BACHELOR OF TECHNOLOGY (MECHANICAL ENGINEERING) CREDIT BASED

KURUKSHETRA UNIVERSITY KURUKSHETRA

SCHEME OF STUDIES/EXAMINATION

SEMESTER VIII(w.e.f. session 2021-2022)

S. No.	Course No.	Course Name	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	MEC-402LA	Project-IV	0:0:10	10	5	-	100	100	200	3
2	MEO*	Open Elective-II	3:0:0	3	3	75	25	0	100	3
3	MEO*	Open Elective-III	3:0:0	3	3	75	25	0	100	3
4	MEP*	Program Elective-V	3:0:0	3	3	75	25	0	100	3
5	MEP*	Program Elective-VI	3:0:0	3	3	75	25	0	100	3
			Total	**22**	**17**	**300**	**200**	**100**	**600**	

Program Elective- V		Program Elective-VI	
Course No.	**Course Name**	**Course No.**	**Course Name**
MEP-402A	Non-Conventional Machining	MEP-408A	Welding Technology
MEP-404A	Automobile Engineering	MEP-410A	Design of Pressure Vessels and Piping
MEP-406A	Product Design and Manufacturing	MEP-412A	Quality and Reliability Engineering

Open Elective- II		Open Elective-III	
Course No.	**Course Name**	**Course No.**	**Course Name**
MEO-402A	Supply Chain Management	MEO-408A	Lubricants and Lubrication
MEO-404A	Competitive Manufacturing Systems	MEO-410A	Total Quality Management
MEO-406A	Concurrent Engineering	MEO-412A	Energy Conservation and Management

*** The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

B. Tech. 8th Semester) Mechanical Engineering							
MEP-402A	Non-Conventional Machining						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	75	25	100	3
Purpose	This course provides comprehensive knowledge about the advanced technologies and different Non-conventional machining processes.						
Course Outcomes							
CO 1	Students will be able to compare conventional and non-conventional machining processes and recognize the need for Non-conventional machining processes.						
CO 2	Students will be able to know about the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM.						
CO 3	Students will be able to know about the constructional features, performance parameters, process characteristics, applications, advantages and limitations of AJM, WJM and AWJM.						
CO 4	Students will be able to identify the need of chemical and electro-chemical machining processes along with the constructional features, process parameters, process characteristics, applications, advantages and limitations.						
CO 5	Students will be able to explain the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM, LBM and EBM.						

UNIT-I

Introduction to non-conventional machining: Introduction to non-conventional machining(NCM) processes, characteristics of conventional machining processes, characteristics of non-conventional machining processes, need for development of non-conventional machining processes, comparison of conventional and non-conventional machining processes, , classification of non-conventional machining processes, history of non-conventional processes, advantages of non-conventional machining processes, disadvantages of non-conventional machining processes, applications of non-conventional machining processes.

Ultrasonic machining (USM): process principle, equipment, design consideration for tool, tool feed mechanism, abrasive slurry, Liquid media, operation of USM, process parameters, process capabilities, mechanics of cutting in USM applications of USM, advantages of USM, disadvantages of USM, Mechanics of cutting in USM, ultrasonic welding

UNIT-II

Abrasive jet machining (AJM): process principle, equipment, process parameters, process capabilities, applications of AJM, advantages of AJM, disadvantages of AJM, Mechanics of cutting in AJM.

Water jet machining (WJM): process principle, equipment, process parameters, process capabilities, Metal removal rate, applications of WJM, advantages of WJM, disadvantages of WJM.
Abrasive water jet machining (AWJM): process principle, equipment, process parameters, process capabilities, Metal removal rate, applications of AWJM, advantages of AWJM, disadvantages of AWJM.

UNIT-III

Chemical machining: Introduction, process principle, five steps of chemical machining,elements of process, Influence of etchant medium, selection of maskant and etchants, chemical blanking, accuracy of chemical blanking, applications of chemical machining, advantages of chemical machining, disadvantages of chemical machining, chemical milling, photochemical machining.
Electrochemical machining (ECM): classification of ECM processes, fundamental principles of ECM, elements of ECM process, electro-chemistry of ECM process, process parameters, process characteristics, tool design, accuracy, determination of metal removal rate, evaluation of metal removal rate of an alloy, surface finish and work material characteristics, economic consideration, advantage, limitation and application, basics of electrochemical grinding, deburring and honing.

UNIT-IV

Electric discharge machining (EDM): Principal and metal removal mechanism, generators, electrode feed control, electrode material, tool electrode tool design, EDM wire cutting, surface finish, accuracy and application.
Laser beam machining(LBM): Introduction, generation of LASER, Equipment and mechanism of metal removal, LBM parameters and characteristics, Applications, Advantages & limitations.
Electron beam machining (EBM): Introduction, Principle, equipment and mechanism of metal removal, applications, advantages and limitations.

Text Books:

1. Unconventional Machining processes- T. Jagdeesha, I.K. International Publishing house
2. Advanced Machining processes- V.K. Jain, Allied Publishers private Ltd.
3. Unconventional Manufacturing process- M.K. Singh, New Age International
4. Modern machining processes – P.C. Pandey and M.S. Shan, TMH

Reference Books:

1. Non-traditional Manufacturing Processes –G.F. Benedict, Marcel Dekker,Inc.
2. Advanced Method of Machining –J.A. McGeough, Chapman and Hall.
3. Electrochemical Machining of Metals –Ruryantsev & Davydov, Mir Pub.

Note: The paper setter will set the paper as per the question paper template provided.

B. Tech (8th Semester) Mechanical Engineering							
MEP-412A	QUALITY AND RELIABILITY ENGINEERING						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	75	25	100	3
Purpose	The purpose of this course is to provide students with an in-depth knowledge of quality and reliability. The course addresses the principles and techniques of Statistical Quality Control and their practical uses as well as give insight to modern reliability engineering tools.						
Course Outcomes							
CO1	Students will be able to understand the concept of quality value and engineering and application of statistical methods for quality control. The student will also be able to solve the problems related with dispersion of data.						
CO2	Students will be able to understand different control charts and will solve the problems on control charts. They will also understand various sampling plans and design sampling plans.						
CO3	Students will be able to explain the loss function and tolerance design for online quality control. They will come to know the concept of reliability and will be able to understand the mathematical derivations of different failure rates.						
CO4	Students will be able to describe various hazard models and solve problems for finding reliability of complex systems.						

UNIT-I

Quality value and engineering: Quality systems, quality engineering in product design and production process, system design, parameter design, tolerance design, statistical methods for quality control and improvement, mean, median, mode, standard deviation, calculating area, Normal distribution tables, finding the Z score, Central limit theorem.

UNIT-II

Variation in process: Control charts for variables: X-bar and R charts, Control charts for attributes P, C and U-Chart, Establishing and interpreting control charts process capability, Quality rating, Short run SPC.

Acceptance sampling by variables and attributes, single, double, sequential and continuous sampling plans, design of various sampling plan.

UNIT–III

Loss function, tolerance design: N type, L type, S type; determination of tolerance for these types, online quality control – variable characteristics, attribute characteristics, parameter design.

Concept and definition of reliability: Reliability Parameters: Reliability as a function of time, failure rate as a function of time, Bath-tub curve, constant failure rate, increasing failure rate, mean time to failure (MTTF), MTTF as a function of failure rate, mean time between failure (MTBF), mean down time (MDT), maintainability & availability

UNIT–IV

Brief discussion on hazard models: Constant hazard model, linearly increasing hazard model, nonlinear hazard model and Weilbull distribution, Advantages of weibull distribution, System reliability models: series system, parallel system, series-parallel system

Complex system: Reliability of series, parallel & standby systems & complex systems & reliability prediction and system effectiveness, reliability testing

Text books:

1. Reliability Engineering, (3rdEdition) - LS Srinath, Affiliated East West Pvt Ltd, 1991..
2. Reliability Engineering- E.Bala Guruswamy, Tata McGraw Hill, 1994.
3. Statistical Quality Control- M. Mahajan, Dhanpat Rai & Co., 2018.
4. Statistical Process Control- Eugene Grant, Richard Leavenworth, McGraw Hill.

Reference books:

1. Introduction to Reliability Engineering- Lewis E. E., John Wiley & Sons - 1987
2. Reliability Based Design-Rao S. S., McGraw Hill - 1992
3. Practical Reliability Engineering- O'cconer P. D. T., John Wiley & Sons Ltd. - 2003
4. Statistical Quality Control-Eugene G. L., McGraw-Hill - 1996

Note: The paper setter will set the paper as per the question paper template provided.

B. Tech. (8th Semester) Mechanical Engineering							
MEO-402A	SUPPLY CHAIN MANAGEMENT						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	75	25	100	3
Purpose	The main objective of the course is to impart students with the knowledge of the performance, driver and metrics, network design, economies and uncertainties in Supply chain management.						
Course Outcomes							
CO1	Students will be able to explain the basics of Supply chain management and its performance.						
CO2	Students will be able to discuss supply chain metrics and the process of designing the supply chain networks.						
CO3	Students will be able to explain various aspects and functions of the supply chain network. Also, they will be able to explain the design process of the Global supply chain network.						
CO4	Students will be able to describe how to manage economies and uncertainties in the supply chain.						

UNIT-I

Understanding the supply chain: Introduction, definition, the objective of a supply chain, the importance of supply chain decisions, decision phases in a supply chain, process views of a supply chain, examples of supply chains.

Supply chain performance: Achieving strategic fit and scope: Competitive and supply chain strategies, achieving strategic fit, expanding strategic scope, challenges to achieving and maintaining strategic fit.

UNIT-II

Supply chain drivers and metrics: Financial measures of performance, drivers of supply chain performance, framework for structuring drivers, facilities, inventory, transportation, information, sourcing, pricing.

Designing the supply chain network: Designing distribution networks and applications to online sales: the role of distribution in the supply chain, factors influencing distribution network design, design options for a distribution network, online sales and the distribution network, distribution networks in practice.

UNIT-III

Network design in the supply chain: The role of network design in the supply chain, factors influencing network design decisions, framework for network design decisions, models for facility location and capacity allocation, making network design decisions in practice.

Designing global supply chain networks: The impact of globalization on supply chain networks, the offshoring decision: total cost, risk management in global supply chains, discounted cash flows, evaluating network design decisions using decision trees, to onshore or offshore: evaluation of global supply chain

design decisions under uncertainty, making global supply chain design decisions under uncertainty in practice.

UNIT-IV

Managing economies of scale in a supply chain: Cycle inventory, the role of cycle inventory in a supply chain, estimating cycle inventory–related costs in practice, economies of scale to exploit fixed costs, economies of scale to exploit quantity discounts, short-term discounting: trade promotions, managing multi-echelon cycle inventory.

Managing uncertainty in a supply chain: Safety inventory, the role of safety inventory in a supply chain, determining the appropriate level of safety inventory, impact of supply uncertainty on safety inventory, impact of aggregation on safety inventory, impact of replenishment policies on safety inventory, managing safety inventory in a multie-chelon supply chain, the role of IT in inventory management, estimating and managing safety inventory in practice.

Text books:

1. Supply chain Management: Strategy, Planning and Operations - Chopra, S., and Meindl, P., Fifth Edition, Pearson Education (Singapore) Pte. Ltd, 2004.
2. Designing & Managing the Supply Chain: Concepts, Strategies & Case studies - Simchi-Levi, P., Kaminsky, Ravi Shankar, E., Third Edition, Tata McGraw-Hill Edition, 2003.

Reference books:

1. Purchasing and Supply Chain Management: Text and Cases - Doebler, D.W. and Burt, D.N., McGraw-Hill Publishing Company Limited, New Delhi, 1996.
2. Supply Chain Management for Competitive Advantage - Rangaraj, TMH.

Note: The paper setter will set the paper as per the question paper template provided.

B. Tech. 8th Semester) Mechanical Engineering							
MEO-410A	TOTAL QUALITY MANAGEMENT						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	75	25	100	3
Purpose	The purpose of this course is to develop an understanding of quality management framework, philosophies, in-depth knowledge of various tools and techniques with their application in the manufacturing and service industry.						
Course Outcomes							
CO1	Students will be able to understand quality management philosophies and frameworks.						
CO2	Students will be able to describe various tools and techniques of quality management.						
CO3	Students will be able to explain the applications of quality tools and techniques in both manufacturing and service industry						
CO4	Students will be able to describe various quality systems like ISO and its standards.						

UNIT-I

Introduction and philosophies of quality management:introduction, need for quality ,evolution of quality, definitions of quality, dimensions of product and service quality, basic concepts of TQM, TQM framework, benefits, awareness and obstacles, quality, vision, mission and policy statements, contributions of Deming, Juran and Crosby , barriers to TQM, quality statements, customer focus,customer orientation, customer satisfaction, customer complaints, and customer retention,costs of quality.

UNIT-II

Principles of quality management: Leadership,strategic quality planning, quality councils, employee involvement, motivation, empowerment, team and teamwork, quality circles recognition and reward, performance appraisal, continuous process improvement , PDCA cycle, 5S, Kaizen ,supplier partnership, partnering, supplier selection, supplier rating.

Process capability: Meaning, significance and measurement,six sigma concepts of process capability.

UNIT–III

Tools and techniques for quality management: Quality functions development (QFD), benefits, voice of customer, information organization, house of quality (HOQ), building a HOQ, QFD process.

Failure mode effect analysis (FMEA): Requirements of reliability, failure rate, FMEA stages, design, process and documentation,seven old (statistical) tools,seven new management tools,bench marking and POKAYOKE.

UNIT–IV

Quality systems organizing and implementation: Need for ISO: 9000, ISO: 9001-2008 quality system,elements, documentation, quality auditing, QS:9000, ISO: 14000,concepts, requirements and benefits, TQM implementation in manufacturing and service sectors, quality audits, TQM culture.

Text Books:

1.Total Quality Management-Dale H.Besterfield, Pearson Education (First Indian Reprints 2004).
2. Total Quality Management-Shridhara Bhat K, Himalaya Publishing House, First Edition 2002.

Reference Books:

1. Competitive Manufacturing Management – John M. Nicholas, TMH.
2. Total Quality Management- R Kesavan, C Elanchezhian, B Vijaya Ramnath, IK International.
3. Total Quality Management: Principles, Methods, and Applications-Sunil Luthra, Dixit Garg, Ashish Agarwal, Sachin K. Mangla, CRC Press.
4. Total Quality Management-Poornima M. Charantimath, Pearson Pub.

Note: The paper setter will set the paper as per the question paper template provided.