



SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 16.01.2021

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No	: ME F219
Course Title	: MANUFACTURING PROCESSES
Instructor-in-Charge	: TUFAN CHANDRA BERA
Tutorial Instructors	: Divyansh Patel, Tufan Chandra Bera, Faizan Mohammad Rashid
Practical Instructors	: Rishi Kumar, Anish Kumar, Rishi Parvanda, Pawar Shrikant Shankarrao

1. Course Description:

Metal casting, different types of casting processes, casting analysis and defects. Metal forming processes, analysis and defects. Welding, brazing and soldering, process and defects. Machining processes and analysis, machine tools and cutting tool geometry. Polymer processing, metrology and instrumentation. Limits, fits and tolerances. Related laboratory experiments.

2. Scope and Objective of the Course:

An in-depth comprehension of various manufacturing processes is mandatory for a mechanical or manufacturing engineer, as physical component or product is obtained through proper transformations according to design requirement. Therefore, an attempt has been made to nurture the fresh talents for converting them into an efficient manufacturing engineer by studying various manufacturing processes in details. This course is designed to enrich theoretical, analytical as well as practical knowledge about conventional manufacturing processes such as casting, forming, welding and machining used in product fabrication and development. In addition to it, this course also aims to introduce polymer processing and powder metallurgy techniques along with brief introduction of metrology.

3. Text Books:

T1. S. Kalpakjian and S. R. Schmid, "Manufacturing Processes for Engineering Materials," Pearson Education, New Delhi, Fifth Edition, 2011.

4. Reference Books:

- R1.** Amitabha Ghosh and Asok Kumar Mallik, "Manufacturing Science", Affiliated East-West Press, New Delhi, 1985.
- R2.** P. N. Rao, "Manufacturing Technology: Foundry, Forming & Welding," Tata McGraw-Hill, New Delhi, 2000.
- R3.** P. N. Rao, "Manufacturing Technology: Metal Cutting & Machine Tools," Tata McGraw-Hill, New Delhi, 2000.
- R4.** Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology," Pearson Education, Fourth Edition, New Delhi, 2001.
- R5.** A. Bhattacharyya, "Metal Cutting Theory and Practice", New Central Book Agency, 2000.
- R6.** R. K. Jain, "Engineering Metrology" Khanna Publishers, New Delhi, 2007.



5. Course Plan:

Module Number	Lecture session	Reference	Learning Outcome
1.Introduction to manufacturing processes	L1.1.Introduction of casting, forming, machining & welding and their importance in part and product manufacturing.	(T1) Ch-1	Realization and selection of suitable manufacturing processes in part and product manufacturing.
2. Metal casting	L2.1 Various elements in mold making process and their attributes.	(T1) Ch-5	Understanding and analysis of metal casting processes, identification of casting defects and their remedies to obtain sound casting.
	L2.2 Molding materials, various standard testing of molding materials.	(T1) Ch-5	
	L2.3 Various elements of gating system for Casting, design of pouring basin, sprue and sprue base well in gating system.	(T1) Ch-5	
	L2.4 Design of runner and runner extension in gating system	(T1) Ch-5	
	L2.5 Design of in-gates and calculation of pouring time. Design of riser and importance of chill in castings	(T1) Ch-5	
	L2.6 Mechanism of solidification, Freezing of pure metals and alloys.	(T1) Ch-5	
	L2.7 Analysis of casting defects & remedies and inspection of casting defects.	(T1) Ch-5	
	L2.8 Various casting process such as shell molding, precision investment, permanent mold. die casting, vacuum die casting, low pressure die-casting, centrifugal casting.	(T1) Ch-5	
3. Metal forming	L3.1 Plastic deformation and yield criteria, upper bound and lower bound theory.	(T1) Ch-6	In-depth comprehension and analysis of metal forming processes, identification of forming defects and their remedies to obtain sound component.
	L3.2 Various forming processes, Types of forging processes.	(T1) Ch-6	
	L3.3 Analysis of rolling process	(T1) Ch-6	
	L3.4 Rolling defects and analysis	(T1) Ch-6	
	L3.5 Wire drawing process	(T1) Ch-6	
	L3.6 Tube and strip drawing process	(T1) Ch-6	
	L3.7 Extrusion process and its analysis.	(T1) Ch-6	



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	L3.8 Types and analysis of sheet metal forming.	(T1) Ch-7	
4. Welding and joining processes	L4.1 Introduction to welding process, its importance in product manufacturing. Gas welding, gas cutting and their attributes	(T1) Ch-12	To know the various welding processes and suitability and analysis of the process for obtaining defect free product.
	L4.2. Fundamentals of shield arc welding, Arc structure and power characteristics.	(T1) Ch-12	
	L4.3 Study of electrode, flux and operation.	(T1) Ch-12	
	L4.4 Welding symbols and Design of weld joints.	(T1) Ch-12	
	L4.5 Study of SAW, TIG, MIG, electroslog and electrogas welding.	(T1) Ch-12	
	L4.6 L14.2 Study of various resistance welding processes	(T1) Ch-12	
	L4.7 Brazing and soldering	(T1) Ch-12	
	L4.8 Weld Defects, inspection and welding metallurgy.	(T1) Ch-12	
5. Machining	L5.1 Introduction to machining and Various machining processes.	(T1) Ch-9	Understanding about various components of cutting forces and its importance in metal cutting. Determination and estimation of cutting forces. Comprehension about mechanics of common machining operations such as turning, shaping, milling and drilling and grinding.
	L5.2. Materials and geometry of cutting tools.	(T1) Ch-9	
	L 5.3 Introduction to machine tool drives and mechanisms	(T1) Ch-9	
	L 5.4 Mechanics of turning processes.	(T1) Ch-9	
	L 5.5 Mechanics of shaping	(T1) Ch-9	
	L 5.6 Mechanics of peripheral milling	(T1) Ch-9	
	L 5.7 Mechanics of face milling	(T1) Ch-9	
	L 5.8 Mechanics of drilling milling	(T1) Ch-9	
	L 5.9 Tool wear, tool life and machinability	(T1) Ch-9	
	L 5.10 Grinding and other abrasive machining processes	(T1) Ch-9	
	L5.11 Surface finish and surface integrity	(T1) Ch-9	



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6. Polymer processing	L6.1. Manufacturing of non-metallic parts	(T1) Ch-10	Get to know about various processing techniques of polymer and composite materials.
	L6.2. Powder metallurgy, forming and shaping of plastics, composite materials and ceramics and glass.		
7. Metrology	L7.1. Introduction of metrology and instruments for part inspection.	(T1) Ch-4	Understating about basics of metrology and limits, fits, and tolerances.
	L7.2. Limits, fits and tolerances		

6. Evaluation Scheme:

Component	Duration	Weightage (Mark)	Date & Time	Nature of component (Close Book/ Open Book)
Mid-Semester Test	90 Min.	30% (60)	---	Open book
Comprehensive Examination	120 Min.	35% (70)	05/05/2021 FN	Open book
Tutorial		20% (40)	---	Open book
Practical		15% (30)	---	Open book

7. Chamber Consultation Hour: To be announced in the class.

8. Notices: All notices related to the course will be displayed either on Notice Board of Mechanical Engineering Department or NALANDA only.

9. Make-up Policy: Make-up will be granted **ONLY** in genuine cases with prior permission. The request application for make-up test **MUST** be reached to the Instructor-in-Charge before commencement of the scheduled test along with **DOCUMENTARY PROOF**. No make-up will be allowed for the Surprise Quiz Tests.

10. Note:

It will be the responsibility of the individual student to be regular in maintaining the self-study schedule as given in the course handout, attend lectures and the lab demonstration as per the schedule announced in Nalanda. Mid Semester Test and Comprehensive Examination are according to the Evaluation Scheme given in the respective Course Handout. If the student is unable to appear for the Regular Test/Examination due to genuine exigencies, the student must refer to the procedure for applying for Make-up Test/Examination.

Instructor-in-Charge
ME F219