ENGINEERING WORKSHOP PRACTICE

A. K. Sarathe

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by A. K. Sarathe

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FOREWORD

Engineering has played a very significant role in the progress and expansion of mankind and society for centuries. Engineering ideas that originated in the Indian subcontinent have had a thoughtful impact on the world.

All India Council for Technical Education (AICTE) had always been at the forefront of assisting Technical students in every possible manner since its inception in 1987. The goal of AICTE has been to promote quality Technical Education and thereby take the industry to a greater heights and ultimately turn our dear motherland India into a Modern Developed Nation. It will not be inept to mention here that Engineers are the backbone of the modern society - better the engineers, better the industry, and better the industry, better the country.

NEP 2020 envisages education in regional languages to all, thereby ensuring that each and every student becomes capable and competent enough and is in a position to contribute towards the national growth and development.

One of the spheres where AICTE had been relentlessly working from last few years was to provide high-quality moderately priced books of International standard prepared in various regional languages to all it's Engineering students. These books are not only prepared keeping in mind it's easy language, real life examples, rich contents and but also the industry needs in this everyday changing world. These books are as per AICTE Model Curriculum of Engineering & Technology – 2018.

Eminent Professors from all over India with great knowledge and experience have written these books for the benefit of academic fraternity. AICTE is confident that these books with their rich contents will help technical students master the subjects with greater ease and quality.

AICTE appreciates the hard work of the original authors, coordinators and the translators for their endeavour in making these Engineering subjects more lucid.

(**Anil D. Sahasrabudhe**)

Acknowledgement

The author is grateful to AICTE for their meticulous planning and execution to publish the technical book for Diploma students.

I sincerely acknowledge the valuable contributions of the reviewer of the book Prof. Hamid Zaheer, for making it students' friendly and giving a better shape in an artistic manner.

This book is an outcome of various suggestions of AICTE members, experts and authors who shared their opinion and thoughts to further develop the engineering education in our country.

It is also with great honour that I state that this book is aligned to the AICTE Model Curriculum and in line with the guidelines of National Education Policy (NEP) -2020. Towards promoting education in regional languages, this book is being translated in scheduled Indian regional languages.

Acknowledgements are due to the contributors and different workers in this field whose published books, review articles, papers, photographs, footnotes, references and other valuable information enriched us at the time of writing the book.

Finally, I like to express my sincere thanks to the publishing house, M/s. Khanna Book Publishing Company Private Limited, New Delhi, whose entire team was always ready to cooperate on all the aspects of publishing to make it a wonderful experience.

A. K. Sarathe

Preface

The "Engineering Workshop Practice Manual" is the result of my teaching, teacher-training and practical experience in this area. The AICTE model curriculum 2019 for diploma engineering & technology courses has been considered in developing this manual and all the units are covered in a proper and systematic way in this manual. All the units are supported with relevant theory, figures and photographs to help students to understand the unit in a better way.

There are total five units in the manual. First unit deals with the carpentry, second unit is about fitting, third unit focuses on welding, fourth unit discuss about sheet metal working and the fifth unit deals with electrical house wiring. The manual comprises of total seventeen workshop practical from P1 to P17 and the same are arranged in hierarchical manner from simple to complex so that students are not only focus on completing the practical and getting the marks / grades but are also motivated to create useful products incorporating their creative and critical thinking as well.

The manual format has been fine tuned by senior NITTTR Bhopal faculty to ensure alignment with outcome based education philosophy. The purpose of writing this manual is to introduce basic workshop practices to first year engineering diploma students to gain practical experience in using tools, equipment, instruments, machinery and processes correctly in various engineering shops. Efforts are made to present basic workshop practice in simplest possible way.

While preparing this manual, different standard text books and manuals of workshop technology are referred to handle workshop practice problems using critical thinking and performing procedures correctly. Students are encouraged to explore more information about workshop practice by advising them to refer standard books on workshop technology and through online links related to workshop activities.

I, sincerely hope that this engineering workshop practice manual will inspire students to take active participation in learning various workshop processes, as well as it will motivate teachers to make students learn with passion.

I am thankful to all suggestions made by stack holders to make this manual beneficial to all concerned.

It is really a great pleasure to cover and complete this manual for students as well as for teachers.

A. K. Sarathe

Outcome Based Education

For the implementation of an outcome based education the first requirement is to develop an outcome based curriculum and incorporate an outcome based assessment in the education system. By going through outcome based assessments, evaluators will be able to evaluate whether the students have achieved the outlined standard, specific and measurable outcomes. With the proper incorporation of outcome based education there will be a definite commitment to achieve a minimum standard for all learners without giving up at any level. At the end of the programme running with the aid of outcome based education, a student will be able to arrive at the following outcomes (as per NBA guidelines):

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

2. **Problem analysis:** Identify and analyse well-defined engineering problems using codified standard methods.

3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.

6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

7. **Life-long learning:** Ability to analyse individual needs and engage in updating in the context of technological changes.

Course Outcomes

CO-1. Use carpentry tools to make simple carpentry jobs

CO-2. Use fitting tools and instruments to make simple jobs.

CO-3. Prepare simple butt and lap joints using Arc, Gas, MIG welding equipment

CO-4. Undertake simple sheet metal jobs using relevant operations and tools safely.

CO-5. Undertake electric wiring works for various domestic applications.

Mapping of Course Outcomes with Programme Outcomes to be done according to the matrix given below:

Course Outcomes	EXPECTED MAPPING WITH COURSE OUTCOMES (1- Weak Correlation; 2- Medium Correlation; 3- Strong Correlation)						
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO-1	2	-	-	3	1	-	1
CO-2	3	-	1	3	2	-	1
CO-3	3	1	1	3	2	-	1
CO-4	3	1	1	3	2	-	1
CO-5	2	1	2	3	2	1	1

Abbreviations and Symbols

List of Abbreviations

Abbreviations and Symbols	Full form
Amp	Ampere
cm	Centimeter
kW	Kilowatt
m	Meter
mm	Millimeter
V	Volt
W	Watt
"	Inch
'	Feet

List of Figures

Guidelines for Teachers

To implement Outcome Based Education (OBE) knowledge level and skill set of the students should be enhanced. Teachers should take a major responsibility for the proper implementation of OBE. Some of the responsibilities (not limited to) for the teachers in OBE system may be as follows:

- Within reasonable constraint, they should manoeuvre time to the best advantage of all students.
- They should assess the students only upon certain defined criterion without considering any other potential ineligibility to discriminate them.
- They should try to grow the learning abilities of the students to a certain level before they leave the institute.
- They should try to ensure that all the students are equipped with the quality knowledge, practical skills as well as competence after they finish their education.
- They should always encourage the students to develop their ultimate performance capabilities.
- They should facilitate and encourage group work and team work to consolidate newer approach.
- They should assess the students based on suggested assessment scheme provided at the end of all the practical. If necessary, the suggested performance indicators can be changed as per requirement of the practical.

Bloom's Taxonomy

Level	Teacher should Check	Student should be able to	Possible Mode of Assessment
Creating	Students ability to create	Design or Create	Mini project
Evaluating	Students ability to Justify	Argue or Defend	Assignment
Analysing	Students ability to distinguish	Differentiate or Distinguish	Project/Lab Methodology
Applying	Students ability to use information	Operate or Demonstrate	Technical Presentation/ Demonstration
Understanding	Students ability to explain the ideas	Explain or Classify	Presentation / Seminar
Remembering	Students ability to recall (or remember)	Define or Recall	Quiz

Guidelines for Students

Students should take equal responsibility for implementing the OBE. Some of the responsibilities (not limited to) for the students in OBE system are as follows:

- Students should be well aware of each PrO before the start of each practical of every unit.
- Students should be well aware of each CO before the start of the course.
- Students should be well aware of each PO before the start of the programme.
- Students should think critically and reasonably with proper reflection and action.
- Learning of the students in practicals should be connected and integrated relevant theory and real life situations.
- Students should be well aware of their competency at every level of OBE.

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