



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Fabrication Technology

Course/Subject Code: DI03055011

Course / Subject Name: Production Technology

|                         |                 |
|-------------------------|-----------------|
| w.e.f. Academic Year:   | 2024-25         |
| Semester:               | 3 <sup>rd</sup> |
| Category of the Course: | PCC             |

|                      |  |
|----------------------|--|
| <b>Prerequisite:</b> | -  |
| <b>Rationale:</b>    | This course focuses on different types of metal cutting machine tools used in fabrication industries. This course will develop capabilities for selection and usage of machine tool, work holding devices, cutting tools and process parameters. It also develops safety consciousness to the work in machine shop. This course focuses on manufacturing processes related to fabrication industries like metal casting and mechanical working of metal. This course develops quality consciousness among the student regarding these processes. It includes hands-on practice for students to develop practical skills. |

## Course Outcomes:

After Completion of the Course, Student will be able to:

| No | Course Outcomes  | RBT Level |
|----|--|-----------|
| 01 | Classify the machine tools used in fabrication industry.   | U         |
| 02 | Select cutting parameters for a job with given specification to be manufactured on lathe machine tool.   | A         |
| 03 | Select conventional machine tool used in fabrication industries other than lathe machine required to manufacture a given job as per the specification. | A         |
| 04 | Prepare procedural steps for making a given job by sand casting process.   | A         |
| 05 | Describe mechanical working process used for manufacturing of given component.   | U         |

## Teaching and Examination Scheme:

| Teaching Scheme<br>(in Hours) |   |    | Total Credits<br>L+T+(PR/2) | Assessment Pattern and Marks |       |                     |            | Total<br>Marks |
|-------------------------------|---|----|-----------------------------|------------------------------|-------|---------------------|------------|----------------|
| L                             | T | PR | C                           | Theory                       |       | Tutorial/ Practical |            |                |
|                               |   |    |                             | ESE<br>(E)                   | PA(M) | PA(I)               | ESE<br>(V) |                |
| 3                             | 0 | 2  | 4                           | 70                           | 30    | 20                  | 30         | 150            |



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## Course Content:

| Unit No. | Content   | No. of Hours | %of Weightage |
|----------|---|--------------|---------------|
| 1        | <b>Introduction to machine tools</b><br>1.1 Classification of manufacturing/production process.<br>1.2 Definition and concept of machine tool.<br>1.3 Criteria for selection of production process.<br>1.4 Function of machine tools.<br>1.5 Classification of machine tools.<br>1.6 Orthogonal/oblique cutting.<br>1.7 Shearing action and types of chips.<br>1.8 Safety consideration in machine shops.   | 6            | 13%           |
| 2        | <b>Lathe machine tool</b><br>2.1 Function and construction of Lathe.<br>2.2 Size, types and selection of lathe.<br>2.3 Basic parts of lathe.<br>2.4 Feed mechanism.<br>2.5 Lathe accessories and lathe<br>2.6 Attachments.<br>2.7 Lathe operations.<br>2.8 Lathe cutting tools, its geometry and material.<br>2.9 Cutting speed, feed, DOC, MRR.<br>2.10 Cutting fluid and lubricants used.   | 15           | 33%           |
| 3        | <b>Conventional machine tools used in fabrication industries (other than lathe machine)</b><br>3.1 Drilling machine tools.<br>3.1.1 Construction, types and size of drilling machine<br>3.1.2 Drill speed and feed mechanism<br>3.1.3 Operation performed on drilling machine<br>3.1.4 Types of drills<br>3.1.5 Twist drill geometry<br>3.1.6 Drill holding devices<br>3.1.7 Work holding devices<br>3.1.8 Drill size, designation and drill material.<br>3.1.9 Reamers<br>3.1.10 Taps<br>3.2 Shaper Machine tools.<br>3.2.1 Working principle, construction, types & size specification<br>3.2.2 Shaper work holding devices<br>3.2.3 Shaper operation<br>3.3 Milling machine tools. | 10           | 22%           |



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|          |   |   |     |
|----------|---|---|-----|
|          | 3.3.1 Working principle, types and size specification<br>3.3.2 Milling cutters<br>3.3.3 Milling methods<br>3.3.4 Milling operation<br>3.4 Grinding Machine tools.<br>3.4.1 Working principle, types, size and specification of grinding.<br>3.4.2 Grinding Machine operation<br>3.4.3 Grinding wheels, its classification, size, shape, and type of abrasives, grain size, bond grade, structure, marking system.<br>3.4.4 Glazing, loading and gumming of grinding wheel.<br>3.4.5 Truing, dressing, balancing of grinding wheel<br>3.4.6 Selection of grinding wheel<br>3.5 Metal Sawing machine.<br>3.5.1 Metal Sawing machine<br>3.5.2 Reciprocating Saw<br>3.5.3 Abrasive disc cutting<br>3.5.4 Power hacksaw blades |   |     |
| <b>4</b> | <b>Foundry</b><br>4.1 Sand casting process & its steps<br>4.2 Advantages & Application of casting<br>4.3 Foundry layout and different sections of foundry<br>4.4 Pattern : function, material, types, pattern making, pattern color coding, pattern allowances<br>4.5 Mould : Mould materials, moulding sand & its types, moulding binders<br>4.6 Core : Core types, core application<br>4.7 Principle of gating system<br>4.8 Function of gating system and Its different elements<br>4.9 Induction Furnace.<br>4.10 Fettling & finishing of casting<br>4.11 Defects in casting  | 9 | 20% |
| <b>5</b> | <b>Mechanical working of metals</b><br>5.1 Principle of Hot and Cold working of metals and their effects on mechanical properties of metal<br>5.2 Rolling : Introduction & Concept, Hot and cold rolling of metals, Types of rolling mills, Defects in rolled products<br>5.3 Extrusion : Introduction & Concept, Methods of extrusion, Hot and Cold extrusion,<br>5.4 Forging : Introduction, Merits of forging compare to machining and casting, hand forging tools, Forging Operations, Forging process, Forging defects<br>5.5 Metal Spinning: Introduction and principle of operation, spinning process,   | 5 | 12% |



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|                          |           |            |
|--------------------------|-----------|------------|
| Application of spinning. |           |            |
| <b>Total</b>             | <b>45</b> | <b>100</b> |

## Suggested Specification Table with Marks (Theory):

| Distribution of Theory Marks |         |         |         |         |         |
|------------------------------|---------|---------|---------|---------|---------|
| R Level                      | U Level | A Level | N Level | E Level | C Level |
| 43 %                         | 33 %    | 24 %    | -       | -       | -       |

Where R : Remember; U : Understanding; A : Application; N : Analyze; E : Evaluate; C : Create  
(as per Revised Bloom's Taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks and marks at different taxonomy levels (R, U and A) in the question paper may vary slightly from above table.

## References / Suggested Learning Resources:

### (a) Books:

| Sr. No. | Title of Book                   | Author           | Publication with place, year and ISBN                                   |
|---------|---------------------------------|------------------|---|
| 1       | Production Technology Vol-1 & 2 | O. P. Khanna     | Dhanpat Rai Publication   |
| 2       | Manufacturing Technology        | P. N. Rao        | Tata McGraw Hill Publishing Co. Ltd, New Delhi                          |
| 3       | Workshop Technology vol-1 & 2   | Hajra & Chaudhri | Media Publishers & Promoters, India. ISBN: 9788185099156, 9788185099156 |
| 4       | Foundry Technology              | O. P. Khanna     | Dhanpat Rai Publication   |
| 5       | Production Technology           | R. K. Jain       | Khanna Publishers   |
| 6       | Manufacturing Science           | S. Dalala        | -   |
| 7       | Workshop technology             | R. S. Khurmi     | S. Chand  |
| 8       | Foundry Engineering             | P. L. Jain       | Tata McGraw Hill Education  |



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## (b) Open-source software and website:

- <https://www.mechanicalbooster.com/2016/12/types-of-chips.html->
- <https://youtu.be/ljveGnQw2G0>
- <https://www.theengineerspost.com/types-of-lathe-machines>
- <https://youtu.be/1AwOzDv7j6o>
- <https://www.wisc-online.com/LearningContent/mtl8502/MLT8502>
- <https://esskaymachines.com/blog/types-of-drilling-machine>
- <https://youtu.be/a07gtJbK9aU>
- [https://en.m.wikipedia.org/wiki/Milling\\_\(machining\)](https://en.m.wikipedia.org/wiki/Milling_(machining))
- <https://mechanicalnotes.com/shaper-machine>
- [https://youtu.be/EgLXmKy2w\\_k](https://youtu.be/EgLXmKy2w_k)
- <http://www.mechanicalwalkins.com/power-hacksaw-parts-working-and-driving-mechanism>
- <https://www.foundry.com>
- <https://youtu.be/rL3dLQYEEKw>
- <http://www.mccannsales.com/book/sandcasting.pdf>
- [http://www.youtube.com/watch?v=6xnKmt\\_gsLs](http://www.youtube.com/watch?v=6xnKmt_gsLs)
- <https://youtu.be/dNbVsmVgOnM>
- [https://youtu.be/zu4MG\\_R8-KA?si=CNBWZxFGxoIP7oKx](https://youtu.be/zu4MG_R8-KA?si=CNBWZxFGxoIP7oKx)

## Suggested Course Practical List:

| Sr. No. | List of Practical  | No. of Hours |
|---------|--|--------------|
| 1       | Demonstrate safety consideration in machine shop.  | 02           |
| 2       | Prepare a job for given specification which includes facing & step turning (Straight turning) operation on lathe machine.  | 04           |
| 3       | Prepare a job for given specification which includes taper turning operation on lathe machine.                             | 04           |
| 4       | Prepare a job for given specification which includes thread cutting operation on lathe machine.                            | 04           |
| 5       | Prepare a job for given specification on drill machine.  | 02           |
| 6       | Demonstrate the shaper machine.  | 02           |
| 7       | Demonstrate the milling machine.   | 02           |
| 8       | Prepare a job for repairing of welded joint by using hand grinder.   | 02           |
| 9       | Cut different commercial form of metal used in fabrication industries by power hacksaw machine as per given specification. | 02           |
| 10      | Cut M.S round bar by using abrasive disc cutter.   | 02           |



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|    |  |           |
|----|--|-----------|
| 11 | Prepare sand casting procedure steps for given job.                                    | 02        |
| 12 | Prepare procedural steps of mechanical working process to manufacture given component. | 02        |
|    | <b>Total</b>   | <b>30</b> |

### Note

- More **Practical Exercises** can be designed and offered and can be changed by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.
- Boiler suit, safety shoes, other safety items & hand tools are compulsory while attending laboratory and has to be brought by students.

### List of Laboratory / Learning Resources Required:

|     |  |
|-----|--|
| 1.  | Lathe machine tools                      |
| 2.  | Drilling machine tools                   |
| 3.  | Shaper machine tools                     |
| 4.  | Milling machine tools                    |
| 5.  | Grinding machine tools                   |
| 6.  | Power Hacksaw machine tools              |
| 7.  | Disc cutters                             |
| 8.  | Different work holding devices           |
| 9.  | Foundry equipments & hand tools          |
| 10. | Different marking and measuring tools    |
| 11. | Different Machine Tools attachments etc. |

### Suggested Project List :

- Chart making:** Student have to prepare a chart on construction of various machine tools, work holding devices, tool signature, operations, process etc. given by the subject teacher.
- Video Preparation:** Student have to prepare his/her video on demonstrating different machine tool, work holding devices, cutting tools & operations perform on machine tools etc. given by the subject teacher.
- E-learning projects:** Students have to use internet and other online resources for preparation of report and/or download video on the topic given by the subject teacher within the syllabus or beyond the syllabus.
- Report preparation:** Student has to use different books, technical magazine, journals etc. for preparation of a report on the topic given by the subject teacher within the syllabus or beyond the syllabus.



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- e) **Power point presentation:** Students has to prepare a power point presentation of 10 to 15 slides on the topic given by the subject teacher within the syllabus or beyond the syllabus. In the end of presentation student has to ask at least 3 to 5 MCQ based question to identify the gain of listeners at the end presentation.

## **Suggested Activities for Students:**

- a) Prepare solutions of different assignments given by subject faculty.
- b) Prepare a list of specifications for various tools/equipment/machines used in the workshop.
- c) Download videos showing correct practices for different manufacturing processes.
- d) Visit at local manufacturer place and prepare the report on it.
- e) Arrange the local Industrial visit in machining industry, foundry and/or mechanical etc. working industry.
- f) Select three industrial components approved by subject teacher and list various methods of manufacturing used to produce them.
- g) Select four different components which are made by sand casting process.
- h) Draw different commercial forms of metals and suggest appropriate mechanical working process to manufacture them.
- i) List different mechanical properties of metal required for manufacturing a product by using different mechanical working process.
- j) Collect sample of different types of chips and list different factors affecting production of that chip.

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## ANNEXURE-1: SAMPLE SAFETY CONTRACT

(To be filled by the students and submitted to concerned faculty/staff)

-- Use for reference purposes only --

1. You have to read and sign the safety contract.
2. The safety contract says that you understand that safety is your responsibility.
3. The safety contract to be signed before you carry out any work in the laboratory and if you don't observe and obey the safety rules, you will not be allowed in the laboratory.

### Safety Contract

Date: \_\_\_\_\_

Name of Institute: \_\_\_\_\_

Name of Course with Code: Production Technology

Name of Faculty/Staff with Designation: 1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

#### I RECOGNIZE THAT:

1. Safety is my responsibility when using a tool.
2. Safety regulations have been provided to me.
3. The possibility of accident and injury increases if I do not follow all the safety guidelines.
4. I must act responsibly to ensure my own safety & the safety of others in the work area.

#### I AGREE TO:

1. Never work in the shop without my faculty's/ Instructor's supervision.
2. Read and practice all the safety regulations that have been distributed to me in this course or have been posted in the work areas.
3. Act in a responsible manner at all times in the laboratory.
4. Follow all instructions given by the faculty/Instructor.
5. Immediately report any unsafe condition or activity to my faculty/Instructor.
6. Wear eye protection at all times when working with tools or working anywhere near someone
7. who is using tools.
8. Cut or Tie back long hair, remove jewellery, secure loosed clothing, and wear boiler suit & safety shoes in the laboratory.
9. Clean all work areas and put equipment away before leaving the laboratory.

I, \_\_\_\_\_, have read and agree with all the safety instructions.

#### Particulars:

Programme : \_\_\_\_\_

Batch No. : \_\_\_\_\_

Enrollment No.: \_\_\_\_\_

Student Signature

\_\_\_\_\_