CIF: Workshop Practice, ME-124, Programme Core (PC)
Department of Mechanical - Mechatronics Engineering
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LNMIIT
The LNM Institute of Information Technology

Summary

Programme: B. Tech. (Mech)	Course Title: "Workshop Practice"			Course Code: ME-124
Course type: Programme Core (PC)	Prerequisites None			Total Hours 14 (WL)+42 (WP)
Eligibility: Fresh Offered: II Sem	Workshop Lecture (WL) Hrs./Week = 1	Tutorial (T) Hrs./Week = 0	Workshop Practical (WP) Hrs./Week = 3	Credits **1-0-3 = 1.5**

Learning Objective

Workshop practice is an essential component of the industrial environment. It helps engineers develop and enhance relevant technical hand skills required in various engineering industries and workshops. Workshop Experience aims to impart basic know-how of various hand tools, power tools, machine tools, and their use in different sections of manufacturing. The use of workshop practices in day-to-day industrial and domestic life helps to solve real-life problems. The workshop experiences help build an understanding of the complexity of industrial jobs, along with the time and skill requirements of the job. The Workshop Exposure builds hands-on experiences that help learn manufacturing processes and production technology courses in successive semesters. By working with machinery and tools, students gain valuable experience that complements theoretical knowledge. These skills are crucial for their future careers, as engineers often need to apply practical solutions in real-world scenarios.

The course introduces students to fundamental engineering concepts and methods. It bridges the gap between theory and practice, allowing students to apply their knowledge to real-world situations. Workshop practice is also important since only practice can make a person perfect. Students are advised to undergo each skill experience with remembrance, understanding, and application, with special emphasis on an attitude of inquiry to know why and how for the various instructions and practices imparted to them in each shop. The Workshop in the institute has seven instruction shops (Welding Shop, Fitting Shop, Foundry Shop, Machine Shop, Smithy Shop, Carpentry Shop and Sheet Metal Shop) to learn and practice a wide range of manufacturing processes. A resource in the workshop not only helps to complete engineering syllabus practical but also supports undertaking undergraduate projects (BTPs), creative competitive working models manufacturing to the postgraduate and PhD research projects of social and industrial relevance.

Students learn safety protocols and regulations specific to workshops. Understanding safe practices is essential to prevent accidents and maintain a secure working environment. Having workshop skills, enables students to perform repairs and fabricate parts in-house. This can save costs for industries and organizations by avoiding outsourcing repairs or manufacturing.

The "Workshop Practices" course equips students with practical skills, deepens their understanding of engineering, and prepares them for the challenges of the industry. **It's a vital component of their education and future success.**

Philosophy of conducting practicals / Topic Coverage in the Shop / Laboratory

1. Introduce topic / title of the experiment.
2. Reason for conducting the particular experiment.
3. Relevance to the Industry / Research.
4. Safety and Hazards.
5. The technology.
6. Equipment / consumables / parametric window.
7. Practical understanding of technology through physical observations / mechanical testing / metallurgical investigations / productivity etc. in the Laboratory.
8. Industrial visit.

9. Development of theoretical / empirical relationships with motivation to write a research paper.
10. Application of Digital Manufacturing / Computer Applications (includes CAPP, Expert Systems)
11. Advantages and limitations.
12. Possibility of Innovations.
13. Possibility of Start-ups.
14. Commercial aspects.

Workshop Practice supported by complementary lectures, takes care of aspirations of the students in terms of EMPLOYABILITY, SKILL DEVELOPMENT, ENTREPRENEURSHIP, TEACHING and R&D.

Methodology

Jobs for various shops have been designed to ensure remembrance, understanding, applying, analysing and a curiosity to know 'how and why' for the various instructions and practices imparted to them in each shop, Bloom's taxonomy levels (1-4), Programme outcomes (1-12) and PSOs (1-3).

Brainstorming through **'how & why'**	Bloom's Taxonomy (1-4)	Cos (1-4)	POs (1-12)	PSOs (1-3)

CO and Bloom's level Correlation

COs	CO1	CO2	CO3	CO4
Bloom's levels (BL)	BL-1	BL-2	BL-3	BL-4
	Remembering	Understanding	Applying,	Analysing

Workshop Practicals, Course outcomes (CO), Bloom's levels (BL) and duration; Hours (H).

#	Experiment	CO	BL	H
1	Introduction to Workshop Practice, Shop Floor Working, and Tool-Room Concepts: • *Bloom's Level-1 (Remember):* This topic involves introducing students to basic concepts related to workshop practice, shop floor operations, and the role of the tool-room. It focuses on recalling and understanding fundamental information.	1	1	2
2	Safety and Hazards Awareness in Central Workshop and Laboratories: • *Bloom's Level - 2 (Understand):* Students learn about safety protocols, hazards, and precautions associated with workshop activities. Understanding safety guidelines falls under the "understand" category.	2	2	3
3	Introduction to Hand Tools, Materials, and Their Properties: • *Bloom's Level-2 (Understand):* Students gain an understanding of various hand tools, materials used in workshops, and their properties. This involves comprehension and application.	2	2	2
4	Bench Work Tools and Their Uses: • *Bloom's Level-2 (Understand):* Students learn about bench work tools and their practical applications. Understanding the purpose and usage of these tools falls under the "understand" level.	2	2	1
5	Bench Work Tools, Processes, and Job Making: • *Bloom's Level-3 (Apply):* This topic goes beyond understanding and requires students to apply their knowledge. They learn how to use bench work tools effectively and create specific components or products.	3	3	2
6	Smithy and Forging Tools and Equipment: • *Bloom's Level-2 (Understand):* Students understand the tools and equipment used in smithy and forging processes. This level emphasizes comprehension.	2	2	2

7	Smithy and Forging Operations and Job Making: • Bloom's Level-3 (Apply): Students apply their knowledge by performing smithy and forging operations, creating actual components or products.	3	3	2
8	Oxy-Fuel, Arc, and Plasma Arc Cutting Operations: • Bloom's Level-3 (Apply): Students demonstrate cutting techniques using different methods. Application and skill development are key here.	3	3	2
9	Oxy-Fuel Welding, Brazing, and Soldering Processes: • Bloom's Level-3 (Apply): Students apply welding, brazing, and soldering techniques, considering safety precautions and equipment. This involves practical application.	3	3	3
10	Demonstration of Various Welding Processes (Submerged Arc, MIG, GTAW): • *Bloom's Level-4 (Analyze):* Students observe and understand different welding processes, their equipment, and parameters. Effect of welding parameters on BG&SR and analysis.	4	4	3
11	Robotic Arc Welding and 3-D Metallic Printing: • *Bloom's Level-4 (Analyze):* Students analyze advanced techniques like robotic arc welding and 3-D metallic printing. This level involves critical thinking and evaluation.	4	4	2
12	Underwater Welding and Electrode Waterproofing: • *Bloom's Level-3 (Apply):* Students apply underwater welding techniques and learn about electrode waterproofing. Practical skills are emphasized.	3	3	3
13	Foundry Tools and Furnace Familiarization: • Bloom's Level-2 (Understand): Description: Students understand foundry tools, equipment, and furnace operations. Comprehension is the focus.	2	2	2
14	Green Sand Preparation and Casting an Aluminium Cube: • *Bloom's Level-3 (Apply):* Students apply the process of green sand preparation and casting, creating an aluminum cube.	3	3	3
15	Introduction to Various Machine Tools and Their Operations: • *Bloom's Level-2 (Understand):* Students understand different machine tools and their functions. Comprehension is key.	2	2	2
16	Lathe Machine Operations and Job Making (Including Hemi-Spherical Ball): • *Bloom's Level-3 (Apply):* Students apply lathe machine operations to create specific components, including a hemi-spherical ball.	3	3	3
17	Milling, Shaper, Drill, and Surface Grinder Operations: • *Bloom's Level-3 (Apply):* Students perform machining operations on different tools. Application and skill development are emphasized.	3	3	3
18	Introduction to Carpentry Shop and Woodworking Tools: • *Bloom's Level-2 (Understand):* Students understand carpentry shop basics, types of wood, and woodworking tools.	2	2	2
Total number of hours:		**42**		

Recommended Books

#	Title	Author(s)	Publisher
1.	Workshop Practices and Materials	Bruce J. Black	Routledge, 711 Third Avenue, New York, NY 10017
2.	Introduction to Basic Manufacturing Processes and Workshop Technology	Rajender Singh	New Age International (P) Limited, Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi - 110002
3.	Workshop-practice	C. S. Baladhiya & J. B. Rao	www.AgriMoon.Com

Additional Resources: NPTEL, MIT Video Lectures, Web resources etc.

Students are free to refer to any other book of choice on the subject. Assessment will be done only on basis of quality of technical content and relevant sketches.

Evaluation Method

Event	COs	BL	Weightage (%)
Continuous Job Assessment	1-4	1-4	72
Workshop job files			8
Brainstorming Brainteasers	1-4	1-4	20
TOTAL ASSESSMENT			**100**

CO and PO Correlation Matrix (MME)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Explanation and Justification for Correlation Matrix

The CO and PO correlation matrix indicates a perfect correlation (value of 3) between each Course Outcome (CO), each Program Outcome (PO) and Program Specific Outcomes (PSO). The justification for this corelation matrix is as under:

1. **Perfect Alignment**: A correlation value of 3 across all Course Outcome (CO), each Program Outcome (PO) and Program Specific Outcome (PSO) suggests that each course outcome is designed explicitly to fully align with and achieve every program outcome. This indicates a meticulous design where every aspect of the curriculum and course objectives directly contributes to meeting the overarching program goals.

2. **Comprehensive Coverage**: Each CO is intended to comprehensively cover the knowledge, skills, and competencies outlined in the corresponding Pos and PSOs. This ensures that students, upon completing the courses associated with these COs, will have acquired all the intended learning outcomes of the program.

3. **Assessment and Accreditation**: Such a matrix is highly favourable in educational assessment and accreditation contexts. It demonstrates that the curriculum is carefully structured to ensure that students receive a well-rounded education that meets or exceeds the standards set by accrediting bodies or educational institutions.

4. **Curriculum Integrity**: The matrix suggests a high level of integrity in curriculum design, with clear mapping between what is taught in courses (COs) and what is expected in terms of program outcomes (POs) and program specific outcome (PSOs). This helps in maintaining consistency and quality across different offerings of the program.

5. **Continuous Improvement**: While a perfect correlation may indicate strong alignment, it also invites scrutiny for continuous improvement. Even with perfect alignment on paper, there is often a need for review and update curriculum to ensure relevance and responsiveness to changes in industry, technology, and educational best practices.

In a nutshell, a correlation matrix where all values are 3 indicates an ideal scenario where the course in the program is meticulously crafted to ensure students achieve all intended program outcomes. It reflects a rigorous approach to curriculum design aimed at providing students with a comprehensive educational experience aligned with institutional and external standards.

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