

Measurements and Manufacturing Process

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
18MET32	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

1. Understand the basic objectives of metrology, measurements methods and its advancements.
2. Acquire knowledge on different standards of length, calibration of End Bars,
3. Equip with knowledge of limits, fits, tolerances and gauging.
4. To provide knowledge of various casting process and materials used in foundry practice.
5. To prepare the moulds by the concept of gating and risering systems.
6. To provide adequate knowledge of melting and pouring onto the various casting moulds.

Syllabus

Module - I

Introduction to Metrology:

Standards of measurement: Definition and Objectives of metrology, Measurements: Requirements, methods of measurements, Definitions-Least count, Accuracy, precision and errors in measuring instruments.

Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, calibration of end bars (Numerical), Slip gauges, Wringing

phenomena, Indian Standards (M-87, M-112), Numerical problems on building of slip gauges. **08 Hours**

Module - II

System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly, limits of size, Indian standards, concept of limits of size and tolerances, definition of fits, hole basis system, shaft basis system, geometric tolerance, position-tolerances.

Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials. Brief concept of design of gauges (Taylor's principles), Problems on design of gauges. **09 Hours**

Module - III

INTRODUCTION TO CASTING PROCESS AND BASIC MATERIALS USED IN FOUNDRY

Definition, Classification of *manufacturing* processes. Introduction to Casting process and steps involved. Varieties of components produced by casting process. Advantages and Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance. Classification of patterns, BIS colour coding of Patterns.

Sand Moulding: Types of base sand, requirement of base sand, Methods used for sand moulding such as Green sand, dry sand and skin dried moulds.

Binder: Definition, Types of binder used in moulding sand.

Additives: Need, Types of additives used and their properties.

08 Hours

Module – IV

CONCEPTS USED IN FOUNDRY

Cores: Definition, Need, Types, Method of making cores, Binders used, core sand moulding.

Concept of Gating and Risers: Principle and types.

Preparation of sand molds: Molding machines- Jolt type, squeeze type and Sand slinger.

Sand Molding process: Green sand, core sand, dry sand, sweep mold, CO₂ mold, shell mold, investment mold. **07 Hours**

Module – V

MELTING & METAL MOLD CASTING METHODS

Melting Furnace: Cupola construction, zones and operation of conventional Cupola.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Thixo-casting and Continuous Casting Processes.

Fettling and cleaning of castings: Basic steps, casting defects, Causes, features and remedies. **07 Hours**

Course Outcomes:

On completion of this course, the students are able to:

1. Understand the objectives of metrology, methods of measurements and calibration of end bars.
2. Describe slip gauges, wringing of slip gauges and building of slip gauges.
3. Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design.
4. Describe the casting process, Identify various types of patterns, binders, additives, cores and moulding machines.
5. Explain the mould preparation using Core, Gating, Riser system and Molding Machines.
6. Describe the working of cupola furnace used for melting of metals and special types of casting processes.

Text Books:

1. Beckwith, Marangoni, Leinhard: “Mechanical Measurements”, (Chapters 12-14, 16), Pearson Education, 6th Edition, 2007, ISBN-13: 978-81-317-1718-9.
2. P.N.Rao: “Manufacturing Technology”, Volume-1, (Chapters 3-6), Tata McGraw Hill, 4rd Edition, 2013, ISBN-13: 978-12590-62575.
3. P.L.Jain: “Principles of Foundry Technology”, (Chapters 1-8), McGraw Hill Education (India) Private Ltd., 2009, ISBN-13: 978-0-07-015129-1.

Reference Books:

1. Serope Kalpakjian and Steven R. Schmid, “Manufacturing Engineering and Technology”, (Chapters 11), Pearson Publication, 4th Edition, 2006, ISBN-13: 9788177581706.
2. I.C. Gupta, “Engineering Metrology”, (Chapters 2,4,6), Dhanpat Rai Publications, 7th Edition, 2012, ISBN-13: 9788189928452 .

E-Resources:

1. <http://www.nptel.ac.in>



