BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, K.K. BIRLA GOA CAMPUS

FIRST SEMESTER 2022-23

### Course Handout Part II

Date: 11/10/2022

*Course No.* : MEF112

## Course Title : Workshop practice

## Instructor-in-Charge : Rajiv A. Shinde

**Course description:**

Shop practice involving machining (turning, facing, thread cutting, drilling, and grinding etc.) casting, metal forming, welding, fitting and wood-working etc. Demonstrations of metal cutting machines, e.g., shaper and CNC machines

**1. Scope and Objective of the Course:**

This course is an entry level course for all first degree students. The course will provide an overview of the techniques and applications of basic manufacturing processes required to produce a finished product from raw materials.

The primary objective of this course is to learn how a product is manufactured and to gain technical knowledge and skills involved in the processes. This knowledge will be useful in whatever discipline a student belongs to.

The manufacturing processes covered include Machining, Casting, Joining processes, metal forming, Sheet metal work processes. The students are exposed to modern manufacturing machines like CNC. A brief review of the properties of engineering materials and of measuring and gauging tools are also included.

The course is practical orientated and requires that basic skills in handling of tools, machines and machine tools used in different manufacturing processes are acquired through the hands-on experience.

Practical classes will be conducted in the Workshop, and they are intended to provide hands-on experience in handling of basic tools, machines, machine tools and produce simple utility jobs.

**2. Reference books**

**Text Book**

1. B S Nagendra Parashar and R K Mittal, *Elements of Manufacturing Process*, Prentice Hall of India, 2008.

**Reference Books**

1. Campbell J.S., *Principles of Manufacturing Materials and Processes*, Tata McGraw-Hill, New Delhi, 1995 print.
2. Richard R. Kibbe et all, *Machine Tool practices*, Sixth edition, Prentice Hall of India Pvt. limited, New Delhi, 2003.
3. E. Paul Degarmo, J.T. Black, Ronald A. kosher, *Materials and processes in Manufacturing*, PHI 2005.
4. Mikell P.Groover, Fundamentals of Modern Manufacturing, Second edition, John Wiley& sons Pvt Ltd.

**3. Course Plan:**

1. **Practical Part**

|  |  |  |
| --- | --- | --- |
| **Exercise No.** | **Description** | **No. of Jobs** |
| 1 | Metrology | 4 Experiments |
| 2 | Metal Turning Lathe | 1 |
| 3 | Milling machine | 1 |
| 4 | Fitting | 1 |
| 5 | Electric Arc Welding | 1 |
| 6 | Gas Welding | 1 |
| 7 | Carpentry | 1 |
| 8 | Foundry Practice | 1 |
| 9 | Electroplating | 1 |
| 10 | Demonstration of the shaper machine | --------- |
| 11 | Demonstration of Pipe bending | -------- |
| 12 | Demonstration of the CNC machines | --------- |

1. **Theory Part**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lech. No.** | **Learning objectives** | **Topics for syllabus** | **Ref. [book]-Ch.** |
| 1 | Course Instructions | Basics of manufacturing, types of production systems. | T-1 |
| 2 | Engineering Materials | Mechanical properties of material, Poisson’s ratio, Mode of fracture, FOS, Stress strain curve for ductile and brittle material, Common engineering material, Selection of material and numerical examples on stress, change in length and % elongation | T-2 |
| 3 | Role of measurements in manufacturing | Metrology, inspection, measuring, gauging, limits & fits. numerical examples on type of fits | T-3 |
| 4 | Theory of metal cutting | Machine tool classification, Tool material, Types of tool, Tool geometry, Tool signature, Left and right hand tools, Orthogonal oblique cutting, Type of chips, cutting fluids | T-4 |
| 5 | Production of cylindrical surfaces: machine tool and operations | Lathe machine tool, operating conditions, various operations on a lathe and Machining time calculation and numerical examples | T-5 |
| 6 | Production of cylindrical holes and allied operations | Drilling machine, drill, operating conditions, boring, reaming, tapping, Machining time in drilling numerical examples | T-6 |
| Production of flat surfaces: shaping | Shaping machines, operations on shapers and planers | T-7 |
| 7 | Production of complex and flat surfaces | Milling machine, type of milling processes & operations | T-8 |
| 8 | Obtaining surface finish | Abrasive machine, abrasives, grinding, grinding wheel, grinding machines and fine finishing operations. | T-9 |
| 9 | Production of parts by casting | Casting processes, pattern making, moulding sand, moulding process, cores, casting defects, advantages and disadvantages of casting, Special casting process | T-11 |
| 10 | Production of parts by forming | Metal forming processes, rolling, extrusion, and forging processes. | T-12 |
| Production of sheet metal parts | Punches & dies, sheet metal operations. | T-13 |
| 11 | Mechanical joining processes | Mechanical joining, arc welding, gas welding, soldering, brazing and mechanical fastening. | T-15 |
| 12 | Powder Metallurgy | Manufacturing process, Production of powder, mixing, compaction, sintering, Advantages and limitation | T-14 |
| 13 | Plastic processing and additive manufacturing | Types of plastic, forms of raw plastic material, Methods of processing, Introduction to additive manufacturing, | T-16 |
| 14 | Revision |  |  |

**4. Evaluation Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component** | **Duration (Min)** | **Marks (%)** | **Date & Time** | **Nature of Component** |
| Laboratory Practical Regular Class Work + Laboratory Report | Continuous | 50% | Regular | Evaluation by Staff / Instructor |
| Laboratory Practical Comprehensive Exam | 120 | 25% | Will be announced later | Evaluation by Instructor |
| Comprehensive exam | 90 | 25% | 15/07/2023  10:00 am – 11:30 am | Online/offline classroom and Closed book |

# **5. Workshop Practice and some points of Safety:**

Since the students may not be fully conversant with the operating mechanisms of the machinery of the workshop, direct handling of the machines should always be avoided. They should do it with supervision of the concerned Workshop staff and faculty only.

**The student must wear apron meant for the practical**. The aprons should be stitched within the first week of the admission. **The students should wear shoes during lab hours**. If any student is found without the apron or shoes, he/she will not be admitted to the workshop and will lose attendance. Any loose garment which can hangout and thus endanger the personal safety of the student, are not allowed in the workshop. Therefore admission to workshop is conditional on the basis of these conditions of the protective wear. Instructor In Charge / Workshop Superintendent’s discretion is final.

# **6. Make-up Policy**:

Make up for shop practice will not be permitted. In case of a genuine difficulty, the student can complete his practical in some other batch, by taking prior permission from the concerned instructor as well as the instructor of the practical batch in which student is going to work.

**Make up will not be given for Quiz exam in any case.**

**7. Notices:**

All notices concerning the course will be displayed either on Workshop Notice Board or on

course folder ‘Announcement’ of Quanta.

**8. Others:**

Any creative activity to promote the understanding of the subject is encouraged. Students

can come up with simple projects to familiarize themselves with various manufacturing

practices. For this, the students can consult the Instructor/ the Instructor in Charge /

Workshop Superintendent.

**INSTRUCTOR-IN-CHARGE**