internal supervisor will be allotted total weekly teaching load of 1 period (supervising upto 4 students), and 2 periods , if supervising more than 4 students.

Evaluation Process:

Each student will submit 3 copies of the detailed internship report to the Department in prescribed format at the conclusion of training.

Internal assessment/ Sessional of Internship will be made jointly by the Departmental Faculty Co-coordinator for Internship, the concerned organization training supervisor/official and internal supervisor.

Assessment by the External supervisor/Mentor = 40% of Internal Assessment Marks

Assessment by the internal supervisor and Departmental Faculty Co-coordinator for Internship = 60% of Internal Assessment Marks

Practical Examination Assessment of Internship will be made by the committee consisting of the Chairperson of the Department, Departmental Faculty Co-coordinator for Internship and one external examiner appointed by the University.

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 of India.
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 working principles 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 conditioning processes.

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 ; and applied 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-H2O based 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 by the 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 at exp. 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 to achieve the following objectives:

- To expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence, creating competent professionals in the industry.
- To Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills 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 relevant aspects 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 working environment 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 activities done 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 the student 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 equal weightage, 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 energy resources.
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 plant design, 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 McGraw Hill 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 the implications 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 condition Monitoring.

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 Freedom system

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., Simchi Levi 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 of electrical 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 Industrial applications.

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- Shaft encoders, CD Sensors, Vision System, etc.

UNIT II

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

Hardware Structure, Software Design and Communication, Programmable Logic Devices, Automatic Control and 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 (Thomson Learning 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 proper usage of the IP address, subnet mask and default gateway in a routed network.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

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, Sunit Belapur, 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.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

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

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

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; Indian Standard 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, occupancy loads; 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, New Delhi.

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.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

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**

Reference Books:

1. Monochrome and ColourTelevision by R. R. Gulati, New Age International Publishers

Note:

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 attempt only five questions selecting at least one question from each unit.

The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course outcomes: At the end of the course, students will demonstrate the ability to:

1. Identify and explain basic working of electronics products like TV, Microphone, loudspeaker, AC, Microwave ovens.
2. Learn various components of composite video signal and differentiate between line, brightness, saturation and to design the lower power consumption device, the primary challenge is how to minimize overall cost.
3. Acquire ability to design different display screen so that effect of radiations on eyes will be reduced.
4. Understand the general importance of product safety to consumers & producers will reduce the various adverse impacts of these devices on common man.

ME 402C Major Project

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits
0	0	16	8

Class Work	**:**	**25 Marks**
Examination (Practical)	**:**	**75 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 the student is expected to complete the study/modeling/ design part of the project.

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: Design/Innovate/ creative product or solution using his/her professional capability.

CO3: Prepare project reports.

CO4: Effectively communicate details of the project undertaken.

The assessment of the class work for Major Project will be evaluated through two presentations, with equal weightage, 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 assessment of practical/Examination component for Major Project will be evaluated through a panel of examiners consisting of the following:

1. Chairman of Department: Chairperson
2. Major Project coordinator: Member Secretary
3. External Expert: To be appointed by the University

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/her 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 406C General Fitness For the Profession

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits (Audit Pass)			
0	0	0	0	**Class Work**	**:**	**0 Marks**
				Practical	**:**	**100Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

General Fitness for the Profession (ME 406C) is a compulsory & qualifying course (Audit Pass). The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

Course Outcomes: This course is intended to evaluate the overall fitness of students as a result of 4 years of engagement in the degree course. At the end of the course, the student will be able to:

CO1: Attain quality in professional competence.

CO2: Compete in the professional field on the basis of temperament, attitude and outlook.

CO3: Participate on issues pertaining to society, community and nation at large.

CO4: Effectively communicate on technical and societal issues.

The evaluation for this course will assess the performance of student; at the end of 8th semester, in all types of programme activities like Academics, Cultural, Sports, NSS, organisation of camps, social activities etc., during the 8 semester period.

The student will submit a written report and present the same before the evaluation committee orally for assessment. The report and presentation should highlight the followings:

I. Academic Performance **(20 Marks)**
II. Extra-Curricular Activities / Community Service, Hostel Activities **(12 Marks)**
III. Technical Activities / Industrial, Educational tour **(12 Marks)**
IV. Sports/games **(16Marks)**
V. Written and oral communicative skill **(40 Marks)**

The evaluation of the General Fitness will be made by the committee of examiners constituted as under:

1. Chairperson of the Department : Chairperson
2. Final Year Coordinator of the Department : Member
3. External Examiner : Appointed by the University

ME 404C Internship

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
0	0	-	20	Class Work	:	250 Marks
				Examination (Practical)	:	250 Marks
				Total	:	500 Marks
				Duration of Examination	:	3 Hours

Course Objectives: This course is intended to provide students the practical exposure to industrial setup. This is also intended to provide him/her the platform to explore his professional engagement with the training organization. This course is further expected to increase the employability of the graduate trainee.

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.

Each student will undergo industrial training/Internship (minimum 16 weeks) in joint supervision of internal supervisor (allotted by the Department) and the supervisor/official of the organization under whom the candidate is associated for training/internship. The internal supervisor will monitor the student specific progress of the internship. The overall monitoring of industrial training has to be done by a departmental faculty co-coordinator.

Evaluation Process:

Each student will submit 3 copies of the detailed internship report to the Department in prescribed format at the conclusion of training.

(A) Internal assessment/ Sessional of Internship will be made jointly by the Departmental Faculty Co-coordinator for Internship, the concerned organization training supervisor/official and internal supervisor.

Assessment by the External supervisor/Mentor = 40% of Internal Assessment Marks

Assessment by the internal supervisor and Departmental Faculty Co-coordinator for Internship = 60% of Internal Assessment Marks

(B) Practical Examination Assessment of Internship will be made by the committee consisting of the Chairperson of the Department, Departmental Faculty Co-coordinator for Internship and one external examiner appointed by the University.

The Following criteria are to be followed for evaluation in each of the Internal assessment/ Sessional as well as practical assessments:

- Detail of training undergone: 40%
- Adequacy and quality of report: 20%
- Quality of learning through Training Project: 20 Marks
- Effectiveness of presentation/Communication skill and Team Work: 20%

ME422C Industrial Engineering and Management
B. Tech. Semester – VIII (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 different types of production systems, the related decision variables, and methods for improving operations and worker safety.
CO2: Perform cost and breakeven analysis and appreciate the strategic role of materials management.
CO3: Explain the product design and development process and associate product design with process design and process selection.
CO4: Appreciate manufacturing strategy and Supply Chain as pathways for competitive advantages.

UNIT I

Introduction: Brief history and Definition of Industrial Engineering, Objectives, relevance of industrial engineering for achieving excellence in industry, types of decisions in industrial engineering.
Production System and Productivity: Value addition process, Production system, types of production system, conceptual model of a production system, Productivity-definition, measurement, factors effecting productivity, ways and strategies to improve productivity.
Work Study- Introduction, Method study- basic procedure of method study, recording techniques, various charts, therbligs etc. Work measurement- basic procedure, various techniques like time study, work sampling, PMTS etc.
Workforce management:- Introduction, recruitment, selection**,** employees empowerment, quality circles, team work etc., **Job design**- Job specialization, job enlargement, job rotation, job enrichment, training etc

UNIT II

Manufacturing cost analysis- fixed & variable cost, direct & indirect cost, Estimation of overheads, Break even analysis.
Materials management- strategic importance, need for integrated approach to materials management- role of value analysis and purchase price analysis, materials handling, inventory control, stores management, waste management. Relevant costs, Overview of inventory models and inventory control models, selective inventory control, JIT- materials management approach.

UNIT III

Product development and design: product development approaches, product development process, Product life cycle (PLC) concept. Product design**-** Various approaches: concurrent engineering, designing for customer-quality function deployment (QFD), design for manufacture and assembly (DFMA), rapid prototyping, design for environment, Role of 3S- standardization, simplification, specialization, role of ergonomics in product design, introduction to value engineering.
Process planning: Introduction, forms of transformation process**,** selection of process, use of break-even analysis.

UNIT IV

Manufacturing strategy and competitiveness
Brief review of manufacturing strategy, measures of manufacturing performance, internal and external aspects of performance measures, order wining and order qualifying criteria, SWOT analysis, five force model, linkage between manufacturing and corporate strategy.
Elements , benefits, and implementation aspects of various approaches: JIT, TQC, TPM
Management of Supply Chains and Service Systems
Overview of supply chain management, Introduction to simulation, Monte Carlo simulation, applications in IE. Management Information System: meaning, importance and role in decision making, Service processes: Introduction, difference between manufacturing and service operations, a conceptual model of service quality

Textbooks:-

1. Industrial engineering & Management by Dr. Ravi Shankar - Galgotia publication
2. Industrial engineering & Management by Dr. B. Kumar – Khanna publication
3. Industrial Engineering by A P Verma - S. K. Kataria and sons
4. Production and Operations Management by Charry- TMH publication

Reference books:-

1. Operations Management by Chase, Jacobs and Aquilano - TMH publication

ME424C Energy Conservation And Management
B. Tech. Semester – VIII (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: Explain the principles of energy conservation, Energy audit, Energy Management and related environmental issues.
CO2: Evaluate the energy saving & conservation in different utilities.
CO3: Explain Energy audit process and methods and the instruments for energy audit for thermal system.
CO4: Perform economic evaluation life cycle cost analysis of thermals systems.

UNIT I

Energy conservation: Introduction, Principles of energy conservation, Energy consumption pattern, Resource availability, Energy pricing, Energy Security, Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope, Evaluation of overall thermal transfer

UNIT II

Energy conservation in utilities: Energy efficiency in boilers, furnaces, steam systems, cogeneration utilities, waste heat recovery, compressed air systems, HVAC & R systems, I.C. Engine, fans and blowers, pumps, cooling tower, DG Sets. Energy conservation in electrical utilities: power factor improvement, electric motor, illumination, scope of energy conservation in lightening.

UNIT III

Energy Audit: Definition, objective and principles of Energy Management, Need of Energy Audit and Management, types of energy audit, audit process, Guidelines for writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations and energy audit report, energy audit of building system, lighting system, HVAC system, Water heating system, heat recovery opportunities during energy audit, Industrial audit opportunities, Instruments for Audit and Monitoring Energy and Energy Savings

UNIT IV

Energy Economics: Simple Payback Period, Time Value of Money, Internal Rate of Return, Net Present Value, Life Cycle Costing, Equivalent uniform annual cost (EUAC), Life cycle cost, Discounting factor, Capital recovery, Depreciation, taxes and tax credit, Impact of fuel inflation on life cycle cost, Cost of saved energy, cost of energy generated, Energy performance contracts and role of Energy Service Companies (ESCOs).
Energy Management and Environment: Importance and role of Energy management, Kyoto protocol, Clean development mechanism (CDM), Geopolitics of GHG control; Carbon Market

Textbooks:-

1. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, Latest Edition, CRC Press
2. Handbook of Energy Audits, Albert Thumann, Latest Edition, The Fairmont Press
3. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience publication
4. Heating and Cooling of Buildings - Design for Efficiency, J. Krieder and A. Rabl, McGraw Hill Publication, latest edition.
5. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation, E J Wilson and D Gerard, Blackwell Publishing

Reference books:-

1. Energy Management, Commonwealth Publication, New Delhi, P.R. Trivedi, K.R. Jolka, Latest Edition, CRC Press
2. Economics of Solar Energy and Conservation System by Kreith, Volume 3.
3. Bureau of Energy Efficiency Reference book: No.1, 2, 3 4

ME 426C Machine Tool Design

B. Tech. Semester – VIII (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: Evaluate motion, forces and power and machining accuracy in different machine tools.
CO2: Design machine tool structures and drives.
CO3: Design speed and feed boxes of machine tool structures.
CO4: Design slide Ways, Guide Ways and Spindles of machine tools

UNIT-I

Analysis of Forces, Velocities and Power Requirements during metal cutting: Turning, Drilling, Milling, Grinding, Planning, Shaping and Broaching.

General Requirements of the Machine Tool: Accuracy of Shape, Dimensional accuracy and surface finish of the components produced. Productivity and Efficiency of Machine tools

UNIT-II

Design Principles: Stiffness and Rigidity of Constructional Elements and Machine Tools under Load, Static Rigidity, Dynamic Rigidity, Brief discussion of Natural frequencies, Damping, Mode of Vibration in Machine Tools.

Standardization of Spindle Speeds and Feed Rates: Layout of Speed Change Gears. Saw Diagrams of Mechanical Stepped Drives in Machine Tools for different series, Layout of the Intermediate Reduction Gears, Calculation of Transmission Ratios, Pulley Diameter, Gear Wheel Diameters and Number of Teeth, Ray Diagram, Speed Diagram.

UNIT-III

Electrical, Mechanical and Hydraulic Drives for the Operational Movements: Electric Drive and Control Equipment, Mechanical and Hydraulic Drives, Drives for Producing Rotational Movements, Stepped Drives, Step less Drives. Drives for Producing Rectilinear Movements, Backlash Eliminator in the Feed Drive Nut.

Design of Constructional Elements: Machine Tool Structures, Structural Elements Design for Centre Lathe, Drilling Machine, Knee Type Milling Machine, Planning Machine, Boring Machine, and Grinding Machines.

UNIT-IV

Design of Slide Ways: Design of Slide ways for Tables, Saddles and Cross-slides, Antifriction Bearings for slide ways, Hydrostatically Lubricated Slide ways.

Design of Spindles and Spindle Bearings: Design of Spindles for Strength and Stiffness, Design of Spindles for Balancing, General Layout and Design of the Driving Elements and the Spindle Bearings, Selection and General Layout of Ball and Roller Bearings for Supporting Spindles. Brief discussion on Design of Secondary Drives for Machine Tools

Text Books:

1. Machine Tool Design by N. K. Mehta, 3e, McGraw Hill Publishing
2. Machine tool design by Sen and Bhattacharya, CBS Publications Oxford and IBH Publishing

Reference Books:

1. Machine Tool Design by S.K, Basu, Design
2. Machine Tool Design by Acherkan, Mir publishing
3. Principles of Metal-Cutting Machine Tools by F. Koenigsberger

ME 432C Computing Techniques

B. Tech. Semester – VIII (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: Understand and appreciate the importance of errors associated with scientific computing and accuracy requirements.
CO2: Understand the computing techniques and the inherent limitations of the techniques.
CO3: Understand the significance of computing methods, their strengths and application areas.
CO4: Perform the computations on various data using appropriate computation tools.
CO5: Understand and implement Discrete Fourier Transform, Fast Fourier Transform.

Unit-I

Chapter-1

Introduction to numerical computing: Numeric data, analog computing, digital computing, process of numerical computing and characteristics, Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy; Computer arithmetic -Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Error propagation, Minimizing the total error.

Chapter-2

System of liner equations: Linear Systems, Solving Linear Systems, Gaussian elimination, Pivoting, Gauss-Jordan, Norms and Condition Numbers, Iterative Methods for Linear Systems Linear least squares: Data Fitting, Linear Least Squares, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization.

Unit-II

Chapter-3

Eigen values and singular values: Eigen values and Eigenvectors, Methods for Computing All Eigen values, Jacobi Method, Methods for Computing Selected Eigen values,

Chapter-4

Nonlinear equations: Fixed Point Iteration, Newton's Method, Inverse Interpolation Method Interpolation: Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation

Unit-III

Chapter-5

Numerical Integration and Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation,

Chapter-6

Initial Value Problems for ODEs, Euler's Method, Taylor Series Method, Runga-Kutta Method, Extrapolation Methods, Boundary Value Problems for ODEs, Finite Difference Methods, introduction to Finite Element Method.

Unit-IV

Chapter-7

Partial Differential Equations, Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods,

Chapter-8

Continuous Fourier Series, Frequency and Time Domains, Fourier Integral and Transform, Discrete Fourier Transform (DFT),Fast Fourier Transform (FFT), The Power Spectrum, Introduction to Curve Fitting with Software Packages.

Text/ Reference Books:

1. Computational Methods in Engineering, S.P. Venkateshan and Prasanna Swaminathan, Ane Books Pvt. Ltd
2. Numerical Methods, E. Balagurusamy, Tata McGraw-Hill Education
3. Numerical Methods for Engineers, Steven C. Chapra Raymond P. Canale, McGraw Hills, 6th edition
4. Computational Science, Kiryanov D. and Kiryanova E., Infinity Science Press, 1st Ed., 2006
5. Scientific Computing With MATLAB and Octave, Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, Springer, 3rd Ed., 2010

ME 434C Finite Element Analysis

B. Tech. Semester – VIII (Mechanical Engineering)

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

Objectives:

1. To illustrate the principle of mathematical modeling of engineering problems
2. To introduce the basics and application of Finite Element Method

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

CO1: Perform finite element formulations for simple engineering problems
CO2: Understand the concepts of discretization and various types of finite elements
CO3: Understand use of finite element in structural and thermal problems
CO4: Use commercial finite element software and understand its structure.
CO5: Write formal technical report based on the finite element analysis of engineering problem

Unit-I

Chapter-1

Historical Background, Mathematical modeling of field problems in engineering, governing equations, discrete and continuous models, boundary and initial value problems,

Chapter-2

Weighted Residual Methods, Variational formulation of boundary value problems, Ritz technique, Basic concept of Finite Element Method.

Unit-II

Chapter-3

One dimensional second order equation, discretization, linear and higher order elements, derivation of shape functions, Stiffness matrix and force vectors, assembly of elemental matrices, Solution of problems from solid mechanics and heat transfer,

Chapter-4

Solution of problems from longitudinal vibration and mode shapes, fourth order beam equation, transverse deflections and natural frequencies.

Unit-III

Chapter-5

Two dimensional equations, variational formulation, finite element formulation, triangular elements- shape functions, elemental matrices and RHS vectors; Application to thermal problems,

Chapter-6

Application to torsion of non-circular shafts, quadrilateral and higher order elements; Plane stresses and plane strain problems, body forces and thermal loads, plate and shell elements.

Unit-IV

Chapter-7

Natural coordinate systems, isoparametric elements and shape functions, numerical integration and application to plane stress problems, matrix solution techniques,

Chapter-8

Solution of dynamic problems, introduction to FE software.

Text Books:

1. Reddy J.N., An Introduction to Finite Element Method, 3rd ed., Tata McGraw Hill, 2005.
2. Seshu P., Text Book of Finite Element Analysis, Prentice Hall, New Delhi, 2007.
3. Rao S.S., The Finite Element Method in Engineering, 3rd ed., Butterworth Heinemann,
4. Chandraputla & Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall,

ME 436C Modern Manufacturing and Materials
B. Tech. Semester – VIII (Mechanical Engineering)

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

Objectives:
1. To illustrate the principle of mathematical modeling of engineering problems
2. To introduce the basics and application of Finite Element Method

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

CO1: Discuss Additive Manufacturing, Rapid prototyping and their applications .
CO2: Describe Micro-machining/Powder Metallurgy and Surface Treatment processes.
CO3: Illustrate the types and Applications of different ceramic and smart materials.
CO4: Describe the types and Applications of different composite materials.

UNIT - I

Additive Manufacturing (AM): Introduction and Classification of AM process, Need for Additive Manufacturing, Fundamentals of Additive Manufacturing and Prototyping, methods of Additive Manufacturing, Applications of AM in rapid prototyping, rapid manufacturing, rapid tooling, repairing and coating, Pre and post Processing in Additive Manufacturing

UNIT – II

Micromachining – definition - principle of mechanical micromachining - Classification of Micro-machining processes and methods

Powder Metallurgy: Introduction to Powder Metallurgy process, preparation of powders, types & function of binders, advantages disadvantages and application of powder metallurgy products

Surface Treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, methods of coating, economics of coating. Electro forming, Chemical vapour deposition, thermal spraying.

UNIT III

Ceramic material: Structural ceramics, Applications, characteristics, classification ,properties, Processing of particulate ceramics, WC, TiC, TaC, Al2O3, SiC, Si3N4, CBN and diamond -properties, processing and application

Smart Material: Classification, types of smart material, carbon nanotechnology tubes and applications.

UNIT IV

Composite material: Definition- Rule of mixtures, methods of manufacturing, Matrix materials-polymers-metals-ceramics, Reinforcements: Particles, whiskers, inorganic fibres, metal filaments- ceramic fibres- natural composite, Advantages and drawbacks of composites over monolithic materials. Properties and applications of composites

Text Books:

1. M. P. Groover, "Principles of Modern Manufacturing," 5 th Edition, Wiley, India, 2014.
2. James A. Murphy- Surface Preparation and Finishes for Metal, McGraw-Hill, New York 1971
3. Manufacturing Engineering and Technology IKalpakijian / Adisson Wesley, 1995
4. Process and Materials of Manufacturing / R. A. Lindburg / 1th edition, PHI 1990.
5. Jain V. K. - 'Introduction to Micromachining' - Narosa Publishing House – 2010

Reference Book:

1. Madou M. J. - 'Fundamentals of Microfabrication' - CRC Press - 2009 - 2nd Edition
2. I. Gibson, D. W. Rosen, and B. Stucker, "Additive manufacturing technologies," New York: Springer. 2010
3. Andreas Gebhardt, Understanding additive manufacturing: rapid prototyping, rapid tooling, rapid manufacturing, Hanser Publishers, 2011

ME 442C Automobile Engineering

B. Tech. Semester – VIII (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:

To understand the construction and working principle of various parts of an automobile

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

CO1: Describe the details, constituents and technologies of Automobiles.
CO2: Discuss the details of the transmission system of an Automobile.
CO3: Explain the types and operation of Steering, suspension and braking system in Automobiles.
CO4: Discuss different alternative energy sources/ fuels in for Automobiles.

Unit-I

Types of automobiles, vehicle construction and layouts, chassis, frame and body, vehicle aerodynamics, IC engines-components, function and materials, variable valve timing (VVT), Engine auxiliary systems, electronic injection for SI and CI engines, unit injector system, rotary distributor type and common rail direct injection system, transistor based coil ignition & capacitive discharge ignition systems, turbo chargers (WGT, VGT), engine emission control by 3-way catalytic converter system, Emission norms (Euro & BS).

Unit-II

Transmission systems, clutch types & construction, gear boxes-manual and automatic gear shift mechanisms, Over drive, transfer box, flywheel, torque converter, propeller shaft, slip joints, universal joints, differential and rear axle, Hotchkiss drive and Torque tube drive.

Unit-III

Steering geometry and types of steering gear box, power steering, types of front axle, types of suspension systems, pneumatic and hydraulic braking systems, antilock braking system (ABS), electronic brake force distribution (EBD) and traction control.

Unit-IV

Alternative energy sources, natural gas, LPG, biodiesel, bio-ethanol, gasohol and hydrogen fuels in automobiles, modifications needed, performance, combustion & emission characteristics of alternative fuels in SI and CI engines, Electric and Hybrid vehicles, application of Fuel Cells

Text books:

1. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 1997.
2. Jain K.K. and Asthana R.B., Automobile Engineering, Tata McGraw Hill, New Delhi, 2002.
3. Heitner J., Automotive Mechanics, 2nd ed., East-West Press, 1999.

Reference book:

1. Heisler H., Advanced Engine Technology, SAE International Publ., USA, 1998.

ME 444C Design of Transmission Systems

B. Tech. Semester – VIII (Mechanical Engineering)

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

Objectives:

To learn about the design procedures for mechanical power transmission components

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

CO1: Inculcate an ability to design belt drives and selection of belt, rope and chain drives.
CO2: Understand and apply principles of gear design to spur gears and spur gear boxes.
CO3: Become proficient in design of helical, bevel gear and worm gear box.
CO4: Learn a skill to design multi-speed gear box for various applications.
CO5: Inculcate an ability to design clutches brakes and cams.

Unit-I

Chapter-1

Flexible transmission elements- design of flat belts & pulleys, selection of V-belts and pulleys, selection of hoisting wire ropes and pulleys, design of chains and sprockets

Chapter-2

Gear transmission- speed ratios and number of teeth, force analysis, tooth stresses, dynamic effects, fatigue strength, factor safety, gear materials; Design of straight tooth spur gear and parallel axis helical gears based on strength and wear considerations, pressure angle in the normal and transverse plane; equivalent number of teeth and forces for helical gears.

Unit-II

Chapter-3

Straight bevel gear- tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of a pair of straight bevel gears;

Chapter-4

Worm gear, merits & demerits, terminology, thermal capacity, materials, forces & stresses, efficiency, estimating the size of worm gear pair. Cross helical gears, terminology, helix angles, sizing of a pair of helical gears.

Unit-III

Chapter-5

Gear box- geometric progression, standard step ratio; Ray diagram, kinematics layout; Design of sliding mesh gear box- Design of multi-seed gear box for machine tool applications; constant mesh gear box, speed reducer unit; problems,

Chapter-6

Variable speed gear box; Fluid couplings, Torque converters for automotive applications, problems,

Unit-IV

Chapter-7

Cam design, types: pressure angle and undercutting base circle determination, forces and surface stresses; Design of plate clutches, axial clutches, cone clutches, internal expanding rim clutches; Electromagnetic clutches;

Chapter-8

Band and Block brakes, external shoe brakes, internal expanding shoe brake, problems

Text Books:

1. Shigley J., Mischke C., Budynas R. and Nisbett K., Mechanical Engineering Design, 8th ed., Tata McGraw Hill, 2010.
2. Jindal U.C., Machine Design: Design of Transmission System, Dorling Kindersley, 2010.
3. Maitra G. and Prasad L., Handbook of Mechanical Design, 2nd ed., Tata McGraw Hill, 2001.

ME 446C Principles of Management

B. Tech. Semester – VIII (Mechanical Engineering)

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

Objectives:

Broad objective of course is to understand the principles of management and their application to the functioning of an organization.

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

CO1: Describe the types of business organization its management, roles of manager and entrepreneurs.

CO2: Distinguish between strategic, tactical, and operational planning and explain the benefits, tools and techniques of planning.

CO3: Understand organizational structure and describe the major considerations in organizing an enterprise's resources, including human resources, and role of IT systems in management.

CO4: Describe the effective management skills needed to maximize individual and organizational productivity related to the internal and external environment and issues of ethics and social responsibility.

UNIT I

Definition of management, science or art, manager vs. entrepreneur; Types of managers managerial roles and skills; Evolution of management- scientific, human relations, system and contingency approaches; Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management

UNIT II

Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes

UNIT III

Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management.

UNIT IV

Directing, individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication. Controlling, system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Text Books:

1. Robins S.P. and Couiter M., Management, Prentice Hall India, 10th ed., 2009.
2. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education, 2004.
3. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999

ME448C Process Planning and Cost Estimation

B. Tech. Semester – VIII (Mechanical Engineering)

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

Objectives:

To introduce process planning concepts to make cost estimation for various products

Course Outcomes:

Upon completion of this course, the students will be able to use the concepts of process planning and cost estimation for various products

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

CO1: Explain Process planning, select material, production machine, equipments and tools using parts drawing; and calculate process parameters for production activity.

CO2: Comprehend the different elements of cost in manufacturing and their estimation procedure.

CO3: Calculate process times for metal cutting jobs on different machines.

CO4: Estimate cost of Production for different jobs in forging, welding, foundry and machining.

UNIT I

Introduction of Process Planning- methods of process planning, drawing interpretation, material evaluation, steps in process selection, production equipment and tooling selection Process planning activities- process parameter calculation for various production processes,

Selection of jigs and fixtures, selection of quality assurance methods, documents for process planning, economics of process planning, case studies

UNIT II

Introduction to cost estimation- importance of costing and estimation, methods of costing, elements of cost estimation, types of estimates, estimating procedure, estimation of labor cost, material cost, allocation of overhead charges, calculation of depreciation cost

UNIT III

Machining time estimation- importance of machine time calculation, machining time for different lathe operations, drilling and boring time calculations, Machining time calculation for Milling, Shaping, Planning and Grinding

UNIT IV

Production costs- Different production processes for different jobs, estimation of forging cost, estimation of welding cost, estimation of foundry cost, estimation of machining cost

Text Books:

1. Peter Scallan, Process Planning, Design/ Manufacture Interface, Elsevier Sci.&Tech. 2002.
2. Ostwald P.F. and Munoz J., Manufacturing Processes and Systems, 9th ed., John Wiley, 1998.
3. Chitale A.V. and Gupta R.C., Product Design and Manufacturing, 2nd ed., Prentice Hall, 2002.

Open Elective –III: CSE340C Artificial Intelligence & Expert Systems
B. Tech. Semester – VIII (Mechanical Engineering)

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

Unit 1(10 Lectures)

Introduction: The AI problems; what is an AI technique; Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving; Production systems; Control strategies: forward and backward chaining Exhaustive searches: Depth first Breadth first search.

Unit 2(10 Lectures)

Heuristic Search Techniques: Hill climbing; Branch and Bound technique; Best first search and A* algorithm; AND/OR Graphs; Problem reduction and AO* algorithm; Constraint Satisfaction problems Game Playing Minmax search procedure; Alpha-Beta cutoffs; Additional Refinements.

Unit 3(12 Lectures)

Knowledge Representation & Reasoning:- Propositional logic, First order predicate logic, Inference in FOPL, Skolemnisation; Resolution Principle and Unification; Forward & Backward chaining, Inference Mechanisms Horn's Clauses; Semantic Networks; Frame Systems and Value Inheritance; Conceptual Dependency**.**

Learning Techniques: - Supervised and unsupervised learning, Decision trees, Statistical learning models, Reinforcement learning.
Expert Systems: Introduction to Expert Systems, Architecture of Expert Systems; Expert System Shells; Knowledge Acquisition; Case Studies: MYCIN, Learning, Rote Learning; Learning by Induction; Explanation based learning.

Text Books/Reference Books:

1. Elaine Rich and Kevin Knight: Artificial Intelligence- Tata McGraw Hill.
2. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems- Prentice Hall of India.
3. Nils J.Nilsson: Principles of Artificial Intelligence- Narosa Publishing house.
4. Artificial Intelligence : A Modern Approach, Stuart Rusell, Peter Norvig, Pearson Education.
5. Artificial Intelligence, Winston, Patrick, Henry, Pearson Education.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Analyze and formalize problem and solve them using AI techniques
2. Use Heuristic search techniques for game playing and other problems
3. Represent diverse knowledge using AI and analyze
4. Understand and design an expert system

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective –III: EE452C Electrical and Hybrid Vehicles
B. Tech. Semester – VIII (Mechanical Engineering)

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

Unit 1(10 Lectures)

Introduction: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern electric vehicles on energy supplies.
Electric Vehicle Composition and Configurations, Basic concept of hybrid Electric vehicle, HEV configuration types – series, parallel, series-parallel and complex hybrid, Power flow control.

Unit 2(10 Lectures)

Electric Propulsion: major requirements of EV motor drive, characteristics and control ofDC motor, Induction motor, Switched Reluctance motor and Permanent Magnet motor, power converters devices/topology, control hardware, software and strategy vehicle, power source characterization, transmission characteristics.

Unit 3(12 Lectures)

Energy Storage: Introduction to energy storage requirements in Hybrid and Electric Vehicles, Energy sources, Battery based energy storage and its analysis, Fuel fell based energy storage and its analysis, super capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis.

Unit 4(12 Lectures)

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Plug-in electric vehicles, Vehicle to grid (V2G) and Grid to vehicle (G2V) fundamentals.

Text/ Reference Books:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
4. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the basic concept and history of EV and HEV.
2. Understand the models to describe hybrid vehicles and their performance.
3. Understand the different possible ways of energy storage.
4. Understand the different strategies related to energy management systems.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective –III: MGT401C Entrepreneurship
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

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

Unit 1 (9 Lectures)

Entrepreneurship: Concept and Definitions of Entrepreneur & Entrepreneurship; Classification and Types of Entrepreneurs; Traits/Qualities of an Entrepreneurs; Entrepreneurship's Challenges; Factor affecting Entrepreneurial Growth – Economic &Non-Economic Factors; Entrepreneur Vs. Intrapreneur .EDP Programmes.

Unit 2 (10 Lectures)

Innovation Technology Management: Entrepreneurial Opportunity Search and Identification; recognition of a good business opportunity; Conducting Feasibility Studies. Business Plan: Purpose of Business Plan; Contents of Business Plan; Presenting of Business Plan; Why Business plan Fails.

Unit 3 (10 Lectures)

Indian Models in Entrepreneurship: Social Entrepreneur: Introduction; Characteristics, Need, Types and Motivations of Social Entrepreneur. Women Entrepreneurship: Role & Importance, Profile of Women Entrepreneur, Problems of Women Entrepreneurs, Women Entrepreneurship Development in India.

Unit 4 (9 Lectures)

Developments of Entrepreneur: Micro, Small and Medium Enterprises: Concept & definitions; Role & Importance; MSMED Act 2006, Current Scheme of MSME- Technology Up-gradation Scheme ,Marketing Assistance Scheme ,Certification Scheme, Credit- rating scheme , Problems facing MSME.
Financing the venture: Introduction, features and process of Venture Capital, Funding from Banks.

Text Books:

1. Roy Rajeev, Entrepreneurship 2/e, Oxford University Press.
2. Charantimath, Poornima, "Entrepreneurship Development and Small Business Enterprises", Pearson Education, New Delhi.

Reference Books:

1. Roy Rajeev, Entrepreneurship 2/e, Oxford University Press.
2. Charantimath, Poornima, "Entrepreneurship Development and Small Business Enterprises", Pearson Education, New Delhi.
3. Norman M. Scarborough, "Essentials of Entrepreneurship & Small Business Management", PHI, New Delhi.
4. Vasant Desai, "Entrepreneurial Development and Management", Himalaya Publishing House, New Delhi.
5. Kumar Arya, "Entrepreneurship: creating and leading an entrepreneurial organization", Seventh Impression, Pearson Education.
6. Holt, "Entrepreneurship: New Venture Creation", Prentice Hall, New Delhi.
7. Hisrich, Robert D., Michael Peters and Dean Shephered, "Entrepreneurship", Tata McGraw Hill, New Delhi.
8. Bridge, S et al., "Understanding Enterprise: Entrepreneurship and Small Business", Palgrave Publication.
9. Donald F. Kuratko, "Entrepreneurship: Theory, Process, and Practice", South Western College Publications.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the concept of entrepreneurship, traits required to become an entrepreneur.
2. Design and formulate the basic principles of business plans, they can choose and present their business plan.
3. Know about the different types of entrepreneurs.
4. Understand the role of MSME in the development of Small Scale industries.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective –III: ME452C Fundamentals Of Sustainable Manufacturing
B. Tech. Semester – VIII (Mechanical Engineering)

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

Unit 1 (9 Lectures)

Introduction: Introduction to sustainability and drivers for sustainable development and Sustainable Manufacturing - Concept of Triple bottom line, Environmental, Economic and Social Dimensions of Sustainability, Sustainable Product Development – Various Phases.

Unit 2 (10 Lectures)

Tools and Techniques: Environmental Conscious Quality Function Deployment, Life cycle assessment, Design for Environment, R3 and R6 cycles, loop production systems, Reverse supply chain, product acquisition management Design for Disassembly.

Unit 3 (10 Lectures)

EIA Standards: CML, EI 95 and 99, ISO 14001 EMS and PAS 2050 standards, Environmental Impact parameters, Energy in manufacturing (assessment and minimization)

Design for recycling: Eco friendly product design methods – Methods to infuse sustainability in early product design phases

Unit 4 (9 Lectures)

Sustainability Assessment: Concept, Models and Various Approaches, Toxic substances in industry, Product Sustainability and Risk/Benefit assessment– Corporate Social Responsibility, Industry cooperation for reducing Carbon footprint

Green Manufacturing: Dry and near-dry machining, edible oil-based cutting fluids, cryogenic machining, improving work environment, of lean manufacturing, Lean techniques for green manufacturing and strategies for waste reduction in green manufacturing.

Text Books:

1. G. Atkinson, S. Dietz, E. Neumayer ―Handbook of Sustainable Manufacturing‖. Edward Elgar Publishing Limited, 2007.
2. D. Rodick, Industrial Development for the 21st Century: Sustainable Development Perspectives, UN New York, 2007.

Reference Books:

1. P. Lawn, Sustainable Development Indicators in Ecological Economics, Edward Elgar Publishing Limited.
2. S. Asefa, The Economics of Sustainable Development, W.E. Upjohn Institute for Employment Research, 2005.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Summarize sustainability issuesand drivers of sustainability.
2. Understand various standards for Environmental Impact Assessment.
3. Apply various tools and technique to access manufacturing sustainability.
4. Comprehend sustainability advantages associated with various manufacturing initiatives.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective –III: CHE459C Nanoscience and Nanotechnology
B. Tech. Semester – VIII (Mechanical Engineering)

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

Unit 1 (9 Lectures)

Types of materials; bonding in materials; crystal structures and defects; amorphous materials; origins of properties of materials; Effect of nanostructures on properties of materials.
The science of materials – materials science; Historical use of nanoparticles; discovery of the carbon nanotubes; fullerenes; nanostructured materials.

Unit 2 (10 Lectures)

Particle-wave duality; de-Broglie waves; Schrodinger equation in 1-Dimension; Superposition; Energy eigenstates; Interpretation of wave function; Fermions and Bosons; Electron density of states; Energy bandgaps; Fermi energy; Excitons and Bohr radius.

Unit 3 (10 Lectures)

AFM; STM; Transport in nanostructures; 0,1 and 2 dimensional nanostructures; Bandgap engineering; Molecular motors; MEMS and NEMS devices. Biomaterials and nano-biotechnology.

Unit 4 (9 Lectures)

Synthesis of Nanomaterials – ZnO and Fe3O4. Characterization of phases and quantification of phases. Applications of Nanomaterials: In textile industry, in catalytic operations, in energy generation, in energy storage, in environmental remediation and in sensors and devices.

Text Books:

1. NANO:The Essentials Understanding Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw Hill Publishing Company Limited, 2007, 0-07-154830-0.
2. Material Science and Engineering, 7th ed. , William D. Callister, Johan Wiley & Sons, Inc.
3. Nanostructured Materials and Nanotechnology, Hari Singh Nalwa, Academic Press, 2002.
4. Nanostructures and Nanomaterials, synthesis, properties and applications., Guozhong Cao, Imperial College Press, 2004.

Reference Books:

1. Introduction to Nanoscience, S.M. Lindsay, Oxford University Press, 2010, ISBN: 978–019–954421–9 (Pbk).
2. Nanoscience, Hans-Eckhardt Schaefer, Springer, 2010, ISBN 978-3-642-10558-6.
3. Chemistry of nanomaterials: Synthesis, Properties and applications. C.N.R. Rao, Achim Muller, A.K. Cheetham, Wiley-VCH, 2004.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Learn about the background on nanoscience and give a general introduction to different classes of nanomaterials.
2. Develop an understanding of the science behind the nanomaterial properties.
3. Apply their learned knowledge to study and characterize nanomaterials.
4. Familiarize themselves with the variety of nanotechnology applications, and know how to approach the synthesis of nanomaterials with a set of desirable properties.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective –III: EE454C Smart Grid
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

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

Unit 1(10 Lectures)

Introduction: Concept of smart grid, smart grid control, Communications and Sensing in a Smart Grid, Hardware Architecture, Software architecture, Protocol detail, application & benefits, PLCs Vs RTUs, IED's, RTU Block diagram, PMU communication interface.

Unit 2(10 Lectures)

Cyber Security of the Smart Grid: Smart Grid Threats, Vulnerabilities and Cyber Security Strategies, Cyber Security Environment, False Data Injection and Attacks in Electric Power Grids Cyber-Physical System Security.

Unit 3(12 Lectures)

Smart Grid Technologies: Energy Management System, Demand side management: peak clipping, valley filling, load shifting etc., state estimation, load forecasting. Time of the day pricing(TOD), Time of use pricing(TOU).

Unit 4(12 Lectures)

Distributed Generation & Control: Concept of distributed generation, Introduction of various distributed generation sources like wind, solar, fuel-cell, micro-hydro, PHEV's etc., Grid integration and control of distributed generation sources.

Text Books:

1. T. Gönen, Electric Power Distribution System Engineering, McGraw-Hill, 1986. ISBN: 0-8493- 5806-X.
2. Distribution System Protection Manual, McGraw-Edison Power Systems, 1990.
3. Westinghouse Electric Utility Ref. Book, Vol.3, Distribution Systems, 1965.
4. R. E. Brown, Electric Power Distribution Reliability, Marcel Dekker Inc., 2002.

Reference Books:

1. IEEE Power and Energy Magazine, July/August 2007 Issue
2. James Burke, Power Distribution Engineering, Mercel Dekker, 1994.
3. A.J. Pansini, Electrical Distribution Engineering McGrawHill, 1983.
4. E. Lakervi, E.J.Holmes, Electricity Distribution Network Design, IEE series, 1989.
5. J. Gers and E. J. Holmes Protection of Electricity Distribution Networks 2nd Edition.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the features of Smart Grid.
2. Understand to make conventional grid more smart, reliable, and efficient.
3. Understand the technical expertise in the emerging area of smart grid.
4. Understand the concepts of distributed generation.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt 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, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.