



FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Automobile Engineering)

Semester: V

Course Code: 202010502

Course Title: Automotive Manufacturing Techniques

Course Group: Professional Core Course

Course Objectives: To learn different manufacturing techniques such as foundry, welding, forming, as well as the design and utilities of jigs & fixtures. An introduction to advanced manufacturing techniques, manufacturing of plastic components for automotive applications and coating techniques are also covered.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Internal		External		Total
				Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	50 / 18	25 / 9	50 / 17	25 / 9	150 / 53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	INTRODUCTION OF MANUFACTURING PROCESS: Introduction to automotive manufacturing techniques, Importance of manufacturing, economic and technological definition of manufacturing, Classification of manufacturing processes, Selection of manufacturing process.	3



2	FOUNDRY PRACTICES: PATTERN & MOULD: Making Pattern, Pattern Allowances and Pattern Layout, Color scheme of Patterns , Defects, Types of Cores and their Utility. Moulding and Pouring: Classification of mould materials according to characteristics, Types of sands and testing, parting powders and liquids, Sand Mixing, Moulding defects. Melting and Pouring: refractory material and fluxes, Furnaces: Pit furnace, Tilting and Cupola furnaces, Casting defects, Factors determining soundness of casting.	12
3	FORMING AND SHAPING PROCESSES: Elastic and plastic deformation, Concept of strain hardening, Hot and cold working, Rolling, Principle and operations, Roll pass sequence, Extrusion, Wire and Tube drawing processes. Forging: Forging operations, Method of forging, Forging hammers and presses, Principle of forging tool design, Sheet Metal Forming: Shearing, Drawing, Squeezing, Blanking, Piercing, deep drawing, Coining and embossing. Metal working defects, cold heading, Riveting, Thread rolling bending and forming operation.	10
4	METAL JOINING PROCESSES: Automotive Applications, Principle of welding, Classification of welding and allied processes. Soldering, Brazing Shield metal arc welding: Electrodes and Electrode Coatings, Power sources and consumables, Tig, Mig. Gas welding and cutting: Principle, Oxyacetylene welding equipment, Welding positions, Flame cutting, Resistance welding: Principle and Equipments, Spot, Projection and seam welding process, Advanced Welding Processes: Atomic hydrogen, ultrasonic, Plasma and laser beam welding, Electron beam welding, friction and explosive welding, Welding defects.	10
5	JIGS & FIXTURES: Principles of location, Locating methods and devices, Basic elements, Clamping methods : Principles of clamping, Mechanical actuation, pneumatic, Hydraulic actuation Machining Jigs: General principles of milling, lathe, boring, broaching, Drill bushes and Jig buttons, Tolerances and materials used, development of jigs. Welding fixtures: Development of welding fixtures of automotive components, Assembly, Inspection and Welding fixtures. Modular fixtures systems: Quick change fixtures.	4



6	MODERN AUTOMOTIVE MANUFACTURING APPLICATIONS : 3D printing, concepts & its applications, Plastic Process, Surface Coating for Vehicle Body Chassis and Components, windshield glass making process, Super finishing processes: Lapping, Honing, burnishing, Barrel Tumbling Process, concepts of EDM & LBM, Etc.	6
	Total	45

List of Practicals / Tutorials:

1	Understand the construction, working principal, applications and limitations of fundamental machine tools and various measuring instruments available in machine shop.
2	Develop the procedure for producing the mould ready for pouring, for given pattern.
3	To understand various forming and forging processes used in automotive industries
4	Perform Oxy acetylene gas welding and cutting procedures and appreciate various welding flames and techniques.
5	Perform resistance-spot welding parameters, cycle and testing procedure
6	Perform the effect of varying arc welding variables like arc voltage, arc current and welding speed on bead characteristics for a shielded metal arc welding (SMAW) process.
7	Demonstration of various jig & fixtures for given automotive component and their applications
8	Study of various super -finishing and Non-conventional manufacturing technologies used for automotive manufacturing.
9	Study of various painting and coating processes used in automotive vehicles
10	Demonstration of 3D printing technologies and its applications in automotive components.

Reference Books:

1	Manufacturing Technology Vol. II, By P.N. Rao, Tata McGraw Hill
2	Production Technology by P.C. Sharma S Chand & Co Ltd.
3	Manufacturing Processes and Systems, 9th Ed. Phillip F., Ostwald, Jairo Munoz, Wiley India
4	Production technology, by R.K. Jain, Khanna publishers.
5	Joshi, P.H. "Jigs and Fixtures", Second Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2004.
6	K. Venkataraman, "Design of Jigs Fixtures & Press Tools", Tata McGraw Hill, New Delhi, 2005
8	Manufacturing Engineering And Technology By S. Kalpakjian, Pearson.
9	Design Data Hand Book, PSG College of Technology, Coimbatore.
10	ASTME Fundamentals of Tool Design Prentice Hall of India.



Supplementary learning Material:

1	NPTEL resources
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Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment

Internal Evaluation :

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
25	25	25	15	5	5	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%
CO-1	Describe the most important conventional & advanced manufacturing processes with respect to applications, economics and environmental impact	20%
CO-2	Express Knowledge about the fundamentals of the casting, basic terminology related to casting process.	25%
CO-3	Select appropriate forming & shaping processes for automotive components manufacturing industrial products.	20%
CO-4	Demonstrate ability to set-up and operate welding and cutting equipment.	25%
CO-5	Comprehend the mounting of Jigs and Fixtures on machine tool.	10%

Curriculum Revision:

Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2027