



SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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

www.sathyabama.ac.in

School of Mechanical Engineering

Department of Mechanical Engineering

1.2.1 New Courses Introduced in 2022-2023

S. No.	Course Code	Course Name	Page No.
1	SMEA3034	Design of jigs, fixtures and press tools	2
2	SMEA3035	Disaster management	4
3	SMEA3036	Equipment for pollution control	6

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 elliptical 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

- C01 Summarize the different methods of Locating Jigs and Fixtures and Clamping principles
- C02 Design and develop jigs and fixtures for given component
- C03 Discuss the press working terminologies and elements of cutting dies C04 Distinguish between Bending and Drawing dies.
- C05 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. ASTM 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

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

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.

C05 - 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.

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Max. Marks: 100

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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 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

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)	



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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
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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.

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Dr. J.Jayaprabakar	Associate Professor	
Dr.S.Ganesan	Associate Professor	
Ms. Sanjana Kallat	External Member (Alumni)	