

		National Institute of Technology Meghalaya An Institute of National Importance											CURRICULUM				
Programme		Bachelor of Technology in Mechanical Engineering										Year of Regulation				2018	
Department		Mechanical Engineering										Semester				VII	
Course Code	Course Name	Credit Structure				Marks Distribution											
		L	T	P	C	INT	MID	END	Total								
ME 422	ADVANCED MANUFACTURING PROCESS	3	0	0	3	50	50	100	200								
Course Objectives	To introduce the basics of advance casting, forming and rapid prototyping.	Course Outcomes	CO1	Able to interpret the basics of foundry technology (Understanding)													
	To apply the knowledge of advanced casting, forming, Rapid prototyping and 3D printing in manufacturing industries with its advantages and disadvantages		CO2	Able to Explain the process of solidification, melting and quality control of steels and non-ferrous alloys (Understanding)													
	To discuss different methods of Rapid prototyping and know its advantages and disadvantages		CO3	Able to Apply the knowledge of metal forming in advanced manufacturing process industry. (Application)													
CO4			Able to Apply the knowledge of Rapid prototyping in manufacturing (Application)														
CO5	Able to Analyse and discuss different methods of Rapid prototyping and 3D printing with its advantages and disadvantages (Analysis)																
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	1	2	2	2	0	0	0	0	0	0	0	0	2	0	0	
2	CO2	2	2	2	2	0	0	0	0	0	0	0	0	2	0	0	
3	CO3	3	3	3	3	0	0	0	0	0	0	0	0	3	0	0	
4	CO4	2	2	2	3	0	0	0	0	0	0	0	0	2	0	0	
5	CO5	2	2	3	3	2	0	0	0	0	0	0	0	3	3	0	
SYLLABUS																	
No.	Content													Hours	COs		
I	Trends & scope in foundry Industry: Position of foundry industry worldwide and in India, analysis of data in respect of production and demand. Properties and applications of modern cast alloys- SG iron. Al – alloys, Mo- alloys, Ti – alloys. Technology of Selected Casting Processes, clay bonded, oil bonded, synthetic resin bonded and inorganic material bonded mould and core making processes. Sand additives and mould coatings. Metal mould casting processes, centrifugal and continuous casting processes.													08	CO1		
II	Solidification: Nucleation and grain growth, Solidification of pure metals, short and long freezing range alloys. Rate of solidification, macrostructure and microstructure. Solidification Contraction; Fluidity and its measurement. Mould-metal interface reactions. Melting and quality control: Melting and quality control of various steels and non-ferrous alloys casting defects - fettling, inspection and testing of castings. Casting for heterogeneous materials: FRP, quick casting , full mould casting Evaporative pattern casting													08	CO2		
III	Metal forming as a manufacturing process, theoretical analysis (theory of plasticity), Stress-strain relationship, Strain hardening, Material incompressibility, Work of plastic deformation, Work hardening, Yield criteria, Flow rule, Yield criterion and flow rule for Anisotropic material -Problems. Overview of various metal forming operations: Material behaviour – Mechanics of Plastic Flow Problems in Forging; Workability of testing techniques, Tribology in metal forming: Formability of sheet, Formability tests, Forming limit diagrams. Pressing and Sintering: Workability Studies – Densification.													08	CO3		
IV	Introduction, Prototyping fundamentals, Historical development, Advantages of AMT, Commonly used terms, process chain, 3D modelling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, RP data formats, Classification of AMT process, Applications to various fields. Liquid based systems: Stereo lithography apparatus (SLA): Models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages. Solid ground curing (SGC): Models and specifications, process, working principle, applications.													06	CO4		
V	Solid based systems: Laminated object manufacturing (LOM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages. Fused Deposition Modelling (FDM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages. Powder Based Systems: Selective laser sintering (SLS): Models and specifications, process, working principle, applications, advantages and disadvantages. Three-dimensional printing (3DP): Models and specification, process, working principle, applications, advantages and disadvantages.													06	CO5		
Total Hours													36				
Essential Readings																	
2. Richard Heine, Carl Loper and Philip Rosenthal “Principles of Metal Castings”, McGraw Hill Education; 2nd edition , July 2017																	
3. P.C. Mukherjee, “Fundamentals of metal casting technology” Oxford and IBH Co, 1988																	
4. Surender Kumar, “Technology of Metal Forming Processes”, Prentice - Hall, Inc., 2008.																	
Supplementary Readings																	
1. C. K. Chua, K. F. Leong, C. S. Lim, “Rapid prototyping: Principles and Applications”, World Scientific publications, 3rd edition., 2010																	