**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM**
**COURSE TITLE: AUTOMOBILE MANUFACTURING TECHNOLOGY**
**(Code: 3340206)**

| Diploma Programme in which this course is offered | Semester in which offered |
|---|---|
| Automobile Engineering | 4th Semester |

## 1. RATIONALE

As a diploma engineer, they are supposed to manage operations of manufacturing in industries. Thus, they should have operational knowledge and skills of various kinds of manufacturing equipment and processes. This course provides operational knowledge and skills of various manufacturing processes. It also provides general knowledge regarding various machine tools and machining operations carried out on them. This course also creates awareness about modern manufacturing technologies and tools used in industry. The course also tries to develop safety consciousness in students so that they may work safely in machine shop.

## 2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- **Supervise simple manufacturing processes required for manufacturing and repairs of systems / components of automobiles.**

## 3. COURSE OUTCOMES (CO's)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Describe various manufacturing processes and its application
ii. Describe principles of metal working processes and its application
iii. Identify defects and its causes in metal working processes
iv. Explain Casting process, defects & remedial measures
v. Describe different metal joining processes and its application
vi. Identify welding defects, its causes and remedial measures
vii. Explain working principle of conventional and non-conventional Machine Tool and operations carried out on each Machine tool

## 4. TEACHING AND EXAMINATION SCHEME

| Teaching Scheme (In Hours) | | | Total Credits (L+T+P) | Examination Scheme | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | Total Marks |
| L | T | P | C | ESE | PA | ESE | PA | 150 |
| 4 | 0 | 2 | 6 | 70 | 30 | 20 | 30 | |

**Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** – Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

## 5. DETAILED COURSE CONTENTS

| Unit | Major Learning Outcomes (in Cognitive Domain) | Topics and Sub-topics |
|---|---|---|
| **Unit – I Introduction To Manufacturing Processes** | 1.a Describe various manufacturing processes & its application. | 1.1 Nature, role and scope of manufacturing process.<br>1.2 Classification of manufacturing processes.<br>1.3 Introduction and application of each process.<br>1.4 Types of production. |
| **Unit– II Metal Working Processes** | 2.a Describe principles & its application of metal working processes<br>2.b Explain Defects and its remedies in metal working processes | 2.1 Hot and cold working processes<br>2.2 Working principles and application of: Rolling, Drawing, Spinning, Forging, Bending, Embossing, Extrusion, Piercing, Squeezing<br>2.3 Common Defects observed in cold and hot working processes<br>2.4 Remedial measures |
| **Unit– III Metal Casting** | 3.a Explain various casting process<br>3.b Explain Casting defects & Remedial measures | 3.1 Introduction to casting<br>3.2 Working principles of different methods of casting<br>3.3 Casting defects.<br>3.4 Remedial measures |
| **Unit– IV Metal Joining** | 4.a Describe different metal joining processes<br>4.b Identify appropriate metal joining process for the given job | (a) Introduction and classification of Metal Joining methods<br>(b) Working principles, application, and limitation of Gas Welding, Arc Welding & Resistance Welding<br>(c) Defects in Welding<br>(d) Remedial Measures<br>(e) Working principles & application of Brazing and Soldering<br>(f) Safety precautions. |
| **Unit– V Basic Machine Tools** | 5.a Explain Working principle of each Machine Tool & | 5.1 Introduction to Basic Machine Tools<br>5.2 Working principle of each Machine Tool & List out and explain each operations carried |

| Unit | Major Learning Outcomes (in Cognitive Domain) | Topics and Sub-topics |
|---|---|---|
| | operations carried out on each Machine tool<br>5.b Describe Factors affecting the selection of suitable Machine tool | out on each Machine tool like, Shaping, Planing, Milling, Drilling, Lathe, Boring, Grinding etc…<br>5.3 Factors affecting the selection of suitable Machine tool<br>5.4 Different surface finish operations<br>5.5 Working principle and different operations carried out on press |
| **Unit– VI Modern Manufacturing Tools & Techniques.** | 6.a Justify need and role of automation in automobile manufacturing industries<br>6.b Explain basic concept of CIM, NC, CNC, DNC, FMS, GT and CM<br>6.c Explain automated material handling tools | 6.1 Need and Role of Automation in manufacturing of automobile industry<br>6.2 Basic concepts of NC, CNC, DNC and brief introduction of their components<br>6.3 Basic concepts of Computer Integrated Manufacturing, CIM wheel, Benefits of CIM<br>6.4 Basic concepts of Flexible Manufacturing System, Flexible Assembly Systems, Benefits of FMS<br>6.5 Basic concepts of Group Technology (GT) and Cellular Manufacturing (CM), Benefits of GT and CM<br>6.6 Application of Automated Material handling tools like AGVs, AR/RS, and Robots |

## 6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

| Unit No. | Unit Title | Teaching Hours | Distribution of Theory Marks | | | |
|---|---|---|---|---|---|---|
| | | | R Level | U Level | A Level | Total |
| 1. | Introduction To Manufacturing Processes | 04 | 3 | 4 | 0 | 07 |
| 2. | Metal Working Processes | 10 | 4 | 3 | 4 | 11 |
| 3. | Metal Casting | 08 | 0 | 7 | 3 | 10 |
| 4. | Metal Joining | 08 | 0 | 7 | 3 | 10 |
| 5. | Basic Machine Tools | 16 | 7 | 7 | 7 | 21 |
| 6. | Modern Manufacturing Tools & Techniques. | 10 | 4 | 7 | 0 | 11 |
| | Total | **56** | **18** | **35** | **17** | **70** |

**Legends**: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table**.**

## 7. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

*Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme*

| S. No. | Unit No. | **PRACTICAL/EXERCISES** (Outcomes in Psychomotor Domain) (Any Seven) | Hrs |
|---|---|---|---|
| 1 | II | Demonstrate forging process | 04 |
| 2 | III | Demonstrate casting procedure | 04 |
| 3 | IV | Prepare a job using gas cutting and gas welding | 04 |
| 4 | IV | Prepare a job using arc welding | 04 |
| 5 | IV | Demonstrate brazing and soldering and operation | 04 |
| 6 | V | Demonstrate various machining operation carried out on centre lathe as per the given drawing (Straight Turning, Taper Turning, Grooving, Knurling, Thread cutting) | 04 |
| 7 | V | Demonstrate basic operations on Shaper and Milling Machine | 04 |
| 8 | V | Demonstrate surface finishing operations (Grinding, Honning, Lapping) | 04 |
| 9 | VI | Demonstrate working of CNC Lathe and/or CNC Milling machine. | 04 |

## 8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Seminar by Students on manufacturing processes like forging, casting, welding process etc.
ii. Prepare Display Board such as gas cutting kit, welding kit etc.
iii. Prepare job to explore various welding techniques applicable in automobile industries.
iv. Prepare job to explore various operations using various machine tools and measuring equipments.
v. Internet Base Assignment, Teacher guided self learning activity etc.(These could be Individual or group base.)

## 9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

i. Lectures cum discussion using Charts (such as forging process, welding, operation carried on lathe machine, milling machine, shaping machine.) and Cut Section/Model (such as mold, riser, runner, flask), Display board (such as casting steps, lathe).

**ii.** Use of power point presentation, animation, or videos showing operations on various machine tools.

## 10. SUGGESTED LEARNING RESOURCES

### A. List of Books

| S.No. | Author | Title of Books | Publication |
|---|---|---|---|
| 1 | R. K. Jain & S.C.Gupta | Production Technology | Khanna Publ. |
| 2 | O.P.Khanna | Production Technology | Dhanpat Rai and Sons |
| 3 | Hazra Choudhary | Workshop Technology Vol-I, Vol-II | Media promotors and publishers pvt. Limited, |
| 4 | Raghuwanshi | Workshop Technology Vol-I, Vol-II | Dhanpat Rai and Sons |
| 5 | M. L. Begman | Manufacturing processes | Willey International edition, USA |
| 6 | R.S. Khurmi And J.K. Gupta | A Textbook Of Workshop Technology : Manufacturing Processes | S. Chand Limited |
| 7 | P.N. Rao | Manufacturing Technology : Foundry, Forming & Welding | TATA Mc-Graw Hill |
| 8 | Mikell P. Groover | Automation, Production Systems, and Computer-integrated Manufacturing | Prentice Hall |
| 9 | P. N. Rao, N. K. Tewari, T. K. Kundra, | Computer Aided Manufacturing | TATA Mc-Graw Hill |
| 10 | P. N. Rao | Cad/Cam: Prin & Appl 3E | Tata McGraw-Hill Education |

### B. List of Major Equipment/ Instrument

i. Lathe Machine
ii. Milling Machine
iii. Grinding Machine
iv. Boring Machine
v. Shaping Machine
vi. Casting Equipments.

### C. List of Software/Learning Websites

i. http://www.youtube.com/watch?v=2lewK1TiQ_c
ii. http://www.youtube.com/watch?v=Kmb5tivQ_bY
iii. http://www.youtube.com/watch?v=h-c4_Ukqgx4
iv. http://www.youtube.com/watch?v=OOyAaWT6WQU
v. http://www-old.me.gatech.edu/jonathan.colton/me4210/casting.pdf
vi. http://me.emu.edu.tr/majid/MENG364/2_casting.pdf

vii. http://www.youtube.com/watch?v=CoNw_faThgQ (What Is Welding)
viii. http://www.youtube.com/watch?v=66-RK0DPXfU (Introduction to Resistance Welding)
ix. http://www.youtube.com/watch?v=U99asuDT97I (Milling: Chapter 1)
x. http://www.youtube.com/watch?v=RIbdYmmhPDI (Milling: Chapter 2)
xi. http://www.youtube.com/watch?v=BBqzca2gmNI (Machine Shop Training - Introduction Lathe Types & Terminology)
xii. http://eng.sut.ac.th/metal/images/stories/pdf/02_Forging.pdf
xiii. http://www.powershow.com/view/1dfd98NjgyZ/Chapter_13_Flexible_Manufacturing_Systems_powerpoint_ppt_presentation (Flexible Manufacturing System)
xiv. http://www.youtube.com/watch?v=JBN7IAwNLqQ (Video for FMS Part-I)
xv. http://www.youtube.com/watch?v=Jldf6Po8xWo (Video for FMS Part-II)

http://www.powershow.com/view/1451a5MDlmY/Chapter_12_Group_Technology_and_Cellular_Manufacturing_Systems_powerpoint_ppt_presentation (Group Technology and Cellular Manufacturing)

xvi. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDAQFjAA&url=http%3A%2F%2Fharshparmar.files.wordpress.com%2F2013%2F04%2Fautomated-guided-vehicles.ppt&ei=kkZMUvrCLc6HrgfUz4GIAw&usg=AFQjCNFBlD0ST8JFiEGmZThfFC2G5ye29Q (AGV)

xvii. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CDYQFjAB&url=http%3A%2F%2Fwww.et.byu.edu%2F~ered%2FME486%2FJenniferAGV.ppt&ei=kkZMUvrCLc6HrgfUz4GIAw&usg=AFQjCNFEEjrn80-Z-1Hgk8vpUeeNUhAxVg (AGV)

xviii. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CDAQFjAB&url=http%3A%2F%2Fwww.deu.edu.tr%2Fuserweb%2Farslan.ornek%2Fdosyalar%2F67044-Ch11.ppt&ei=7klMUtahL8qArgefhoDACA&usg=AFQjCNHW7sUWf3jeGBbQZcpvE8UoqfYiIg (AS/RS)

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

**Faculty Members from Polytechnics**

- **Prof. D. A. Dave,** H.O.D., Automobile Engineering Department, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.
- **Prof (Mrs.) M. N. Vibhakar,** Lecturer, Automobile Engineering Department, Dr. S&SS Gandhi Polytechnic, Surat.
- **Prof. S.V. Trivedi**, H.O.D., Automobile Engineering Department, Parul Institute Technology, Vadodara.
- **Prof. D. J. Gohel,** Lecturer, Automobile engineering Department. C.U.Shah Polytechnic,Surendranagar

**Coordinator and Faculty Members from NITTTR Bhopal**

- **Dr. K. K. Jain,** Professor, Department of Mechanical Engineering.
- **Dr. C. K. Chugh,** Professor, Department of Mechanical Engineering.