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(AICTE Model Curriculum Based Scheme) with Provision for Internship

Bachelor of Technology (B.Tech.) VIII Semester (Mechanical Engineering)

w.e.f. July 2024

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	ME801M	PEC-III	Professional Elective Course-III	70	20	10	-	-	100	3	1	-	4
2	ME802M	OEC-IV	Open Elective Course-IV	70	20	10	-	-	100	3	1	-	4
3	ME803M	PI	Major Project / Internship	-	-	-	150	100	250	-	-	16	8
			Total	140	40	20	150	100	450	**6**	**2**	**16**	**16**

Note: 1. Departmental BOS will decide list of three optional subjects for PEC III as well as for OEC IV.

Professional Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	ME801M A	Computer Integrated Manufacturing
2	ME801M B	Tribology
3	ME801M C	Advance Machining Processes

Open Elective Course-IV		
S.No.	**Subject Code**	**Subject Name**
1	ME802M A	Energy Conservation & Audit
2	ME802M B	Quality Management
3	ME802M C	Management Information System

Note: 2. Students going for internship would have to opt MOOC/NPTEL subjects decided / listed by the HOD / Coordinator.

Professional Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	ME801M D	NPTEL-1
2	ME801M E	NPTEL-2
3	ME801M F	NPTEL-3

Open Elective Course-IV		
S.No.	**Subject Code**	**Subject Name**
1	ME802M D	NPTEL-4
2	ME802M E	NPTEL-5
3	ME802M F	NPTEL-6

Note: 3. For Major Project / Internship, evaluation is based on work done, quality of report, presentation and performance in viva-voce through department project supervisor / Industry Project Coordinator.

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

PEC: Professional Elective Course, OEC: Open Elective Course, PI: Project and Internship

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Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME801MA	Computer Integrated Manufacturing	70	20	10	-	-	100	3	1	-	4

Course Objective:
To provide knowledge and details of the means of computer aided manufacturing and various functions supporting the automated manufacturing.

Course Contents:

Module-I
Introduction: Introduction to manufacturing systems and their performance analysis; Introduction to automation; Introduction to computer integrated manufacturing (CIM).

Module-II
Numerical Control (NC): Introduction, numerical control – its growth and development, components of NC system, input devices, control systems – point to point, straight cut, and continuous path NC, open loop and closed loop NC systems, NC interpolations – linear, circular, helical, parabolic and cubic interpolation, applications of NC systems, merits and demerits.

Module-III
Extensions of NC: Concepts of computer numerical control (CNC), machining center, and direct numerical control (DNC), and their advantages.

Module-IV
Robotics: Robot anatomy and related attributes, robot control systems – limited sequence, playback with point to point, playback with continuous and intelligent control; End effectors – gripper, tools; Sensors in robotics – tactile sensors, proximity, optical sensors and machine vision; Applications of industrial robots, robot programming.

Module-V
Material Handling and Storage: Overview of material handling equipments, automated material handling equipments – AGVs, conveyor systems, performance analysis of material handling systems, automated material storage systems – ASRS and carousel storage, analysis of automated storage systems.

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Manufacturing Support Functions: Introduction to group technology (GT), computer aided process planning (CAPP), material requirement planning (MRP), capacity planning, scheduling etc.

References of Books:

1. Groover, M. P., "Automation, Production systems and Computer Integrated Manufacturing", 3rd 2007 Ed., Prentice-Hall.
2. Singh, N., "Systems Approach to Computer Integrated Design and Manufacturing", John Wiley & Sons. 1996
3. Chang,T.-C., Wysk,R. A. and Wang, H.-P. "Computer Aided Manufacturing", 3rd 2005 Ed., Prentice Hall.
4. Rembold,U., Nnaji,B. O. and Storr A., "Computer Integrated Manufacturing", Addison Wesley. 1994
5. Besant,C. B. and Lui,C. W. K., "Computer Aided Design and Manufacture", Ellis Horwood Ltd. 1991
6. Rao,P. N., Tiwari,N. K. and Kundra,T.K., "Computer Aided Manufacturing", Tata McGraw Hill. 1993
7. Koren, Y. "Computer Control of Manufacturing Systems", McGraw Hill. 1983
8. Lynch, M., "Computer Numerical Control for Machining", McGraw-Hill. 1992
9. Sava,M. and Pusztai,J., "Computer Numerical Control Programming", Prentice Hall. 1990

Expected outcome of course:

Possible outcomes of course are ability to:

CO1	Understand fundamental of CNC machines
CO2	Understand concept behind CNC and DNC.
CO3	Application and working of robots in CNC
CO4	Understand automated material handling equipments and group technology (GT), computer aided process planning (CAPP).

Mapping of the course outcomes (COs) with program outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3		1							
CO2	1	2	2		2							
CO3	1	1	2								1	
CO4											1	

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Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME801MB	Tribology	70	20	10	-	-	100	3	1	-	4

Course Objective:

To study the basic principles governing the tribology and apply them to reduce friction and wear in mechanical machines and structures.

Course Contents:

Module-I: Introduction, history of tribology, early scientific studies of friction, wearand lubrication. Tribo-Surface preparations and characteristics. Surface contacts, Hertz contact stresses, residual stress, surface fatigue, creep, stress relaxation, fracture mechanics, elastic, viscoelastic and plastic behavior of materials. Choice of materials.

Module-II: Friction, laws of friction, rolling/sliding friction, theory of adhesion and abrasion, different mechanisms of friction, stick slip characteristics, interface temperature, thermal analysis, Molecular mechanical theory of friction, operating conditions and system parameters, calculations of coefficient of friction, design of friction devices.

Module-III: Wear, different types of wear mechanisms, adhesive, abrasive impact, percussion erosion, fretting wear calculations of wear rate, two body/ three body wear, wear prevention, wear of metal cutting and metal forming tools, wear mapping of materials, cavitation, surface fatigue, corrosion, performance levels classifications and specifications of lubricants

Module-IV: Lubrication, lubricants and additives, composition and properties of lubricants, maintenance of oil and emulsions, industrial hygiene aspects, technical regulations for lubricants, boundary/ mixed and fluid film lubrication, industrial methods of lubrications, SAE,BIS, ASTM, IP, DIN Standards, oil testing's, wear and chemistry of lubricants.

Module-V: Nano tribology, Instrumental tests, Bearings, clutches and brakes, commonly used bearing materials, and properties of typical bearing materials, slide units, dynamic seals, Automobile applications, machine tools/ press machines applications. Other applications and case studies.

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Evaluation:

Evaluation will be continuous an integral part of the class as well through external assessment.

References:

1. Principles and applications of tribology, Bharat Bhushan, John Wiley& sons, ISBN O47I 594075.
2. Tribology,, - lubrication ,friction and wear, I V Kragelsky and V VAlisin, Mir publication, ISBN 186058288s.
3. Applied Tribology,M MKhonsari and E. R. Booser, John Wiley, ISBN 0471283029.

Tutorial topics:

1. Testing equipments of tribology.
2. Various industrial applications of tribology.
3. NEMS and MEMS applications
4. Solid, liquid and mist/ gas lubricants.
5. Surface coatings.
6. Chemical analysis of materials
7. Various simulations
8. AFM/ FFM , SFA, STM, studies.

Course Outcomes:

At the completion of this course, students should be able to

CO1	Infer the basic principles governing the wear, friction and lubrication.
C02	Examine the different mechanisms of friction and develop friction devices
C03	Illustrate the various modes of lubrication.
CO4	Analyze various mechanical machines and structures against wear and friction.

Mapping of the course outcomes (COs) with program outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1									
CO2	1	2	2	1								
CO3	2		1									
CO4	1	2	2	2								

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Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME801MC	Advance Machining Processes	70	20	10	-	-	100	3	1	-	4

Course Objectives:

1. Understand the fundamentals and technologies used in different advance machining processes.
2. Apply the characteristics and applications of the product obtained using advanced manufacturing processes.
3. Compare different advance machining processes.

Course Contents:

Module-I: Mechanical processes: Process selection, mechanics of cutting, metal removal rate, cutting tool system design, ultrasonic machining, abrasive jet machining, water jet machining, effect of parameters and variables, applications and limitations, recent developments in mechanical processes.

Module-II: Electrochemical and chemical metal removal processes: Electrochemical machining [ECM], elements of ECM, power source and control system, electrolytes, tool work system, chemistry of the process, tool design and metal removal rate, process faults, material removal and surface finish, electrochemical grinding, electrochemical deburring, electrochemical honing, chemical machining.

Module-III: Thermal metal removal processes: Electric discharge machining [EDM], spark erosion, mechanism of metal removal, spark erosion generator, electrode feed control, vibrating electrode system, dielectric fluid, flushing, accuracy, plasma are machining [PAM], non thermal generation of plasma, mechanisms and parameters, equipments, electron beam machining [EBM], generation and control of electron beam, theory and process capabilities, neutral particle etching, laser beam machining, hot machining, methods of local heating toollie and production rate.

Module-IV: Rapid prototyping fabrication methods: Fundamentals, Technologies, Applications, Principle sand working of 3D printing, subtractive v/s additive manufacturing

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process, VAT photopolymerization, material and binder jetting, continuous liquid inter phase production, direct metal laser sintering.

Module-v: Technologies of micro fabrication: Types of micro system devices, Industrial applications, micro fabrication processes, LIGA process Technologies of nano fabrication, importance of size, scanning probe microscope, carbon Buckyballs and nano tubes, nano fabrication processes.

References:

1. Mikell P. Groover, Fundamentals of Modem Manufacturing, Wiley India, ISBN 9788126523016
2. Pandey P.C, Shan H.S., Modern Machining Processes, Tata McGraw Hill,ISBN 0070965188
3. Lal G.K,Gupta V, Reddy N.V., Narosa Publishing House,ISBN 8173197091
4. CMTI Handbook

Course Outcomes:

At the completion of this course, students should be able to

CO1	Explain the fundamentals and technologies used in different advance machining DTOCESSES
C02	Predict the characteristics and applications of the product obtained using advanced manufacturing processes.
C03	Compare different advance machining processes.

Mapping of the course outcomes (COs) with program outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1									2
CO2	2		2	1	3							1
CO3	3	2		1	1							1

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Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME802MA	Energy Conservation & Audit	70	20	10	-	-	100	3	1	-	4

Course Objective

1. Understand the concepts of energy management and conservation.
2. Able to conduct energy audit and report.
3. Concepts of Energy policy its purpose and formation.
4. Able to do Electrical Energy Management in different electrical systems.

Course Contents:

Module-I

Energy Management: Concept of energy management, energy demand and supply, economic analysis; Duties and responsibilities of energy managers. Energy Conservation: Basic concept, energy conservation in Household, Transportation, Agricultural, service and Industrial sectors, Lighting, HAVC.

Module-II

Energy Audit: Definition, need and types of energy audit; Energy management (Audit) approach: Understanding energy cost, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirement; Fuel & energy substitution; Energy audit instruments; Energy conservation Act; Duties and responsibilities of energy manager and auditors.

Module-III

Material Energy Balance: Facility as an energy system; Method for preparing process flow; material and energy balance diagrams. Energy Action Planning: Key elements, force field analysis; Energy policy purpose, perspective, content, formulation, rectification

Module-IV

Monitoring and Targeting: Definition monitoring & targeting: Data and information analysis. Electrical Energy Management: energy conservation in motors, pumps and fan systems; energy efficient motors.

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Module-V

Thermal Energy Management: Energy conservation in boilers, steam turbine and industrial heating system; Application of FBC; Cogeneration and waste heat recovery; Thermal insulation; Heat exchangers and heat pump; Building Energy Management.

References:

1. Murphy &Mckay, Energy Management, BSP Books Pvt. Ltd.
2. Smith CB; Energy Management Principle, Pergamon Press, New york.
3. Rajan GG, Optimising Energy Efficiency in Industry, TMH.
4. Callaghan P O, Energy Management, McGraw-Hill Book Company.
5. Amit Kumar Tyagi, Handbook on Energy Audit and Management, Tata Research Institute. Energy.
6. Bureau of Energy Efficiency, Study material for energy Managers and Auditors: Paper I to V.
7. Hamies; Energy Auditing and conservation: Method, Measurement..., Hemisphere, Washington.
8. Witty, Larry C, Industrial Enegy Management Utilisation, Hemisphere Publishers, Washington
9. Kreith & Goswami, Energy management and Conservation Handbook, CRC Press

Course Outcomes:

At the completion of this course, students should be able to

CO1	Understand the concepts of energy conservation, management and energy efficiency.
C02	Explain energy audit and preparation of report.
C03	Examine Energy Management in different electrical/thermal systems.
CO4	Built Material and energy balance diagram and its significance.

Mapping of the course outcomes (COs) with program outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1					1					
CO2		2	3									
CO3					1						2	
CO4		2	3									

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Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME802MB	Quality Management	70	20	10	-	-	100	3	1	-	4

Course Objective:
To impart awareness regarding quality, its importance, measurement and applications in design, manufacturing and final inspection of product.

Course Contents:

Module-I
Introduction: Different definitions, dimensions, and aspects of quality; Traditional and modern views of quality control; Different Philosophies by quality Gurus, seven basic and new quality control tools.

Module-II
Statistical Process Control: Theory and applications of control charts, controls charts for variables: charts for averages, ranges, and standard deviation, control charts for attributes: p and c charts, fraction defective and number of defects per unit, different adaptations of control charts, manufacturing process variability, manufacturing process capability and tolerances.

Module-III
Acceptance Sampling: Concept of acceptance sampling, sampling by attributes: single and double sampling plans; Construction and use of OC curves.

Module-IV
Total Quality Management: Concept and philosophy, scope, applications, implementation, quality function deployment, six sigma, process capability, just-in-time philosophy, quality circles, quality system and Introduction to ISO 9000 and ISO 14000.

Module-V
Reliability: Concept and definition, measurement and test of reliability, design for reliability, concepts of maintainability and availability.

References:

1. Grant,E., and Leavenworth, R., "Statistical Quality Control", McGraw-Hill 1996
2. Mitra, A., "Fundamentals of Quality Control and Improvement", John Wiley & Sons, Inc, 2008

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3. Juran,J.M., "Quality Control Handbook", McGraw-Hill 1988
4. Besterfield, D.H., Besterfield – Michna, C., Besterfield, G., and Besterfield-Sacre,M., "Total Quality Management",Pearson Education 1999
5. Montgomery, D.C.,"Introduction to Statistical Quality Control",JohnWiley & Sons Inc. 1996

Expected outcome of course:

Possible outcomes of course are ability to:

CO1	Understand various dimensions and aspect of quality
CO2	Understand Theory and applications of control charts
CO3	Understand the fundamental concept acceptance sapling & OC curve
CO4	Implement six sigma & Understand just-in-time philosophy

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												

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Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME802MC	Management Information System	70	20	10	-	-	100	3	1	-	4

Course Objective:

The objective of this course is to introduce the students to the managerial issues relating to information systems, its role in organization, support for decision-making and how information technology can be leveraged to provide business value.

Course Contents:

Module-I: Introduction to MIS

The meaning and use MIS, System View of Business, Process of MIS, Development of MIS within the organization, Management Process, Information Needs, System Approach in Planning Organizing and Controlling MIS. The role of internet- Internet and Web.

Module-II: Data and Information

Introduction, data and information- measuring data, information as a resource, information in organizational functions, types of information technology, types of information systems-transaction processing systems-management information systems

Module-III: Competing with IT

Introduction, The competitive environment of business partnering for mutual benefit-bargaining power of suppliers-bargaining power of buyers and customers-barriers to entry-threat of substitutes-industry regulations, Using IT for competing-competing on low cost-competing on differentiation.

Module-IV: Electronic Commerce

Introduction, E-commerce Technology, doing business over internet- networks-electronic data interchange (EDI)-online payment technology- Mobile commerce- ecommerce-portals-search engines-direct selling- auctions- aggregators, E-business.

Module-V: Decision Support Systems

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Introduction, Characteristics and Objectives, Role of Decision Support Systems and its applications, Components of Decision support Systems, Data Subsystem, Model Subsystem, and User-interface, Group decision support systems (GDSS), Expert systems, Executive Information. Systems and its integration with DSS, Decision-making: Concept, Process, Simon's model, Information System support for Decision Making Phases, Decision making under assumed certainty, risk and uncertainty. Analytics and Business Intelligence- BI techniques.

References

1. James, A. O'Brien, Introduction to Information Systems, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2005.
2. Efraim Turban, Jay E. Aronson and Ting-Peng Liang, Decision Support Systems and Intelligent Systems, Prentice-Hall of India, New Delhi, 7th Edition, 2004.
3. George M. Marakas, Decision Support Systems, Prentice-Hall of India, New Delhi, 2002.
4. Kenneth C. Laudon and Jane P. Laudon, Management Information Systems, Prentice-Hall of India, New Delhi, 9th Edition, 2006.

Evaluation

Evaluation will be continuous an integral part of the class as well through external assessment.

Course Outcomes:

At the completion of this course, students should be able to

CO1	Demonstrate working of MIS within the organization.
C02	Implementation and integration of Data and Information technologies with MIS.
C03	Analyze and Estimation of improvement in results using MIS and Decision Support Systems.

Mapping of the course outcomes (COs) with program outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			1	2	1	1						
CO2				1	1	1						
CO3			2		2		2					

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