

Department of Production Engineering  
Fr. Conceicao Rodrigues College of Engineering (CRCE)

**Fr. Conceicao Rodrigues College Of Engineering**  
 Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

**Department of Production Engineering**

**S.E. (Production) (Semester IV) (2019-2020)**

**Lesson Plan**

**Subject: Manufacturing Engineering-II**

**Credits - 4**

<b>SYLLABUS</b>		
<b>Module</b>	<b>Contents</b>	<b>Hrs</b>
<b>01</b>	<b>Unconventional machining processes:</b> Classification of the Non-traditional machining process. Basic principles, machines, advantage, disadvantages, and applications of Electrical discharge machining (EDM), Electron beam machining (EBM), Plasma arc machining (PAM), Laser beam machining (LBM), Electrochemical machining (ECM), Chemical machining (CHM), Ultrasonic machining (USM), Abrasive jet machining (AJM), Water jet machining (WJM), Abrasive water jet machining (AWJM).	<b>08</b>
<b>02</b>	<b>Types of joints:</b> Mechanical & fabricated joints. Gas, Arc welding, Resistance, Radiation, Solid state and Thermo-chemical welding processes, soldering and brazing processes, welding defects, inspection & testing of welds, Safety in welding.	<b>08</b>
<b>03</b>	<b>Mold Theory:</b> Introduction to foundry, advantages and disadvantages. Pattern: Types, pattern making, allowances and materials. Core: types, core materials, core boxes, core sand. Molding: Types of sands, sand properties, sand control tests, sand preparation, sand molding techniques, special molding processes. Casting techniques: pressure die casting, squeeze casting, Thixo casting, Rheo Casting, investment, Shell molding and fettling. Defects and inspections.	<b>08</b>
<b>04</b>	<b>4.3 Powder Metallurgy:</b> Powder manufacturing methods; Powder Metallurgy Process. Advantages, disadvantages, and applications powder metallurgy. Case studies like Oil Impregnated Bearings.	<b>08</b>
<b>05</b>	<b>5.1 Plastics Molding:</b> Plastic material types, properties and processing methods. <b>5.2 Ceramics Molding:</b> Slip casting, Tape casting, Blow molding and extrusion of glass.	<b>08</b>
<b>06</b>	<b>Polymeric composites manufacturing processes:</b> Basic steps in composite manufacturing process, advantages, disadvantages of thermoset and thermoplastic composite processing. 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.	<b>08</b>

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Co No.	CO Statement
<b>CO1</b>	Illustrate the fundamentals of various non-conventional machining processes, capabilities with their application areas.
<b>CO2</b>	Demonstrate the knowledge pertaining to sheet metal fabrication/different types of joints with their trouble shooting.
<b>CO3</b>	Illustrate the concepts of various metal casting processes.
<b>CO4</b>	Demonstrate the basic knowledge of powder metallurgy process.
<b>CO5</b>	Demonstrate the basic knowledge of plastic/ceramic molding processes.
<b>CO6</b>	Demonstrate the basic knowledge of fabrication of reinforced polymer/polymeric composites with their applications.

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	2										1
<b>CO2</b>	3	2										1
<b>CO3</b>	3	2										1
<b>CO4</b>	3	2										1
<b>CO5</b>	3	2										1
<b>CO6</b>	3	2										1

*Target = 2 for all COs*

<b>FINAL CO</b>	=	<b>(0.8* Direct) + (0.2* Indirect)</b>
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<b>Direct</b>	<b>CO1</b>	(0.6*UTest) +(0.4*Univ Exam)
	<b>CO2</b>	(0.6*UTest) +(0.4*Univ Exam)
	<b>CO3</b>	(0.6*UTest) +(0.4*Univ Exam)
	<b>CO4</b>	(0.6*UTest) +(0.4*Univ Exam)
	<b>CO5</b>	(0.6*UTest) +(0.4*Univ Exam)
	<b>CO6</b>	(0.6*UTest) +(0.4*Univ Exam)

<b>Indirect</b>	<b>CO1</b>	(1*Exit Survey)
	<b>CO2</b>	(1*Exit Survey)
	<b>CO3</b>	(1*Exit Survey)
	<b>CO4</b>	(1*Exit Survey)
	<b>CO5</b>	(1*Exit Survey)
	<b>CO6</b>	(1*Exit Survey)

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**LESSON PLAN**

<b>Subject:</b>	<b>MANUFACTURING ENGINEERING - 2</b>
<b>Academic Year:</b>	2019-20
<b>Name of the Teacher:</b>	Dr. Vasim A. Shaikh

<b>Week No.</b>	<b>Topics</b>	<b>Module</b>	<b>Hours</b>
<b><u>Week 1</u></b> (06/01/20 – 10/01/20)	Course Objectives, Course Outcomes (COs), Textbook, Introduction, Classification of Non-Traditional Machining Processes, Electric Discharge Machining (EDM), Electron Beam Machining (EBM), Plasma Arc Machining (PAM), Laser Beam Machining (LBM).	<b>1</b>	<b>4</b>
<b><u>Week 2</u></b> (13/01/20 – 17/01/20)	Electrochemical Machining (ECM), Chemical Machining (CM), Ultrasonic Machining (USM), Abrasive Jet Machining (AJM), Water Jet Machining (WJM), Abrasive Water Jet Machining (AWJM), Types of Joint, Mechanical Joint, Types of Joint: Fabricated Joint, Classification of Welding Processes.	<b>1</b>	<b>4</b>
<b><u>Week 3</u></b> (20/01/20 – 24/01/20)	(1) Gas Welding. (2) Arc Welding – Shielded Metal Arc Welding, Submerged Arc Welding, Gas metal arc welding (GMAW) (MIG), Gas tungsten arc welding (GTAW) (TIG), (3) Resistance Welding – Spot Welding	<b>1</b>	<b>4</b>
<b><u>Week 4</u></b> (27/01/20 – 31/01/20)	(3) Resistance Welding – Flash Welding, Flash Butt Welding, Seam Welding. (4) Solid State Welding – Cold Welding, Roll Bonding, Friction Welding, Explosive Welding, Diffusion Welding, Ultrasonic Welding.	<b>2</b>	<b>4</b>
<b><u>Week 5</u></b> (03/02/20 – 07/02/20)	(5) Thermo-chemical Welding – Atomic H <sub>2</sub> Welding, Thermit Welding (6) Radiation Welding – Electron Beam Welding,	<b>2</b>	<b>3</b>
<b><u>Week 6</u></b> (10/02/20 – 14/02/20)	Laser Beam Welding. Brazing, Soldering, Welding defects, Testing of welds, Weld safety.	<b>2</b>	<b>2</b>
<b><u>Week 7</u></b> (17/02/20 – 21/02/20)	No classes. <b>Euphoria (Feb 17, 18 and 20).</b>	-	-
<b><u>Week 8</u></b> (24/02/20 – 28/02/20)	Revision <b>Unit Test 1 (Feb 26 - 28).</b>	<b>1, 2</b>	<b>2</b>

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<b><u>Week 9</u></b> (02/03/20 – 06/03/20)	Powder Metallurgy. Definition and steps. Characteristics of metal powder. Production of metal powder. Atomization, Crushing, Milling. Blending and mixing of powder. Compacting. Sintering. Finishing Operations. Advantages and Disadvantages. Applications. Oil impregnated bearing.	<b>4</b>	<b>4</b>
<b><u>Week 10</u></b> (09/03/20 – 13/03/20)	Mold theory, Introduction to foundry and Casting, Advantages and Disadvantages, Sand mold. Important casting terms, Steps in making sand molds, Pattern allowances, Types of Patterns. Pattern materials, Pattern making, Types of Cores, Core boxes. Core boxes, Types of Molding sand, Molding sand properties, Sand control test. Mold sand preparation, Sand molding technique, Pressure die casting,	<b>3</b>	<b>4</b>
<b><u>Week 11</u></b> (16/03/20 – 20/03/20)	Pressure die casting, Squeezed casting, Thixoforming, Thixocasting, Rheoforming, Investment casting, Shell molding, Fettling, Casting defects. Molding with plastics – Injection Molding. <b>Crescendo</b>	<b>3</b>	<b>4</b>
<b><u>Week 12</u></b> (23/03/20 – 27/03/20)	Molding with plastics – Injection Molding, Compression Molding, Transfer molding, Blow molding. Rotational molding, Rotational molding, Thermoforming. Extrusion.	<b>5</b>	<b>4</b>
<b><u>Week 13</u></b> (30/03/20 – 03/04/20)	Extrusion. Molding with Ceramics – Blow molding, Tape casting, Slip casting. Polymeric Composite manufacturing techniques – Steps, Advantages, Disadvantages. Prepregs. Prepregs layup. Hand layup. Spray up. Filament winding. Pultrusion. Resin transfer moulding (RTM process).	<b>5, 6</b>	<b>4</b>
<b><u>Week 14</u></b> (06/04/20 – 10/04/20)	<b>Unit Test 2 (April 7, and 9)</b>	<b>6</b>	<b>4</b>
<b><u>Week 15</u></b> (13/04/20 – 17/04/20)	<b>Submission (Apr 17)</b> <b>Term End (Apr 18)</b>	-	-