NAGARJUNA COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous under VTU)
DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

Sem : III **Academic Year : 2019-20 (Odd Semester)**

Course Code : 18MET32

Course Title : Measurements & Manufacturing Process

Course Coordinator : Mr. Vinod Kumar R

1. **COURSE DESCRIPTION:**

This covers the importance and applications of measuring instruments and calibration of measuring instruments, casting methods using sand mould and metal mould and also the casting defects and remedies. It also includes quality assurance of manufactured parts by inspection and testing.

The main topics covered are system fits, size limits, tolerances, basic materials & concepts used in foundry and it also includes the melting using cupola furnace.

2. COURSE OBJECTIVES:

This course will enable students to:

1. Understand metrology measurements, its advancements & also acquire knowledge on different standards of length, calibration of End Bars.
2. Equip with knowledge of limits, fits, tolerances and gauging.
3. Provide knowledge of various casting process and materials used in foundry practice.
4. Prepare the moulds by the concept of gating and risering systems.
5. Provide adequate knowledge of melting and pouring onto the various casting moulds.

3. COURSE PLAN:

Class Sl No	Module and Title	Topics to be covered	% of portions covered	
			Covered in the chapter	Cumulative
1	**Module – I Introduction to Metrology** T1: pp.2-25, 185-229 T2: pp 01-33	Definition and Objectives of metrology,	20%	20%
2		Measurements: Requirements, methods of measurements		
3		Definitions-Least count, Accuracy, precision and errors in measuring instruments.		

4		Standards of length International prototype meter, Imperial standard yard,		
5		Wave length standard, subdivision of standards		
6		line and end standard, calibration of end bars & Numerical		
7		Slip gauges, Wringing phenomena, Indian Standards (M-87, M-112)		
8		Numerical problems on building of slip gauges.		
9	**Module – II System of Limits, Fits, Tolerance and Gauging** T2: pp 126-162	Introduction, Definition of tolerance, Specification in assembly	20%	40%
10		Principle of interchangeability and selective assembly		
11		limits of size, Indian standards, concept of limits of size and tolerances		
12		definition of fits, hole basis system, shaft basis system		
13		Tolerances- geometric tolerance, position-tolerances		
14		Types of gauges-plain plug gauge, ring gauge,		
15		snap gauge, limit gauge and gauge materials		
16		Brief concept of design of gauges (Taylor's principles)		
17		Problems on design of gauges		
18	**Module – III Introduction to casting process and basic materials used in foundry** T3: pp.39-58 T4: pp 59-109 R2: pp. 1-16 .	Introduction, Classification of manufacturing processes	20%	60%
19		Introduction to Casting process and steps involved.		
20		Varieties of components produced by casting process. Advantages and Limitations of casting process.		
21		Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance		
22		Classification of patterns, BIS color coding of Patterns.		
23		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.		
24		Binder: Definition, Types of binder used in moulding sand.		
25		Additives: Need, Types of additives used and their properties.		
26	**Module – IV Concepts used in foundry** T3: pp.53-59, 75-79 T4: pp 109, 125-164 R2: pp. 256-269	Introduction, Cores: Definition, Need, Types, Binders used, core sand moulding.	20%	80%
27		Method of making cores,		
28		Concept of Gating and Risers: Gating and its types		
29		Risering System & Its types		
30		Preparation of sand molds: Molding machines- Jolt type, squeeze type and Sand slinger.		
31		Sand Molding process: Green sand, core sand, dry sand, sweep mold		
32		CO2 mold, shell mold, investment mold		

33	**Module – V Melting & metal mold casting methods** T3: pp.67-69, 72-74, 93-110 T4: pp 208-230	Melting Furnace: Cupola construction, zones and operation of conventional Cupola.	20%	100%
34		Metal moulds: Gravity die-casting, Pressure die casting		
35		Centrifugal casting, Squeeze Casting,		
36		Thixo-casting and Continuous Casting Processes.		
37		Basic steps of fettling and cleaning		
38		casting defects, Causes, features and remedies		
39		casting defects, Causes, features and remedies		

4.TEXT BOOKS:

T1 R K Jain, "Engineering Metrology", Khanna Publishers, 20th edition, 2013, **ISBN:** 81-7409-153-X

T2 Anand K Bewoor, Vinay A Kulkarni, "Metrology & Measurements", Tata McGraw Hill Education Pvt Ltd., 2012, **ISBN:** 978-0-07-014000-4

T3 RK Rajput, "Manufacturing Technology", Laxmi Publications, 2007, 1st edition, **ISBN:** 978-81-318-0244-1

T4 PN Rao, "Manufacturing Technology", Volume 1, Mcgraw Hill education Pvt Ltd, 2013, **ISBN:** 978-1-25-906257-5

5.REFERENCE BOOKS:

R1 IC Gupta, "Engineering Metrology", Dhanpat Rai Publication, 6th Edition, ISBN 13: 978-8189928452.

R2 Serope Kalpakjian & Steven R Schmid, "Manufacturing Engineering & Technology", 7th edition, Pearson Publications, 2011, ISBN-9780133128741.

R3 RK Jain, "Production Technology", Khanna Publications, 18th edition, 2014, ISBN: 81-7409-099-1.

1. **EVALUATION SCHEME:**

Component	Weightage / Marks	Date
CIE-1	20% / 40	
CIE-2	20% / 40	
CIE-3	20%/ 40	
AAT-1 (Surprise Test)	05% / 10	
AAT-2 (Quiz)	05% / 10	
SEE	50% / 100	

7. COURSE OUTCOMES:

On completion of this course, students will be able to,

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

Course Teachers **HOD**

1. **Mr. Vinod Kumar R**
2. **Mr. LJ Naik** **Dr N Kapilan**