**RTM Nagpur University**
**Syllabus (Theory)**

| Semester | Course Title (Subject) | Hours / Week | | | Credits | Maximum Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | Continual Assessment | University Examination | Total | |
| III | Manufacturing Processes | 3 | 00 | 00 | 3 | 30 | 70 | 100 | 3 |

| Sr. No. | Course Objective<br>The objective of this course is– |
|---|---|
| 1 | To understand the pattern making, gating system, moulding process and casting process. |
| 2 | To expose the students to the principles of the metal joining methods. |
| 3 | To study metal forming techniques, rolling, drawing, sheet metal forming, shearing operations and knowledge about process behavior. |
| 4 | To learn about plastics, ceramics and glass along with properties, types, applications and shaping |
| **Course Outcomes** | |
| After successful completion of this course the student will be able to: | |
| **CO1** | Understand the importance of manufacturing processes, techniques of pattern making and moulding with their properties. Design gating system along with selection of different types of melting furnaces and special casting process. |
| **CO2** | Get acquainted with the basic concept of joining process, welding process and its types, defects and application. |
| **CO3** | Get acquainted with the forming process for metal, mechanics of forming process along with different types of rolling machine. |
| **CO4** | Understand and define press working process along with its classification, types and terminology, different types of dies and introduction to shaping operation. |
| **CO5** | Understand introduction to plastics, ceramics and glasses, its properties, application, forming and its shaping. |

| SYLLABUS | |
|---|---|
| **Contents** | **No of hours** |
| **Unit I**<br><br>**Pattern Making & Moulding:** - Pattern making: Types, materials used, Pattern making allowances, color codes.<br>**Moulding sand:** Composition, moulding sand properties, Sand testing - Grain fineness, moisture content, clay content and permeability test. Core making: - Types, core material & its properties. Types of sand moulds.<br>**Gating System & Casting Processes:** - Gating design - Elements of gating systems, riser design. Melting furnaces - Types, Electric furnace, Induction furnace, Cupola construction & operation, Cleaning, inspection & casting defects - types, causes & remedy. Moulding machines. Special casting processes such as Investment Casting, Centrifugal Casting, Slush Casting, Die Casting, Shell moulding and $CO_2$ moulding. | 10 |
| **Unit II**<br><br>**Joining Processes:** - Major grouping of joining processes, welding, brazing and Soldering, Broad classification of welding processes, types and Principles. Electrodes, weldability of Metals, Welding equipments. Fixtures, Arc Welding & Gas Welding Processes, TIG Welding, MIG Welding, Spot Welding, Plasma Arc welding and Electron Laser Beam welding.<br>**Weld:** Inspection, Defects in various joints and their remedies.<br>**Joint through Adhesive –** classification of adhesive, types of adhesive, applications.<br>, | 09 |
| **Unit III**<br><br>**Forming Process for metals:**- Rolling, Forging, Extrusion, Drawing, Mechanics of forming process, Determination of Rolling pressure and roll specification force, drive force and torque, power loss in bearing, Determination of forging forces and stresses, Equipment (hammer/press) capacity required. (No analytical treatment)<br>, | 09 |
| **Unit IV**<br><br>**Sheet metal working**: - Classification, types of presses, press terminology, Force analysis in press working, Die cutting operation, types of dies, Die and punch allowance, introduction to shaping operations, bending, forming and drawing.<br>, | 08 |
| **Unit V**<br><br>Introduction to Plastics, Properties & types, applications, Forming & Shaping of plastics –Extrusion, injection moulding, Blow moulding, wire drawing, Compression moulding, Transfer moulding, Embossing, Calendaring.<br>Ceramic Structure, Properties, and Applications, Shaping Ceramics, Glasses Structure, Properties, and Applications, Forming and shaping of glass, Composite materials, Processing of metal matrix and ceramic matrix composites, Processing semiconductors.<br>, | 09 |

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students as assignments.

**References:**

**Text Books Recommended:**


1. Workshop Practice, H. S. Bawa, Tata Mc-Graw Hill
2. Manufacturing Engineering & Technology, Kalpakjian, Pearson
3. Modern Materials and Manufacturing Process, R. Gregg Bruce, John E. Neely,Pearson Education
4. Degarmon's Materials and Processes in Manufacturing, 11th Ed. Black, Ronald A Kohser, Wiley India
5. Workshop Technology (Volume I), Hajra Chaudhary, Media Promoters &Publishers
6. Workshop Technology (Vol. I & II), B. S. Raghuwanshi, Dhanpat Rai & Co.
7. Manufacturing technology (Vol. I), P. N. Rao, Tata Mc-Graw Hill
8. Manufacturing Science, Ghosh & Malik, East West Press.
9. Textbook of Production Engineering, P.C. Sharma, S. Chand & Co.
10. "ASM Metals Hand Book on Casting", 1992.
11.Parmer R.S; "Welding Processes& Technology", Khanna Publishers, 1994.
12.Lancaster J.F., George Allen and Unwin, 1991, "Metallurgy of Welding".
13.Metals Hand Book, Vol 6,8th edition, ASM, 1971.
14.AWS Welding Hand Book,Vol 1 to 4 AWS.


**Reference Books Recommended:**


1. Workshop Technology, Vol I & II, WAJ Chapman, Elsevier Butterworth-Heinemann.
2. Manufacturing Processes, M. Begman.
3. Processes & Materials of Manufacturing, R. Lindberg, Allyn & Bacon.

**RTM Nagpur University**
**Syllabus (Practical)**

| Semester | Course Title(Subject) | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | Continual Assessment | University Examination | Total |
| III | Manufacturing Processes | 00 | 00 | 2 | 1 | 25 | 25 | 50 |

| Course Outcomes | |
|---|---|
| After successful completion of this course the student will be able to: | |
| **CO1** | Think in core concept of their engineering application by studying various topics involved in branch specific applications. |
| **CO2** | Understand the relevance and importance of the Different manufacturing techniques and real life application in industry. |
| **CO3** | Design the gating and riser system needed for casting and requirements to achieve defect free casting. |
| **CO4** | Analyze the welding process behavior and requirements to achieve sound welded joint while welding different similar and dissimilar engineering material |
| **CO5** | Understand the plastic, glass and ceramic Processing |

**List of Practical's**

| Sr. No. | List of Practical's |
|---|---|
| 01 | Study of Cupola Furnace. |
| 02 | Study of Moulding Techniques |
| 03 | Study of Casting Process |
| 04 | Study of Pattern Making |
| 05 | Study of Joining Processes |
| 06 | Study of Forming Processes |
| 07 | Study of Drawing Processes |
| 08 | One Job – Pattern Making |
| 09 | One Job – Casting |
| 10 | One Job – on TIG/ MIG/ Resistance welding |
| 11 | Demonstration on Plastic, Glass and Ceramic Processing ( Industrial Visit) |

**Suggested References:**

1. Workshop Technology, Vol I & II, WAJ Chapman, Elsevier Butterworth-Heinemann.
2. Manufacturing Processes, M. Begman.
3. Processes & Materials of Manufacturing, R. Lindberg, Allyn & Bacon.