

LESSON PLAN

Fr. CRCE (Production)

Academic year: 2020-21

Fr. Conceicao Rodrigues College Of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Production & Mechanical Engineering

S.E. (Production) (Semester IV) (2020-2021)

Lecture Plan

Subject: Advanced Manufacturing Processes (AMP)

Credits – 03

Syllabus Production Engineering

Module	Contents	Hrs
01	Introduction to Additive Manufacturing (AM) Subtractive manufacturing v/s Additive Manufacturing, Discussion on different materials used in AM, Role of solidification rate in AM, Grain structure and microstructure in AM. Powder-based AM processes involving sintering and melting (selective laser sintering (SLS), electron beam melting). Solid-based AM process (extrusion based fused deposition modelling (FDM), Laminated object manufacturing (LOM)). Liquid based AM Process (Stereo lithography(SLA))	07
02	Introduction to Hybrid machining Electric discharge grinding (EDG), Electro chemical grinding (ECG), Electro stream drilling (ESD), Electro chemical deburring (ECD), Laser assisted machining (LAM) and Shaped tube electrolytic machining (STEM). Working principle, Material removal mechanism, Identification of process parameters, Advantages, Disadvantages and Applications.	06
03	Introduction to Micro Manufacturing Techniques Challenges in Meso, Micro, and Nano manufacturing. NON – MEMS based - Traditional Micromachining (Micro turning, Micro Milling, Micro grinding, Diamond turning). MEMS based - Overview about micro fabrication methods - Chemical vapor deposition (CVD); Physical vapor deposition (PVD), optical and electron beam lithography; Dry and wet etching.	07
04	Introduction to Nano Finishing Techniques Abrasive Flow Machining (AFM), Magnetic Abrasive Finishing (MAF), Magneto rheological Finishing (MRF), Magneto rheological Abrasive Flow Finishing (MRAFF), Magnetic Float Polishing (MFP), Elastic Emission Machining (EEM), Chemical Mechanical Polishing (CMP).	06
05	Metal Joining Processes: Gas welding, Arc welding, Resistance, Radiation, Solid state and Thermo-chemical welding processes, soldering and brazing processes, welding defects, inspection & testing of welds, Safety in welding.	06
06	Polymeric composites manufacturing processes: Thermoset and Thermoplastic composite processing, advantages & disadvantages. Manufacturing process for thermoset composites (applications, basic processing steps, advantages and limitations only) prepeg layup, wet layup, spray up, filament winding, pultrusion and resin transfer molding. Powder Metallurgy: Powder manufacturing methods; Advantages, disadvantages, and applications of powder metallurgy. Case studies like Oil Impregnated Bearings.	07

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Co No.	Course Outcomes
CO1	Differentiate between traditional and additive manufacturing techniques including solid-based, liquid-based and powder-based techniques.
CO2	Describe the working principle, material removal mechanism and process parameters for Hybrid machining.
CO3	Illustrate the MEMS and Non-MEMS based manufacturing techniques.
CO4	Describe basic Nano finishing techniques.
CO5	Describe metal joining processes along with their advantages, disadvantages and applications.
CO6	Illustrate the Composite manufacturing and powder metallurgy process along with its advantages, disadvantages and applications.

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

Target = 2 for all COs

FINAL CO	=	(0.8* Direct) + (0.2* Indirect)
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Direct	CO1	(0.7*Test) +(0.3*Univ Exam)
	CO2	(0.7*Test) +(0.3*Univ Exam)
	CO3	(0.7*Test) +(0.3*Univ Exam)
	CO4	(0.7*Test) +(0.3*Univ Exam)
	CO5	(0.7*Test) +(0.3*Univ Exam)
	CO6	(0.7*Test) +(0.3*Univ Exam)

Indirect	CO1	(1*Exit Survey)
	CO2	(1*Exit Survey)
	CO3	(1*Exit Survey)
	CO4	(1*Exit Survey)
	CO5	(1*Exit Survey)
	CO6	(1*Exit Survey)

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Note: - Content beyond syllabus (CBS) is in **bold**

Weekly Plan	Topic	Module	Hours
Week 1 (25/01/20 – 28/01/20)	Types of Joints, Gas welding, Arc welding	5	3
Week 2 (01/02/20 – 04/02/20)	Arc welding – SMAW, SAW, MIG, TIG. Videos	5	4
Week 3 (08/02/20 – 11/02/20)	Resistance welding – Spot welding, Seam welding, Butt welding, Flash welding, Solid state welding – Cold welding, Roll bonding, FSW. Videos	5	4
Week 3 (15/02/20 – 18/02/20)	Solid state welding – Explosion welding, Diffusion welding, Ultrasonic welding, Thermit welding, Atomic Hydrogen welding, Welding Videos, Powder Metallurgy – Steps, Powder manufacturing methods, Atomization, Crushing, Milling, Compacting, Sintering, Brazing,	5, 6	4
Week 4 (22/02/20 – 25/02/20)	Soldering, Reflow soldering, Wave soldering, videos on soldering.	6	4
Week 5 (01/03/20 – 04/03/20)	Nano finishing techniques, Abrasive Flow Machining (AFM). Polymeric composite manufacturing techniques. Prepreg layup.	4, 6	4
Week 6 (08/03/20 – 11/03/20)	UNIT TEST - 1		
Week 7 (15/03/20 – 18/03/20)	Polymeric composite manufacturing techniques. Hand layup. Wet layup, Spray up. Filament winding, Pultrusion, Pultrusion and resin transfer molding.	6	
Week 8 (22/03/20 – 26/03/20)	Introduction to Nano Finishing Techniques, Magnetic Abrasive Finishing (MAF), Magneto rheological Finishing (MRF), Magneto rheological Abrasive Flow Finishing (MRAFF).	4	
Week 9 (29/03/20 – 02/04/20)	Magnetic Float Polishing (MFP), Elastic Emission Machining (EEM), Chemical Mechanical Polishing (CMP).	4	

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Week 10 (05/04/20 – 09/04/20)	Introduction to Additive Manufacturing (AM) Subtractive manufacturing v/s Additive Manufacturing, Discussion on different materials used in AM, Role of solidification rate in AM,	1	
Week 11 (12/04/20 – 16/04/20)	Grain structure and microstructure in AM. Powder-based AM processes involving sintering and melting (selective laser sintering (SLS), electron beam melting).	1	
Week 12 (19/04/20 – 23/04/20)	Solid-based AM process (extrusion based fused deposition modelling (FDM), Laminated object manufacturing (LOM)). Liquid based AM Process (Stereo lithography(SLA))	1	
Week 13 (26/04/20 – 30/04/20)	Introduction to Hybrid machining. Electric discharge grinding (EDG), Electro chemical grinding (ECG), Electro stream drilling (ESD), Electro chemical deburring (ECD), Working principle, Material removal mechanism, Identification of process parameters, Advantages, Disadvantages and Applications	2	
Week 14 (03/05/20 – 07/05/20)	Laser assisted machining (LAM) and Shaped tube electrolytic machining (STEM). Working principle, Material removal mechanism, Identification of process parameters, Advantages, Disadvantages and Applications.	2	
Week 15 (10/05/20 – 14/05/20)	Introduction to Micro Manufacturing Techniques Challenges in Meso, Micro, and Nano manufacturing. NON – MEMS based - Traditional Micromachining (Micro turning, Micro Milling, Micro grinding, Diamond turning).	3	
Week 16 (17/05/20 – 21/05/20)	MEMS based - Overview about micro fabrication methods - Chemical vapor deposition (CVD); Physical vapor deposition (PVD), optical and electron beam lithography; Dry and wet etching.	3	
Week 17 (24/05/20 – 28/05/20)	UNIT TEST – 2, Revision	All	