



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

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School of Mechanical Engineering

Department of Mechanical Engineering

1.1.2 Revised Courses and New Courses Introduced in 2022-2023

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Minutes of meeting of Board of Studies Virtual meet held on 6th June 2022
The following Members are participated in the meeting:

1. Dr.L.Vijayaraghavan, Professor- IIT Madras - External Member
2. Er.James Michael Amulu, Director- SAP Research- Walldorf, Baden-Württemberg, Germany - External Member
3. Dr.G.Arunkumar, Professor and Head- Mechanical Engineering - Internal Member
4. Dr.S.P.Venkatesan, Associate Professor- Mechanical Engineering - Internal Member
5. Dr.G.Senthilkumar, Associate Professor- Mechanical Engineering - Internal Member
6. Dr. J.Jayaprabhakar, Associate Professor- Mechanical Engineering- Internal Member
7. Dr.S.Ganesan, Associate Professor – Mechanical Engineering- Internal Member
8. Ms. Sanjana Kallat, Alumni- External Member.

The Chair Person welcomed the members of BoS and placed the agenda for the thoughts of the members. The following deliberations were made as per the items of the circulated agenda.

1. Agenda item # 1 Addition of new Course for Bachelors of Engineering– Mechanical Engineering

The Head of the department highlighted the feedback received from the Alumni for the incursion of new course to focus on emerging technologies and the suggestion from Dr.L.Vijayaraghavan and Er.James Michael Amulu suggested Lean Enterprises and Advanced Manufacturing Technology. Based on BOS members suggestion, Department proposed the following new elective courses for the incorporation from 2020 batch onwards.

Course 1: DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

Course 2: DISASTER MANAGEMENT

Course 3: EQUIPMENT FOR POLLUTION CONTROL

Resolutions:

The BOS resolved to recommend for approval of the suggested courses for inclusion in B.E Programme of Mechanical Engineering.

Agenda item # 2 Modifications proposed for 2020 batch Bachelors of Engineering-Mechanical Engineering course syllabus:

Head of the department informed that the need of revising the syllabus of SMEA1205-CAD/CAM, as per the recent advancements in the field and the following modifications have been considered.

Inclusion of the following topics in Unit I: NC, DNC and CNC machine tools. NC Programming: point to point and continuous path machining approaches, G Codes, M Codes, Canned cycles, Manual NC programming for turning and milling operations. Use of computer applications in inspection, rapid prototyping, material handling and other manufacturing related tasks.

Inclusion of the following topics in Unit V: Computer Aided Process Planning (CAPP): Traditional process planning, Benefits of CAPP, Variant and Generative approaches. Computer integrated production system (CIPS): Traditional production planning, Benefits of CIPS, Master production Schedule, Material Requirement Planning, Inventory Management, Capacity planning, Shop floor control.

Resolutions: The External members considered the revision as necessary as it broadly involved in manufacturing sector. The changes mentioned under inclusion had been approved by all and modification in curriculum had been reflected. Also, it was decided to implement for 2020 batch onwards.

3. Agenda item # 3 Addition of Skill in the professional domains in order to promote industry ready competency among learners. Necessity of introduction of certification courses from competent Government authorities for improving the domain knowledge and thus improving core placement counts.

Head pointed out that the workshop offered by the Department such as trends in Mechanical Engineering and Computational Fluid Dynamics.

Resolutions: The BoS members appreciated the same and suggested to follow in future also for making the industry ready competency among the students.

4. Agenda item # 4 Discussion about the ME CAD course offered was carried out by the BoS members. External members suggest to improve the Design for Manufacturing and Assembly (SPRA5102) subject because it involves industrial benefits for the students. The head inform that, we are working on that and we will revise in the next syllabus revision.

Resolutions: The BoS members appreciated the initiation taken for the revision of course.

5. Agenda item # 5 Any other points with the permission of Chair -Academic flexibilities with extra credits acquired through either advanced study of some courses or with accumulation of additional credits from additional courses as per students'

choice.

Head asked for the suggestions from the External members for students pursuing different specialization.

Resolutions: The BoS recommended that NPTEL courses. It can be selected based on the student's specialization. Also recommend that the students can select the courses at the end of the fourth semester subject to the condition prescribed by the Board of Management time to time. With the above discussion, the Head expressed his deep sense of gratitude to all members for an academic vibrant discussion on various matters. Since there was no other agenda, the meeting ended with the Vote of thanks to the Chair.

Member	Designation	Signature
Dr.L.Vijayaraghavan	Professor, IIT Madras	
Er.James Michael Amulu	Director, SAP Research-Walldorf, Baden-Württemberg, Germany	
Dr.G.Arunkumar	Professor and Head	
Dr.S.P.Venkatesan,	Associate Professor	
Dr.G.Senthilkumar	Associate Professor	
Dr. J.Jayaprabakar	Associate Professor	
Dr.S.Ganesan	Associate Professor	
Ms. Sanjana Kallat	External Member (Alumni)	

SMEA3034	DESIGN OF JIGS, FIXTURES AND PRESS TOOLS	L	T	P	Credits	Total Marks
		3	0	0	3	100

OBJECTIVES:

- To understand the functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of required views of the final design.

UNIT I LOCATING AND CLAMPING PRINCIPLES

9

Objectives of tool design- Function and advantages of Jigs and fixtures – Basic elements – principles of location – Locating methods and devices – Redundant Location – Principles of clamping – Mechanical actuation – pneumatic and hydraulic actuation Standard parts – Drill bushes and Jig buttons – Tolerances and materials used.

UNIT II JIGS AND FIXTURES

9

Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES

9

Press Working Terminologies - operations – Types of presses – press accessories – Computation of press capacity – Strip layout – Material Utilization – Shearing action – Clearances – Press Work Materials – Center of pressure- Design of various elements of dies – Die Block – Punch holder, Die set, guide plates – Stops – Strippers – Pilots – Selection of Standard parts – Design and preparation of four standard views of simple blanking, piercing, compound and progressive dies.

UNIT IV BENDING AND DRAWING DIES

9

Difference between bending and drawing – Blank development for above operations – Types of Bending dies – Press capacity – Spring back – knockouts – direct and indirect – pressure pads – Ejectors – Variables affecting Metal flow in drawing operations – draw die inserts – draw beads- ironing – Design and development of bending, forming, drawing, reverse redrawing and combination dies – Blank development for axisymmetric, rectangular and elliptic parts – Single and double action dies.

UNIT V FORMING TECHNIQUES AND EVALUATION

9

Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke.

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 Summarize the different methods of Locating Jigs and Fixtures and Clamping principles
- CO2 Design and develop jigs and fixtures for given component
- CO3 Discuss the press working terminologies and elements of cutting dies CO4 Distinguish between Bending and Drawing dies.
- CO5 Discuss the different types of forming techniques

TEXT BOOKS:

1. Joshi, P.H. "Jigs and Fixtures", Second Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2010.

2. Joshi P.H "Press tools - Design and Construction", wheels publishing, 1996

REFERENCES:

1. ASTME Fundamentals of Tool Design Prentice Hall of India.
2. Design Data Hand Book, PSG College of Technology, Coimbatore.
3. Donaldson, Lecain and Goold "Tool Design", 5th Edition, Tata McGraw Hill, 2017.
4. Hoffman "Jigs and Fixture Design", Thomson Delmar Learning, Singapore, 2004.
5. Kempster, "Jigs and Fixture Design", Third Edition, Hoddes and Stoughton, 1974.
6. Venkataraman. K., "Design of Jigs Fixtures & Press Tools", Tata McGraw Hill, New Delhi, 2005.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks



New Course

SMEA3035	DISASTER MANAGEMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS

9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)

9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA

9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXT BOOKS:

1. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
2. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.
3. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
4. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

 New Course

SMEA3036	EQUIPMENT FOR POLLUTION CONTROL	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the pollution control regulation and standards, water and wastewater.
- To study the equipment for various water pollution.
- To study the equipment for air pollution control.
- To study the equipment for solid waste processing.
- To study the pollution monitoring equipment.

UNIT 1 POLLUTION CONTROL REGULATIONS AND STANDARDS 9 Hrs.

Pollutants in water and wastewater – sources and impacts- Characteristics and impacts of solid and hazardous wastes - Indian Constitution and Environmental Protection Legislations - Environmental Standards under different Environmental legislations - Water Act (1974), Air Act (1981), Environmental Protection Act (1986) and major Notifications, Municipal solid Wastes (Management and Handling) Rules -Bio Medical Wastes (Management and Handling) Rules - Hazardous Wastes (Management and Handling Rules), Environment Impact Assessment Notifications - Unit operations and unit processes in Pollution Control- - Selection criteria for Pollution Control Equipment.

UNIT 2 EQUIPMENT FOR WATER POLLUTION CONTROL 9 Hrs.

Operational principles and Design criteria of Flash mixers, Flocculators, Clarifiers, Sand Filters, Adsorption Columns, Aerators, Air blowers, Distillation units, Centrifugal and Reciprocating Pumps, Chemical dosing systems, Motors, Pipes, valves and Fittings.- Filed visit to a wastewater treatment plant.

UNIT 3 EQUIPMENT FOR AIR POLLUTION CONTROL 9 Hrs.

Operational principles and Design criteria of Cyclone separators, gravity settlers, Wet Scrubbers, Air strippers, Bag Filters, Electrostatic precipitators, Biofilters - Filed visit to an industry with air pollution control systems.

UNIT 4 EQUIPMENT FOR SOLID WASTE PROCESSING 9 Hrs.

Operational principles and Design criteria of Dewatering equipment – centrifuge, Vacuum Filter, Filter Press- Size Reduction equipment – shredders, grinders – Trommel and Disc Screens – Air Classifiers - bailing and briquetting – incinerators –Pyrolysis – field visit to a solid waste processing facility.

UNIT 5 POLLUTION MONITORING EQUIPMENT 9 Hrs.

Equipment's for sampling of water, solids and air- Sample preservation Equipment – incubators – Cold Storage systems- equipment for analysis of water and air samples- Ambient air and flue gas sampling and monitoring equipment.

TOTAL : 45 Hrs.

COURSE OUTCOMES

At the end of the course the students would be able to

- CO1 - Explain the different types of pollution, their sources and effects.
- CO2 - Discuss the pollution control regulations and standards.
- CO3 - Design equipment for pollution control.
- CO4 - Discuss different methods of pollution control from various sources in air, water and soil.

CO5 - Discuss the Conduct performance assessment of pollution control equipment.

TEXT / REFERENCE BOOKS

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-Graw Hill India, First edition, 2015.
2. Rao. C.S (2006)., "Environmental Pollution and Control Engineering", 2nd Edition, Revised, Wiley Eastern Limited, India.
3. Shyam Diwan and Armin Rosencranz, Enviromental Law and Policy in India, Oxford, 2001
4. Metcalf & Eddy, INC, Wastewater Engineering – Treatment and Reuse, Fourth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2014.
5. Noel de Nevers, "Air Pollution Control Engg", Mc Graw Hill, New York, 2016.
6. CPCB (2021), "Pollution Control Acts, Rules and Notifications issued thereunder, PCL Series- Central Pollution Control Board, Delhi.
7. CPHEEO, "Manual on Municipal Solid waste management, Vol I, II and III, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2016.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

 New Course

SMEA1502	CAD/CAM	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To provide the fundamental information about computer graphics, elements of CAD/CAM and basic understanding about transformations, clipping, windowing and hidden line removal.
- To provide understanding of various wireframe, surface and solid modelling techniques used for generating computer models.
- To provide the details on how computer applications are used directly and indirectly for the manufacturing applications.

UNIT 1 FUNDAMENTALS OF CAD/CAM

9 Hrs.

Introduction: Elements of CAD, Elements of CAM, CAD/CAM integration, Advantages and applications. Computer graphics: Input and output devices, CAD/CAM databases, Requirements of Computer graphics packages. Transformations: Geometric transformation versus viewing transformation, Basic transformation matrices, such as translation, rotation and scaling.

UNIT 2 GEOMETRIC MODELLING - I

9 Hrs.

Wireframe modelling of analytical curves, such as line, circle and conics, and synthetic curves, such as Hermite cubic spline, Bezier curve and B-Spline curve. Surface modelling of analytical surfaces, such as plane surface, ruled surface, surface of revolution and tabulated cylinder, and synthetic surfaces, such as Hermite cubic surface, Bezier surface and B-Spline surface.

UNIT 3 GEOMETRIC MODELING - II

9 Hrs.

Solid modelling techniques: Constructive solid geometry (CSG) representation and Boundary representation. Assembly modelling: Assembly of part drawing, Approaches, Interferences of positions and orientation. Graphics standards: Product data exchange, File format of DXF, IGES and STEP files. Capabilities of modelling & analysis packages.

UNIT 4 COMPUTER AIDED MANUFACTURING - I

9 Hrs.

Manufacturing process data system integration of process data. Manufacturing Planning and Control - CAD/CAM integration - Principles of Computer Integrated computer structures and networking Structure of manufacturing process Process control strategies. General configuration of an adaptive control system. NC, DNC and CNC machine tools. NC Programming: point to point and continuous path machining approaches. G Codes, M Codes, Canned cycles, Manual NC programming for turning and milling operations. Use of computer applications in inspection, rapid prototyping, material handling and other manufacturing related tasks.

UNIT 5 COMPUTER AIDED MANUFACTURING - II

9 Hrs.

Computer Aided Process Planning (CAPP): Traditional process planning, Benefits of CAPP, Computer Integrated Production Management System - Master Production Schedule - Material Requirement Planning - Inventory Management - Manufacturing and Design Data Base - Capacity Planning - Shop Floor Control - Functions - Order release - Order Scheduling - Order progress - Factory data collection. Variant and Generative approaches. Computer integrated production system (CIPS): Traditional production planning, Benefits of CIPS, Master production Schedule, Material Requirement Planning, Inventory Management, Capacity planning, Shop floor control.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Interpret how the basic transformation operations are applied for the geometric and viewing transformations in a CAD environment.
- CO2 - Interpret how the analytic and synthetic curves are generated using the parametric representations in a CAD environment.
- CO3 - Interpret how the analytic and synthetic surfaces are generated using the parametric representations in a CAD environment.
- CO4 - Sketch the 3D model of a given part drawing step by step using a 3D modeling representation technique.
- CO5 - Write the manual NC programming using the FANUC standard NC code library for the given part drawing.
- CO6 - Suggest the appropriate computer aids for the phases of manufacturing and control activities for the stated industrial application.

TEXT / REFERENCE BOOKS

1. Ibrahim Zeid and R. Sivasubramanian, "CAD/CAM : Theory and Practice: Special Indian Edition", 2nd Edition, McGraw Hill Education, 2009.
2. M. Groover and E. Zimmers, "CAD/CAM Computer-Aided Design and Manufacturing", 1st Edition, Pearson Education, 2003.
3. Donald D. Hearn and M. Pauline Baker, "Computer Graphics, C Version", 2nd Edition, Pearson Education, 2014.
4. John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner and Kurt Akeley, "Computer Graphics: Principles and Practice", 3rd Edition, Pearson Education India, 2013.
5. Mikell P Groover, "Automation, Production Systems, and Computer-Integrated Manufacturing", 4th Edition, Pearson

Education, 2014.

6. Mike Mattson, "CNC Programming: Principles and Applications", 1st Edition, Delmar, 2013.
7. M. Adithan and B.S. Pable, "CNC Machines", 3rd Edition, New Age International Publishers, 2018.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 2 Questions each from CO1-CO4, 1 question each from CO5 and CO6 – No choice

20 Marks

PART B: 4 Questions each with internal choice from CO1-CO4, 1 question from CO5 and CO6
with internal choice , each carrying 16 marks

80 Marks



Added Content



Deleted Content

SMEA1502	DESIGN OF MACHINE ELEMENTS (FOR MECH AND MECHATRONICS)	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand the various procedures involved in the design process based on strength requirements.
- To understand the design steps involved in evaluating the dimensions of a component to satisfy functional operation.
- To learn standard practices and standard data by using design data book and catalogues.
- To familiarize the use of data books and various codes for practice.

UNIT 1 STATIC STRESSES AND VARIABLE STRESSES IN MACHINE COMPONENTS

9 Hrs.

Introduction to the design process-factors influencing machine design, selection of materials based on mechanical properties - Preferred Numbers-Direct, Bending and torsional stress equations-Impact and shock loading. Principal stresses for various load -Factor of safety-Theories of failure- design based on strength and stiffness- stress concentration- Design for Variable loading -Gerber line, Goodman's line, and Soderberg's Line.

UNIT 2 DESIGN OF SHAFTS AND COUPLINGS

9 Hrs.

Design of solid and hollow shafts based on strength and rigidity, Keys- different types of keys- Design Keys, keyways, failures of keys-Couplings - Rigid coupling- flexible coupling

UNIT 3 TEMPORARY AND PERMANENT JOINTS

9 Hrs.

Threaded fasteners- stress in screwed threads, Bolted joints including eccentric loading- Design of knuckle and cotter joints- Welded joints- merits and demerits of welded joints, Types of welded joints, weld symbols, Strength of parallel and fillet weld, strength of a welded joint, eccentrically loaded welded joints.

UNIT 4 DESIGN OF SPRINGS AND CONNECTING ROD

9 Hrs.

Functions of springs-applications- spring materials-Design of helical, Belleville springs (disc) and torsion spring-Design of Leaf Spring - Design of connecting rod.

UNIT 5 DESIGN OF BEARINGS FLYWHEELS

9 Hrs.

Introduction -Design of bearings - Sliding contact bearing - Cubic mean load Design of journal bearings- McKees equation- Lubrication in journal bearings -Rolling contact bearing (antifriction bearing). Types of fly wheels- Design of flywheels involving stresses in rim and arm.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Demonstrate and understand the various steps in design process.
- CO2 - Apply the design considerations on the basis of strength, rigidity and standardization.
- CO3 - Analyze and design bolted rivets, welded joints with respect to static and dynamic loads.
- CO4 - Apply the concept of energy absorbing members and connecting rod.
- CO5 - Analyze and apply the concept of bearings and flywheel.
- CO6 - Understand the various design process of machine parts.

TEXT / REFERENCE BOOKS

1. Juvinall R.C. and Marshek K.M., "Fundamentals of Machine Component Design", John Wiley & Sons, 2002.
2. Bhandari V.B., "Design of Machine Elements", Tata McGraw-Hill Book Co, 2003.
3. Norton R.L., "Design of Machinery", Tata McGraw-Hill Book Co., 2004.
4. Spotts M.F, Shoup T.E., "Design and Machine Elements", Pearson Education, 2004.
5. Kanniah, P., Machine Design, 2nd Edition, Scitech Publication Pvt. Ltd., 2009.
6. Shigley, J.E and Mischke, C. R. Mechanical Engineering Design, 6th Edition, Tata McGraw Hill, 2005.
7. Sundararamamorthy, T.V. and Shanmugam, N., Machine Design, Anuradha Agencies, 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks



SMEA1601	DESIGN OF TRANSMISSION SYSTEMS	L	T	P	Credits	Total Marks
		3	*	0	3	100

(Use of approved design data book is permitted)

COURSE OBJECTIVES

- Y To gain knowledge on the principles and procedure for the design of Mechanical power transmission components.
- Y To understand the standard procedures available for Design of Transmission Elements.
- Y To identify critical static and dynamic stresses in a mechanical component.
- Y To learn to use standard data from the design data book and catalogues.

UNIT 1 DESIGN OF FLEXIBLE DRIVES

9 Hrs.

Design of Flat belts and pulleys – Selection of V belts and pulleys – **Selection of hoisting wire ropes and pulleys** - Design of Transmission chains and Sprockets.

UNIT 2 SPUR GEARS AND PARALLEL AXIS HELICAL GEARS

9 Hrs.

Speed ratios and number of teeth-**Force analysis- Tooth stresses –Dynamic effects-Fatigue strength-Factor of Safety-Gear materials-Design of Straight tooth spur and helical gears based on strength and wear considerations.** Pressure angle in the normal and transverse plane –Equivalent number of teeth **- Parallel axis Helical Gears** - Forces for helical gears.

UNIT 3 BEVEL AND WORM GEARS

9 Hrs.

Straight bevel gear: Tooth terminology- Design of pair of straight bevel gears - Tooth forces and stresses Worm Gear: Merits and demerits- Terminology. Design of the worm and gear - Forces and stresses, efficiency.

UNIT 4 GEAR BOXES

9 Hrs.

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of slidingmesh gear box -Constant mesh gear box. - Design of multi speed gear box.

UNIT 5 INTRODUCTION TO FINITE ELEMENT METHOD 12 Hrs

Basic concept of FEM- steps involved in FEM, shape function, mathematical modeling of one dimensional element- stepped bar, tapered bar-simple problems. Variational formulation and approximation- the Rayleigh-Ritz method, method of weighted residuals- simple problems

UNIT 5 CLUTCHES AND BRAKES

9 Hrs.

Design of plate clutches –Cone clutches – Centrifugal clutches- Electromagnetic clutches. Band and Block brakes- External shoe brakes – Internal expanding shoe brake.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Recognize the need for friction drives and positive drives.
- CO2 - Design of spur and helical gears.
- CO3 - Design Bevel and worm gears based on strength and wear consideration.
- CO4 - Design various types of gear boxes
- CO5 - Understand the Mechanical Design procedure of clutches and brakes
- CO6 - Design transmission components used in engine and machines

TEXT / REFERENCE BOOKS

- Bhandari V, "Design of machine elements", 4th Edition, Tata Mcgraw Hill Book Company, 2017.
- Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett —Mechanical.
- Engineering Design, 8th Edition, Tata McGraw-Hill, 2008.
- Prabhu. T.J., —Design of Transmission Elements, Mani Offset, Chennai, 2000.
- Sundararamamoorthy T. V, Shanmugam .N, —Machine Design, Anuradha Publications, Chennai, 2003.
- GitinMaitra, L. Prasad —Hand book of Mechanical Design, 2nd Edition, Tata McGraw-Hill, 2001.
- C.S.Sharma, Kamlesh Purohit, —Design of Machine Elements, Prentice Hall of India, Pvt. Ltd., 2003.
- Bernard Hamrock, Steven Schmid, Bo Jacobson, —Fundamentals of Machine Elements, 2nd Edition, Tata McGraw-Hill Book Co., 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100 Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each – No choice 20 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks 80 Marks

Added Content

Deleted Content

SPRA5102	DESIGN FOR MANUFACTURE AND ASSEMBLY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- Y To know the theory concepts of design for manufacturing and assembly.
- Y To know the general design guidelines for Metal casting, Metal Joining and Assembly.
- Y To know some aspects of the computer application in design for manufacturing and assembly.

UNIT 1 INTRODUCTION

9 Hrs.

General design principles for manufacturability - steps in Design process - strength and mechanical factors, mechanisms selection, evaluation method, Process capability - Feature tolerances Geometric tolerances - Assembly limits -Datum features - Tolerance stacks. Creativity in design - Materials: Types of materials-Composites and Nano materials, Selection of Materials for design Developments in Material technology - criteria for material selection — Material selection interrelationship with process selection, process selection charts.

UNIT 2 MACHINING PROCESS

9 Hrs.

Overview of various machining processes - general design rules for machining - Dimensional tolerance and surface roughness — Design for machining — Ease — Redesigning of components for machining ease with suitable examples.

UNIT 3 METAL CASTING

9 Hrs.

Introduction to different manufacturing processes -Appraisal of various casting processes, selection of casting process, - general design considerations for casting — casting tolerances — use of solidification simulation in casting design — product design rules for sand casting. Advantage and Disadvantage of castings.

UNIT 4 METAL JOINING

9 Hrs.

Introduction to different metal joining methods -Appraisal of various welding processes, Factors in design of weldments — general design guidelines — pre and post treatment of welds — effects of thermal stresses in weld joints — design of brazed joints. Forging — Design factors for Forging - Extrusion & Sheet Metal Work: Design guidelines for Extruded sections - design principles for Punching, Blanking, Bending, and Deep Drawing.

UNIT 5 DESIGN OF ASSEMBLY

9 Hrs.

Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, Identification of uneconomical design - Modifying the design - group technology - Computer Applications for DFMA. Design for Disassembly —Design for interchangeable-Ergonomics considerations in Design.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Outline the appropriate design for economical production and select the materials.
- CO2 - Select between various machining and general design rules for Machining.
- CO3 - Apply a systematic understanding of knowledge in the field of metal casting
- CO4 - Understand the metal joining Processes and appraisal of welding process.
- CO5 - Understand the design guidelines for manual assembly and systematic methodology of DFA
- CO6 - Identify the design and apply the ergonomic consideration in Design

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

- Geoffrey Boothroyd and Peter Dewhurst, "Product Design for Manufacturing and Assembly", CRC Press, 2010.
- Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.
- George E. Deiter, "Engineering Design – Material & Processing Approach", McGraw Hill Intl. 2nd Edition, 2000.
- Geoffrey Boothroyd "Hand Book of Product Design" Marcel and Dekken, N.Y.1990.
- Delbainbre, A "Computer Aided Assembly" London, 1992.
- Dickson, John. R, and Corroda Poly, Engineering Design and Design for Manufacture and Structural Approach, Field Stone Publisher, USA, 1995.



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**School of Mechanical Engineering
Department of Mechanical Engineering**

Minutes of meeting of Board of Studies Virtual meet held on 16th November 2022.

The following Members are participated in the meeting:

1. Dr.L.Vijayaraghavan, Professor- IIT Madras - External Member
2. Er.James Michael Amulu, Director- SAP Research- Walldorf, Baden-Württemberg, Germany - External Member
3. Dr.G.Arunkumar, Professor and Head- Mechanical Engineering - Internal Member
4. Dr.S.P.Venkatesan, Associate Professor- Mechanical Engineering - Internal Member
5. Dr.G.Senthilkumar, Associate Professor- Mechanical Engineering - Internal Member
6. Dr. J.Jayaprabhakar, Associate Professor- Mechanical Engineering- Internal Member
7. Dr.S.Ganesan, Associate Professor – Mechanical Engineering- Internal Member
8. Ms. Sanjana Kallat, Alumni- External Member.

The Chair Person welcomed the members of BoS and placed the agenda for the thoughts of the members. The following deliberations were made as per the items of the circulated agenda.

1. Agenda item # 1 Addition of new Course for Bachelors of Engineering– Mechanical Engineering

The Head of the department highlighted the feedback received from the Alumni for the inclusion of new course to focus on emerging technologies and the suggestion from Dr.L.Vijayaraghavan and Er.James Michael Amulu suggested Lean Enterprises and Advanced Manufacturing Technology. Based on BOS members suggestion, Department proposed the following new elective courses for the incorporation from 2020 batch onwards.

Course 1: DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

Course 2: DISASTER MANAGEMENT

Course 3: EQUIPMENT FOR POLLUTION CONTROL

Resolutions:

The BOS resolved to recommend for approval of the suggested courses for inclusion in B.E Programme of Mechanical Engineering.

2. Agenda item # 2 Modifications proposed for 2020 batch Bachelors of Engineering– Mechanical Engineering course syllabus:

Head of the department informed that the need of revising the syllabus of SMEA1403– Power Plant Engineering, as per the recent advancements in the field and the following modifications have been considered.

Inclusion of the following topics in Unit I: Feed water heaters and evaporators – Steam turbines, Binary cycles. Draught System, Cooling pond and cooling towers, Feed Water Treatment.

Inclusion of the following topics in Unit II: Layout and Components of Diesel - Gas Turbine and Hydro Electric Power Plants- site selection, operations, Advantages - Disadvantages - Applications.

Resolutions: The External members considered the revision as necessary as it broadly involved in manufacturing sector. The changes mentioned under inclusion had been approved by all and modification in curriculum had been reflected. Also, it was decided to implement for 2020 batch onwards.

3. Agenda item # 3_Addition of Skill in the professional domains in order to promote industry ready competency among learners. Necessity of introduction of certification courses from competent Government authorities for improving the domain knowledge and thus improving core placement counts.

Head pointed out that the workshop offered by the Department such as trends in Mechanical Engineering and Computational Fluid Dynamics.

Resolutions: The BoS members appreciated the same and suggested to follow in future also for making the industry ready competency among the students.

4. Agenda item # 4 Discussion about the ME CAD course offered was carried out by the BoS members. External members suggest to improve the Integrated manufacturing Systems (SPRA5104) subject because it involves industrial benefits for the students. The head inform that, we are working on that and we will revise in the next syllabus revision.

Resolutions: The BoS members appreciated the initiation taken for the revision of course.

5. Agenda item # 5 Any other points with the permission of Chair -Academic flexibilities with extra credits acquired through either advanced study of some courses or with accumulation of additional credits from additional courses as per students' choice. Head asked for the suggestions from the External members for students pursuing different specialization.

Resolutions: The BoS recommended that NPTEL courses. It can be selected based on the

student's specialization. Also recommend that the students can select the courses at the end of the fourth semester subject to the condition prescribed by the Board of Management time to time. With the above discussion, the Head expressed his deep sense of gratitude to all members for an academic vibrant discussion on various matters. Since there was no other agenda, the meeting ended with the Vote of thanks to the Chair.

Member	Designation	Signature
Dr.L.Vijayaraghavan	Professor, IIT Madras	
Er.James Michael Amulu	Director, SAP Research- Walldorf, Baden-Württemberg, Germany	
Dr.G.Arunkumar	Professor and Head	
Dr.S.P.Venkatesan,	Associate Professor	
Dr.G.Senthilkumar	Associate Professor	
Dr. J.Jayaprabakar	Associate Professor	
Dr.S.Ganesan	Associate Professor	
Ms. Sanjana Kallat	External Member (Alumni)	

SMEA1504	HEAT AND MASS TRANSFER	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- Y To learn the various modes of heat transfer and understand the basic concepts of mass transfer.
- Y To understand the applications of various experimental heat transfer correlations in engineering applications.
- Y To discuss the thermal analysis and sizing of heat exchangers.

UNIT 1 CONDUCTION

9 Hrs.

General Heat Conduction Equation- Cartesian, Polar and Spherical Co-ordinate Systems – One dimensional steady state heat conduction in simple geometries – Plane wall – Cylinder and sphere – Composite walls – Composite cylinders and spheres – Critical thickness of insulation – heat generation in plane wall, cylinder and sphere – extended surfaces - unsteady state heat conduction-Lumped Analysis – Semi Infinite and Infinite Solids –Use of Heisler's charts.

UNIT 2 CONVECTION

9 Hrs.

Free and Forced Convection – Hydrodynamic and Thermal Boundary Layer – Free and Forced Convection during external flow over Plates and Cylinders – Internal flow through tubes. Internal Flow - Laminar and Turbulent Flow Solutions - Analogies between momentum and heat transfer-Reynolds analogy-Chilton colburn analogy(Modified Reynolds analogy)-Free Convection – Flow over Vertical Plate - Vertical Tubes - Horizontal Plate, Inclined Plate, Cylinders and Spheres

UNIT 3 RADIATION

9 Hrs.

Laws of radiation - Wien's, Rayleigh-Jeans' and Planck's laws, Hemispherical Emissive Power, Stefan-Boltzmann law for the total emissive power of a black body, Emissivity and Kirchhoff's Laws – Concept of Gray, White, Opaque, Transparent and Black body radiation – shape factor - radiation exchange between surfaces -Radiations resistance network - Radiation shields.

UNIT 4 PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGER

9 Hrs.

Boiling and condensation – pool boiling regimes and correlations – critical heat flux - flow boiling correlations - Nusselt's theory – filmwise and dropwise condensation - Condensation over surfaces. Heat Exchanger Types – Overall Heat Transfer Coefficient – Fouling Factors – Analysis – LMTD method – NTU method.

UNIT 5 MASS TRANSFER

9 Hrs.

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy –Convective Mass Transfer Correlations..

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the basic modes of heat transfer and Compute temperature distribution in steady-state and unsteady-state heat conduction.
- CO2 - Understand and analyze heat transfer through extended surfaces.
- CO3 - Interpret and analyse forced and free convection heat transfer.
- CO4 - Explore the real time applications of radiation mode of heat transfer.
- CO5 - Design heat exchangers using LMTD and NTU methods.
- CO6 - Relate the mass transfer concepts for various industrial applications.

TEXT / REFERENCE BOOKS

1. Incropera, F.P. and Dewitt, D.P., Fundamentals of Heat and Mass Transfer, 7th Edition, John Wiley, 2011.
2. Holman, J.P., Heat Transfer, 10th Edition, Tata McGraw-Hill, 2010.
3. Ozisik, M.N., Heat Transfer - A Basic Approach, McGraw-Hill, 1985.
4. Cengel, Y.A., Heat Transfer - A Practical Approach, 2nd Edition, McGraw-Hill, 2002.
5. Sachedva, R.C., Fundamentals of Heat and Mass Transfer, 4th Edition, New Age International, 2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100 Exam Duration : 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice 20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks 80 Marks

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SMEA1403	POWER PLANT ENGINEERING	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- Y To provide essential knowledge of construction and working of various types of power plants.
- Y To detail the role of Mechanical Engineers in their operation and maintenance.

UNIT 1 STEAM POWER PLANT

9 Hrs.

Layout of Thermal Power Plant, Fuel And Ash Handling, Dust collection, Super Critical & FBC Boilers, Super heaters, Air pre heaters, Economizer, Condensers, Feed water heaters and evaporators – Steam turbines, Binary cycles, Draught System, Cooling pond and cooling towers, Feed Water Treatment.

UNIT 2 POWER PLANT EQUIPMENTS AND INSTRUMENTATION 9 Hrs.

Subcritical and supercritical boilers, boiler calculations - boiler efficiencies, equivalent evaporation, boiler power. Condensers - types - Calculation of vacuum efficiency, Feed Heaters, cooling towers - tower characteristics. Classification of plant instruments. Pressure gauges and types, Thermo-meters and types, Liquid level, gauges and types, Flow meter, pH measurement instruments, Gas Analysis, Impurity measurement instruments, Speed measuring instruments. Major Electrical Equipment in Power Plant-Layout of Electrical Equipment, Generator and Excites, Switch gear installations, Circuit breakers, Power transformers, Methods of Earthing a power system, Protective devices and control system used in power plant, Types of relays and voltage regulation.

UNIT 2 DIESEL, GAS, HYDRO ELECTRIC POWER PLANT

9 Hrs.

Layout and Components of Diesel - Gas Turbine and Hydro Electric Power Plants- site selection, operations, Advantages- Disadvantages - Applications.

UNIT 3 NUCLEAR & COMBINED POWER PLANT

9 Hrs.

Nuclear Engineering, Layout and components of Nuclear Power Plants, Working of Nuclear Reactors: BWR, PWR, CANDU, Fast Breeder, Gas Cooled and Liquid Metal Cooled Reactors, Combined and Binary Cycle Power Plants. Integrated Gasifier Combined Cycle power plants.

UNIT 4 ECONOMIC AND ENVIRONMENTAL ISSUES

9 Hrs.

Load Distribution Parameters, Load Curve, Capital and Operating Cost of Different Power Plants - Power Tariff Types - Pollution Control Technologies Including Waste Disposal Options for Thermal and Nuclear Power Plants.

UNIT 5 NON-CONVENTIONAL POWER GENERATION

9 Hrs.

Principle, Construction and Working of Wind, Tidal, Solar Thermal, Solar Electrical, Geothermal, Biogas and Fuel Cell Power Systems, Different Direct Energy conversion systems.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the different power generation methods.
- CO2 - Apply the basic thermodynamic principles to different power generation methods.
- CO3 - Understand construction of steam power plant, its working and significance.
- CO4 - Analyze thermodynamic cycles of Diesel, gas turbine & nuclear power plant.
- CO5 - Study the power generation, Distribution cost and impact of pollution from power plants.
- CO6 - Understand basic concepts of Non-Conventional Power Generation & its importance.

TEXT / REFERENCE BOOKS

- Nag. P.K., "Power Plant Engineering", 4th Edition, Tata McGraw – Hill Publishing Company Ltd., 2012
- Domkundwar, Power Plant Engineering - Dhanpat Rai & Sons, Delhi, 2016.
- Vopal and Stortzki, "Power Plant Engineering", PHI, 2007.
- Rajput.R.K, "Power Plant Engineering", 5th Edition, Laxmi Publications, 2016.
- Nagpal.G.R, Sharma.S.C, "Power Plant Engineering, 16th Edition, Khanna Publishers, 2012.
- Joel Weisomon and Roy Eckart, "Modern Power Plant Engineering", PHI, 1985.
- Rai G.D, Non Conventional Energy Sources, Khanna Publishers, New Delhi, 2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice each carrying 16 marks

80 Marks

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SMEA1503	FINITE ELEMENT ANALYSIS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand the concepts of Mathematical Modeling of Engineering Problems.
- To apply the use of FEM in various engineering problems.
- To learn the efficient implementation of finite element method in solving of simple problems.
- To solve simple and complicated 2D structural problems for stress analysis under impact loads from general engineering aspects.

UNIT 1 INTRODUCTION

9 Hrs.

Historical Background– Basic Concepts of FEM – Mathematical Modeling of field problems in Engineering – Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems–Residual Methods- Variational Formulation of Boundary Value Problems – Ritz Method- Finite Element Modeling - Element Equations - Shape functions -Bar, Beam Elements stepped bar, tapered bar-simple problems

UNIT 2 ONE-DIMENSIONAL PROBLEMS

9 Hrs.

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors- Assembly of Matrices- Solution of problems from solid mechanics and heat transfer-Bar, Beam Elements – Applications to Heat Transfer

UNIT 3 TWO DIMENSIONAL PROBLEMS

9 Hrs.

Basic Boundary Value Problems in Two Dimensions – Triangular, quadrilateral, higher order elements – Triangular elements – Shape functions and element matrices and vectors. Application to Field Problems - Thermal problems – Torsion of Non circular shafts –Quadrilateral elements – Higher Order Elements.

UNIT 4 SOLUTION TO PLANE ELASTICITY PROBLEMS

9 Hrs.

Introduction to Theory of Elasticity – Plane Stress – Plane Strain and Axisymmetric Formulation – Principle of virtual work - Element matrices using energy approach- Body forces and temperature effects – Stress calculations - Plate and shell elements

UNIT 5

SPECIAL TOPICS

Vibrational problems - equations of motion based on weak form -longitudinal vibration of bars - transverse vibration of beams Mesh Generation-Errors in the finite element method - various measures of errors- accuracy of the solution- Eigen value Problems - h & p elements- Applications of FEM software to solve simple problems, types of solver - a brief

ISO PARAMETRIC FORMULATION

9 Hrs.

Natural Co-ordinate System – Lagrangian Interpolation Polynomials – Iso-parametric Elements – Formulation –Numerical Intergration – 1D -2D Triangular elements – rectangular elements – Introduction to Analysis Software— h & p elements-Errors and Types

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the basics of matrix manipulations required for Finite Element Analysis.
- CO2 - Apply finite element formulations to solve one dimensional Problems.
- CO3 - Apply finite element formulations to solve two dimensional scalar Problems.
- CO4 - Apply finite element method to solve two dimensional Vector problems.
- CO5 - Apply finite element method to solve problems on iso parametric element.
- CO6 - Analyze the importance of ethical issues pertaining to the effective utilization of FEA in Mechanical engineering.

TEXT / REFERENCE BOOKS

1. Reddy. J.N., "An Introduction to the Finite Element Method", 3rd Edition, Tata McGraw-Hill, 2010.
2. Seshu, P, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.
3. Chandrupatla & Belagundu, "Introduction to Finite Elements in Engineering", 4th Edition, Prentice Hall College Div, 1997.
4. Rao, S.S., "The Finite Element Method in Engineering", 4th Edition, Butterworth Heinemann, 2005.
5. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis", 4th Edition, Wiley Student Edition, 2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks



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SPRA5104	INTEGRATED MANUFACTURING SYSTEMS	L	T	P	Credits	Total Marks
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COURSE OBJECTIVES

- Y At the end of the course, the student will be able.
- Y Serves as an introduction to the modern manufacturing methods.
- Y To gain knowledge of manufacturing systems integrated with CAD/CAM.
- Y To learn how computers integrated at various levels of production planning.
- Y To understand computer aided planning and control and computer monitoring.
- Y To discuss current or recent manufacturing trends and possible future development.

UNIT 1 INTRODUCTION

9 Hrs.

Objectives of manufacturing systems – identifying business opportunities – classification of problems in manufacturing and production systems. Strategy of linking manufacturing systems – system analysis of manufacturing operation. Automated Manufacturing Systems, Computerized Manufacturing Systems, Reason for Automation, Strategies of Automation.

UNIT 2 GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING

9 Hrs.

Role of Group Technology (GT) in CAD/CAM Integration – Part Families – Parts Classification and Coding – OPITZ coding systems – Production Flow Analysis – Composite part Concept – Machine cell design and layout – Application of GT – Quantitative analysis in cellular Manufacturing – rank order clustering method – Arranging Machines in a GT cell – Case studies. Role of process planning in CAD/CAM integration - Computer Aided Process Planning (CAPP) – Approaches to CAPP.

UNIT 3 COMPUTER AIDED PLANNING AND CONTROL

9 Hrs.

Production planning and control – Cost planning and control – inventory management – Material Requirement Planning (MRP) – case studies – Basics of JIT – Shop Floor Control – Factory data collection systems – Automatic identification systems – barcode technology – Automated data collection systems. Development of actual shop floor control systems (involving LAN, Communication server). Interface of shop floor controller with business systems (ERP or order systems).

UNIT 4 COMPUTER MONITORING

9 Hrs.

Types of production monitoring systems - Structure of manufacturing process – Process control and its strategies. Direct digital control – Supervisory computer control – Computer in Quality Control (QC) – Contact inspection and non contact inspection methods – flexible Inspection Systems – Computer Aided testing – Integration of CAQC with CAD/CAM.

UNIT 5 INTERATED MANUFACTURING SYSTEM

9 Hrs.

Role of integrative manufacturing in CAD/CAM integration – Application and features – Types of manufacturing systems – Material handling systems – Computer control systems. Introduction of Flexible Manufacturing Systems (FMS) – Components of FMS - Flexible manufacturing strategy – Case studies - Benefits of computer integrated manufacturing systems – rapid prototyping – Artificial Intelligence and Expert System in CIM.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the principle of automation in manufacturing systems.
- CO2 - Construct part programming using ISO format for given simple component.
- CO3 - Learn about structural analysis of material requirement.
- CO4 - Know the integration of computer in Quality control.
- CO5 - Develop an FMS layout for given simple part family using group technology concepts.
- CO6 - Recognize the use of Artificial Intelligence and Expert Systems in CIM.

TEXT/REFERENCE BOOKS

- Groover M.P. "Automation, Production systems and CIM", Prentice Hall of India, 2001.
- David Bedworth, "Computer Integrated Design and Manufacturing", TMH, New Delhi.
- Yorem Koren, "Computer Integrated Manufacturing Systems", McGraw Hill, 2017.
- Ranky, Paul G, "Computer Integrated Manufacturing", Prentice Hall International, 2005.
- Yeomanas, R.W. A.Choudry and P.J.W.Ten Hagen. "Design rules for a CIM systems", North Holland Amsterdam, 2002
- Radhakrishnanan O. Subramaniyam S ad Raju V, "Cnationa (P(AD/CAM/CIM)" 2nd Edition New age international (P) Ltd., New Delhi, 2008.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

PART A: 5 Questions of 6 marks each – No choice

PART B: 2 Questions from each unit of internal choice; each carrying 14marks

Exam Duration: 3 Hrs.

30 Marks

70 Marks

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