

# **Muzaffarpur Institute of Technology**



**COURSE FILE**  
**OF**  
**MANUFACTURING BY SHAPING AND JOINING**  
**(021409)**

**FACULTY NAME**  
**ANIL KUMAR**  
**ASSISTANT PROFESSOR,**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

## Content

- 1) *Course File Cover*
  - 2) *Course File Content*
  - 3) *Vision of Department*
  - 4) *Mission of Department*
  - 5) *PEO's and PO's*
  - 6) *Course Description, Objectives and Outcomes*
  - 7) *Mapping CO's with PO's*
  - 8) *Syllabus and GATE syllabus*
  - 9) *Time Table*
  - 10) *Student List*
  - 11) *Course Handout*
  - 12) *Lecture Plan*
  - 13) *Assignments*
  
  - 15) *Sessional Question Papers*
  - 16) *University Question Paper*
  - 17) *Question Bank*
  
  - 19) *Lectures Notes*
  - 20) *Reference Materials*
  - 21) *Results*
  - 22) *Result Analysis*
  - 23) *Quality Measurement Sheets-Course End Survey*
-

---

### **3) Vision of Department**

To strengthen the region through imparting superior quality technical education and research; which enables the fulfillment of industrial challenge and establish itself as a Centre of Excellence in the field of Mechanical Engineering.

### **4) Mission of Department**

- To build an academic environment of teaching and lifelong learning for students to make them competitive in context with advance technological, economical and ecological changes.
- To enable the students to enhance their technical skills and communications through research, innovation and consultancy projects.
- To share and explore the accomplishments through didactic, enlightenment, R & D programs with technical institution in India and abroad.

### **5) PEO's and PO's**

#### **Program Educational Objectives (PEO's)**

*After 4 year of graduation a B.TECH (ME) graduate would be able to*

- Graduates will spread and enhance their technical capability and proficiency through vital domain of economic, environmental and social concerns affiliated with the mankind and industry.
- Graduates will able to Work professionally with modern methods in the area of Thermal, Mechanical System Design, Manufacturing, Measurement, Quality control and other interdisciplinary fields of concerns.
- Graduates will practice Mechanical engineering in sensible, flexible and ethical manner to benefit the society, industry and nation toward the rapidly changing global technical standards.
- Graduates will serve as ambassadors for engineering by their knowledge, creativity, imagination and innovation and set new extremes in their profession through lifelong learning.

## **Program Outcomes (PO's)**

*Students who complete the B.TECH degree in ME will be able to:*

1. An ability to apply the knowledge of mathematics, basic sciences and engineering concepts to solve the complex engineering problems.
2. The ability to conduct experiments and to critically analyze and interpret the experimental data to reach at substantial outcomes.
3. An ability to design systems, components, or processes to meet appropriate needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to identify, formulates, and solves the complex engineering problems.
5. An ability to function on multi-disciplinary teams that leads the multidisciplinary projects.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively with written, oral, and visual means.
8. An ability to understand the impact of engineering solutions in a global, environmental, economic and societal context.
9. An ability to recognize the need to engage in life-long learning.
10. An ability to attain knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern tools necessary for Mechanical engineering practice.
12. Possess ability to estimate costs, estimate quantities and evaluate materials for design and manufacturing purposes.

## **6) Course Description, Objectives and Outcomes**

**Course Description-** Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part.

### **Course Objective-**

To identify, discuss, and analyze the following manufacturing processes for engineering materials and the associated equipment:

1. Casting.
2. Bulk deformation.
3. Sheet metal forming.
4. Joining and fastening
5. Manufacturing of polymers, metal powders, composites, and ceramics.

### **Course Outcomes**

**CO1:** -Ability to analyze and select, types and allowances of pattern used in casting and analyze the component of moulds.

**CO2:** -Design core and gating system in casting process.

**CO3:** -Understand arc, gas and solid state welding

**CO4:** -Aware of manufacturing processes to solve industrial problem

### **7) Mapping CO's with PO's**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1								
CO2	3	3	3									
CO3	2	2	1	1								
CO4	2	3	2		1							

## 8) Syllabus and GATE syllabus

### **University Syllabus- Casting Processes:**

- A.** Types of pattern, pattern allowances, and types of moulds, sand preparation and sand test, preparation of moulds.
- B.** Furnaces: Electric Furnaces, cupola
- C.** Cores: Uses of cores chills, chaplets
- D.** Gating Design: Aspiration effect and effect of friction and velocity distribution. Design of risers and gates, dry sand mould casting, shell mould casting, investment casting, gravity die casting metal mould casting, slush casting, centrifugal casting, CO<sub>2</sub> process.
- E.** Casting effects, causes and remedy
- F.** Finishing of casting and inspection

### **Mechanical Working of Metal:**

Hot working and cold working, its advantages, disadvantages and applications, Rolling, Forging, Wire drawing, Extrusion, Punching and blanking, piercing, spinning coining, Embossing, thread rolling, tube drawing.

### **Powder Metallurgy:**

Principle, methods of producing powder, pressing sintering and finishing operations applications, principles, process, parameters and applications of gas welding, Arc welding, TIG, MIG, welding, thermit welding, Electron beam welding, laser beam welding, submerged arc welding, electro slag welding. Flux- for gas welding and for arc welding, electrode classification and selection, atomic hydrogen welding, selection of welding technique, filter metal welding for the following metals cast iron, aluminium and copper and their alloys, resistance welding, defects in welding, inspection- Destructive test and non-destructive test, equipment, fluxes and applications of soldering and brazing.

**GATE Syllabus- Casting, Forming and Joining Processes:** Different types of castings, design of patterns, moulds and cores; solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding.

**9) Time Table**  
**4th Semester Mechanical**  
**ROOM NO. 110**

<i>Day/ time</i>	09:00- 10:00	10:00- 11:00	11:00- 12:00	12:00- 01:00	01:00- 02:00	02:00- 3:00	03:00- 04:00	04:00- 05:00
<b>MON</b>					<b>B</b>		<b>MSJ ANK</b>	
<b>TUE</b>				<b>MSJ ANK</b>	<b>R</b>			
<b>WED</b>		<b>MSJ LAB ANK</b>			<b>E</b>			
<b>THU</b>					<b>A</b>		<b>MSJ ANK</b>	
<b>FRI</b>				<b>MSJ ANK</b>	<b>K</b>			
<b>SAT</b>								

The first acronym is the subject and second acronym is the first and last initial of faculty names



## **11) Course Handout**

<b>Institute / College Name :</b>	Muzaffarpur Institute Of Technology		
<b>Program Name</b>	<b>B.E. MECHANICAL</b>		
<b>Course Code</b>	ME207		
<b>Course Name</b>	MANUFACTURING BY SHAPING and JOINING		
<b>Lecture / Tutorial (per week):</b>	4/0	<b>Course Credits</b>	3
<b>Course Coordinator Name</b>	ANIL KUMAR		

### **1. Scope and Objectives of the Course**

Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part

### **2. Textbooks**

### **3. Other readings and relevant websites**

S.N	Link of Journals, Magazines, websites and Research Papers
0.	
1.	<a href="https://en.wikipedia.org/wiki/manufacturing">https://en.wikipedia.org/wiki/manufacturing</a>
2.	<a href="https://www.sciencedirect.com/journal/journal-of-manufacturing-processes">https://www.sciencedirect.com/journal/journal-of-manufacturing-processes</a>
3.	<a href="https://link.springer.com">https://link.springer.com</a>

4. <https://www.youtube.com/watch?v=uRVaLUQUmA8&list=PLACB124F79F677B6A>

## 5. Course Plan

Lecture Number	Date of Lecture	Topics	Web Links for video lectures	Text Book / Reference Book / Other reading material	Page numbers of Text Book(s)
1-12		<b>Casting</b>		TB3, RB8	1-8
		Casting: Principles of pattern making, allowances in patterns and core boxes, sand mould casting, constituents and properties of moulding sand and their tests, types of sand moulds, method and principles of gating, risering, use of cores and chills, cleaning of casting, defects in castings and their remedies, sand mould machines, melting and casting practices relating to cast iron, steel, aluminium and its alloys, copper and its alloys. Cupola, crucible and electric furnaces, metal mould casting, gravity casting, die casting, centrifugal casting, non-metallic mould casting-shell mould casting, Investment casting, plaster of paris mould casting.	<a href="https://www.youtube.com/watch?v=uRVaLUQUmA8&amp;list=PLACB124F79F677B6A">https://www.youtube.com/watch?v=uRVaLUQUmA8&amp;list=PLACB124F79F677B6A</a>		
13-21		<b>Mechanical working of metals</b>		TB2, RB9	7-45
		Mechanical working of metals : Hot and cold working of metals, their comparison and limitation, Hot working process – forging, roll forging, rolling piercing, extrusion, cold working processes – rolling, spinning, roll forming, cold	<a href="https://www.youtube.com/watch?v=uRVaLUQUmA8&amp;list=PLACB124F79F677B6A">https://www.youtube.com/watch?v=uRVaLUQUmA8&amp;list=PLACB124F79F677B6A</a>		
		heating, swaging, thread rolling, tube and wire			

		drawing, coining, embossing, tube rolling		
22-26		<b>Powder metallurgy :</b>		TB3, RB9
		Powder metallurgy : Principles, method of producing power, pressing, sintering and finishing operation, applications.	<a href="https://www.youtube.com/watch?v=uRValUQUmA8&amp;list=PLACB124F79F677B6">https://www.youtube.com/watch?v=uRValUQUmA8&amp;list=PLACB124F79F677B6</a>	46-69
27-39		<b>Welding, Brazing and Soldering</b>		TB1, RB1,RB2
		Welding, Brazing and Soldering : Comparison of the processes and their application, welding classification, Gas welding equipment, filler metal and fluxes, classification, oxy-acetylene welding – their applications. Electric arc welding – equipment, electrodes and fluxes, classification, carbon arc welding, shielded metal arc welding, submerged arc welding. Inert gas shielded arc welding. atomic – hydrogen welding – their application, new welding and laser beam welding, plastic welding, thermit welding, welding of cast iron, Aluminium and its alloys, copper and its alloys, Testing of weld destructive and non-destructive tests. Flange cutting, soldering – fluxes solder, equipments, type and applications. Brazing and braze welding fluxes, filler metals, types and application	<a href="https://www.youtube.com/watch?v=uRValUQUmA8&amp;list=PLACB124F79F677B6">https://www.youtube.com/watch?v=uRValUQUmA8&amp;list=PLACB124F79F677B6</a>	70-140
40-45		<b>Manufacturing of plastic components</b>		TB2, RB2
		manufacturing of plastic components : Plastic and its past, present and future uses, injection moulding,	<a href="https://www.youtube.com/watch?v=uRValUQUmA8&amp;list=PLACB124F79F677B6">https://www.youtube.com/watch?v=uRValUQUmA8&amp;list=PLACB124F79F677B6</a>	141-202

		Extrusion of plastic section, welding of plastics, Future of plastic & its application.	A		
--	--	---	---	--	--

Part-B	Topics for Mid Semester Examination(Serial Numbers only)	1 to 3
--------	--	--------

### 1. **Evaluation Scheme:**

Component 1	Mid Semester Exam	20
Component 2	Assignment Evaluation	10
Component 3**	End Term Examination**	70
	<b>Total</b>	<b>100</b>

\*\* The End Term Comprehensive examination will be held at the end of semester. The mandatory requirement of 75% attendance in all theory classes is to be met for being eligible to appear in this component.

### **SYLLABUS**

<b>Topics</b>	<b>No of lectures</b>	<b>Weightage</b>
<b>Casting Processes:</b> Types of pattern, pattern allowances, and types of moulds, sand preparation and sand test, preparation of moulds. <b>Furnaces:</b> Electric Furnaces, cupola <b>Cores:</b> Uses of cores chills, chaplets <b>Gating Design:</b> Aspiration effect and effect of friction and velocity distribution. Design of risers and gates, dry sand mould casting, shell mould casting, investment casting, gravity die casting metal mould casting, slush casting, centrifugal casting, CO2 process Casting effects, causes and remedy <b>Finishing of casting and inspection</b>	14	31%

<p><b>Mechanical Working of Metal:</b> Hot working and cold working, its advantages, disadvantages and applications, Rolling, Forging, Wire drawing, Extrusion, Punching and blanking, piercing, spinning coining, Embossing, thread rolling, tube drawing.</p>	9	20%
<p><b>Powder Metallurgy:</b> Principle, methods of producing powder, pressing sintering and finishing operations applications</p>	4	9%
<p><b>Welding, Brazing and Soldering:</b> Principles, process, parameters and applications of gas welding, Arc welding, TIG, MIG, welding, thermit welding, Electron beam welding, laser beam welding, submerged arc welding, electro slag welding. Flux- for gas welding and for arc welding, electrode classification and selection, atomic hydrogen welding, selection of welding technique, filter metal welding for the following metals cast iron, aluminium and copper and their alloys, resistance welding, defects in welding, Inspection- Destructive test and non-destructive test, equipment, fluxes and applications of soldering and brazing.</p>	12	27%
<p><b>Manufacturing of Plastic Components:</b> Plastic and its Past, present and Future uses, Injection Moulding, Welding of Plastics, Future of Plastic and its Application</p>	6	13%

	Assignment Numbers	Topics
1	Assignment #1	1
2	Assignment #2	2,3
3	Assignment #3	4,5

**This Document is approved by:**

Designation	Name	Signature
Course Coordinator	ANIL KUMAR	
H.O.D	Dr.Vikash Kumar	
Principal	Dr. J. N. Jha	

### ***12) Lecture Plan***

Part-A	Lecture Plan	
FIRST TERM		
S.No	Topic Name	Periods
<b>1</b>	<b>Casting</b>	
1.1	Introduction of Casting	1
1.2	Principal of Pattern Making	1
1.3	Allowance in Patterns and core boxes	1
1.4	Sand mould Casting	1
1.5,1.6	Constituents and properties of Moulding sand and Principal of Gating	2
1.7	Risering,Use of Cores and Chills	1
1.8	Cleaning of Casting	1
1.9	Defects in casting and their Remedies	1
1.10	Sand Mould Machine	1
1.11	Melting and Casting Particles relating to cast iron,Steel.Aluminium and its alloys	1

1.12	Cupola, crucible and electric furnaces	1
1.13	Metal mould casting, Gravity casting, Die Casting	1
1.14	Investment casting, Plaster of Paris mould Casting	1
<b>2</b>	<b>Mechanical Working Of Metal</b>	
2.1	Hot and cold working of Metals, Their comparison and limitation	1
2.2	Hot working Process, Forging, Roll Forging	1
2.3,2.4	Rolling Piercing, Extrusion, Cold working Processes	2
2.5	Rolling, Spinning, Roll Forming	1
2.6,2.7	Cold Heating, Swaging, Thread Rolling	2
2.8,2.9	Tube and Wire drawing, Coining, Embossing, Tube Rolling	2
<b>3</b>	<b>Powder Metallurgy</b>	
3.1	Principles, Method of Producing Power	1
3.2	Pressing	1
3.3	Sintering and Finishing Operation	1
3.4	Application	1
	<b>Second Term</b>	
<b>4</b>	<b>Welding, Brazing and Soldering</b>	
4.1	Introduction of Welding	1
4.2	Comparison of Processes and Their application	1
4.3	Welding Classification	1
4.4	Gas welding Equipment, Filler Metal and fluxes	1
4.5	Classification Carbon arc Welding	1
4.6	Atomic Hydrogen Welding, Their Application	1

4.7	New Welding and Laser Beam Welding	1
4.8	Plastic Welding,Thermit Welding	1
4.9	Welding of Cast Iron,Aluminum and it's Alloys	1
4.10	Testing of Weld destructive Test and Non-destructive Test	1
4.11	Flange Cutting,Soldering,Fluxes solder, Equipment's type and applications	1
4.12	Filler Metals, Types and Application	1
<b>5</b>	<b>Manufacturing of Plastic Components</b>	
5.1,5.2	Plastic and its Past, present and Future uses	2
5.3,5.4	Injection Moulding	2
5.5	Welding of Plastics	1
5.6	Future of Plastic and its Application	1
		45



## **13) Assignments**

### **Assignment I**

- 1) An aluminium alloy (density 2600 kg/m<sup>3</sup>) casting is to be produced. A cylindrical hole of 100 mm diameter and 100 mm length is made in the casting using sand core (density 1600 kg/m<sup>3</sup>). The net buoyancy force (in newton) acting on the core is \_\_\_\_\_.
- 2) Name the different types of pattern allowances and brief note on each of them?
- 3) What are the materials that are generally used for preparing patterns?
- 4) Sketch and explain TIG and MIG welding process?
- 5) Explain the following with neat sketches?
  - a) Submerged arc Welding.
  - b) Oxy acetylene welding.

### **Assignment II**

- 1) What is Powder metallurgy?
- 2) Write brief notes on solid state welding?
- 3) Define arc welding and gas welding?

### **Assignment III**

- 1) Write down different types of defect in casting?
- 2) Define different types of special casting process?
- 3) Define gating system in casting?

## **14) Tutorial Sheets**

[http://nptel.ac.in/gate\\_paper.php](http://nptel.ac.in/gate_paper.php)