



C. U. SHAH UNIVERSITY

Wadhwan City

FACULTY OF: - Technology and Engineering
DEPARTMENT OF: - Automobile Engineering
SEMESTER: -V
CODE: - 4TE05MPR1
NAME: – Manufacturing Processes-II

Teaching and Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE05MPR1	Manufacturing Processes- II	4	0	2	6	5	30	1.5	70	3	---	20	30	150

Objectives:

- To select appropriate manufacturing process for producing part under consideration.
- To identify various process parameter and their effects on processes.
- To design the process and tooling.
- To identify the defects and propose the remedies.

Prerequisite:

Basic knowledge of tools used in workshop.

Course Outline:

Sr. No.	Course Content	Hours
1	Manufacturing Concept: Importance of manufacturing, Classification of manufacturing processes, Primary and secondary manufacturing processes. Job, batch and mass production, Selection of Manufacturing process.	04
2	Foundry Technology: Patterns Practices: Types of patterns, allowances and material used for patterns, moulding materials. Moulding sands: properties and sand testing, core materials and core making, core print; core boxes, chaplets, gating system design. Moulding practices: Green, dry and loam sand moulding, pit and floor moulding; shell moulding; permanent moulding; carbon dioxide moulding. Casting Practices: Fundamental of metal casting, Sand casting, Shell-Mould casting, Mold casting (plaster and ceramic), Investment casting, Vacuum casting, Permanent mould casting, Slush casting, Die casting, Pressure die casting, Centrifugal casting, Continuous casting, Squeeze casting, Casting alloys, Casting defects, Design of casting, Gating system design, and riser design. Melting furnaces-rotary, Pit electric, Tilting and cupola. Metallurgical considerations, Solidification of Casting.	14

3	Fabrication Processes: Introduction, classification, general considerations, Welding, Types, Metallurgy of welding. Processes- Gas welding, Arc welding, Resistance welding, Solid state welding, Thermit welding. Newer welding Processes. Welding design & Welding defects, Testing & Inspection of Welds, Brazing & Soldering, Adhesive bonding, Mechanical fastening, Joining non metallic materials, Design consideration in joining, Economic consideration. Examples.	12
4	Metal Forming Processes: Introduction, nature of plastic deformation. Hot working and Cold working processes, Rod, Wire and tube drawing. Rolling, Rolling Load, Roll passes. sheet metal forming processes, metallurgical aspects. Smithing and forging: Introduction, process device, fibrous structure and grain flow of forging, Depth and heat treatment of forged parts; design considerations. Orbital forging, Rotary swaging, Examples.	10
5	Processing Polymers and Reinforced Plastics: Introduction, Types of plastics, Elastomers, Laminating & Reinforcing, processing of plastics, Extrusion, Injection molding, Blow molding, Insert molding. Thermoforming, Calendaring. Processing of reinforcing plastics, Molding, Filament winding, Pultrusion and Pulforming. Design considerations, Economics of processing plastic, General characteristics and applications.	10
6	Nano Manufacturing: Introduction, clean rooms, fabrication of Microelectronic, Microelectrochemical, Micromechanical devices, Micromachining of MEMS devices, LIGA and related Micro fabrication processes, Solid free-form fabrication, Mesoscale Manufacturing, Nanoscale Manufacturing. Hard part CNC Turning.	10

Learning Outcomes:

Students will be able to select manufacturing process for the product under consideration and to tackle the common problem and faults.

Books Recommended:

1. Elements of Workshop Technology by **Hajra Choudhury**, Vol. I and II”, Media Promoters Pvt Ltd., Mumbai.
3. Manufacturing Processes for Engineering Materials by **Serope Kalpakajain, Steven R. Schmid**, Pearson Publication.
4. Manufacturing Technology Volume - I & II by **P.N. Rao**, Tata McGraw Hill.

Reference Books:-

1. Production Technology by **P. C. Sharma**, S Chand & Co Ltd.
2. Production technology by **R. K. Jain**, Khanna publishers.
3. Elements of Manufacturing Processes by **B. S. Magendran Parashar & R. K. Mittal**, Prentice Hall of India.
4. Principles of Metal Casting by **Richard W. Heine, Carl R. Loper, Philip C. Rosenthal**, Tata McGraw Hill.
5. Welding Processes & Technology by **Dr. R. S. Parmar**, Khanna Publishers.
6. Welding technology by **O. P. Khanna**, Dhanpat Rai publishers.

Research Reference:-

7. ASME – Journal of Manufacturing Science and Engineering
8. www.springer.com
9. www.sciencedirect.com



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FACULTY OF: - Technology and Engineering
DEPARTMENT OF: - Automobile Engineering
SEMESTER: - V
CODE: - 4TE05AHT1
NAME: – Automobile Heat Transfer (AHT)

Teaching and Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE05AHT1	Automobile Heat Transfer	3	0	2	5	4	30	1.5	70	3	---	20	30	150

Objectives:

- It gives fundamental difference between thermodynamics and heat transfer and different modes of heat transfer.
- Clear understanding about different laws governing the heat transfer modes, their physical significance and list their applications.

Prerequisite:

Basic knowledge of thermodynamics and mathematics for the related practices.

Course Outline:

Sr. No.	Course Content	Hours
1	Introduction: Typical heat transfer situations, Modes of heat transfer, Heat transfer parameters, Different thermo physical properties, Effect of temperature of thermal conductivity of various kinds of materials	02
2	Heat Conduction: Fourier's law, General three-dimensional heat conduction equation in Cartesian, Cylindrical and spherical co-ordinates, One dimensional steady conduction through plane wall, composite plane, cylinder and sphere, Critical thickness of insulation, Heat transfer from extended surfaces.	08
3	Heat Convection: Newton-Rikhman law, Dimensional analysis applied to forced and free convection, Dimensional numbers and their physical significance, Empirical corrections for free and forced convection, Thermal and hydrodynamics of boundary layers, Continuity momentum and energy equations, Blasius solution for laminar boundary layer, Von-Karman integral solution.	10
4	Heat Radiation: Absorptivity, reflectivity and transmissivity, Black white and grey body, Emissive power and emissivity, Laws of radiation, Planck, Stefan-Boltzmann, Wein's displacement, Kirchoff's law, Intensity of radiation and solid angle, Lambert's cosine law, Radiation heat exchange between black bodies, Shape factor, Heat exchange between non-black bodies, Infinite parallel planes and infinite long concentric cylinders, Radiation shield, Heat exchange between two grey surfaces, Electrical analogy.	10

5	Heat exchangers: Types of heat exchangers, Overall heat transfer coefficient, Analysis of heat exchangers, LMTD method, Effectiveness-NTU method, Correlation factor and effectiveness of heat exchangers, Air cooled heat exchanger and construction, Design criteria for air cooled engine, Heat transfer and fin design, Heat exchanger test including geometrical similarity, Thermal balance and flow test, Endurance test.	06
6	Boiling and Condensation: Boiling heat transfer Pool boiling, Condensation heat transfer, Film condensation, Dropwise condensation.	03
7	Automobile Cooling System: Radiator construction, Engine cooling system, Coolant properties, Design parameters for radiators and water pump design, Hoses, Thermostat valve, Radiator cap, Radiator fan, Radiator fan shroud, Surge tank, Design parameters and synchronization of vehicular engine cooling system for dissipation of heat generated in engine.	06

Learning Outcomes:

- The learners may able to get balanced treatment of the heat exchange in simple, lucid and easily understandable way without sacrificing emphasis on the fundamental aspects.
- Help to appreciate the importance of heat transfer in various fields of engineering.
- Impart knowledge to get cooler engine and effective radiator system.

Books Recommended:-

1. Heat & Mass Transfer by **Dr. D. S. Kumar**, S. K. Kataria & Sons, New Delhi.
2. Heat & Mass Transfer by **Er. R. K. Rajput**, S. Chand & Company Ltd., New Delhi.
3. Heat & Mass Transfer by **Arrora & Domkundwar**, Dhanpat Rai and Co., New Delhi.
4. Automobile Mechanics by **Dr. N. K. Giri**, Khanna Publishers, New Delhi.

Reference Books:-

1. Heat Transfer by **J. P. Holman**, Tata McGRAW Hill.
2. Introduction to Thermodynamics and Heat Transfer by **Yunus and A. Cengel**, McGRAW Hill, International.
3. Heat and Mass Transfer by **P.K. Nag**, Tata McGRAW Hill, New Delhi.
4. Heat Transfer by **S. P. Sukhatme**, University Press.
5. Fundamental of Heat and Mass Transfer by **C. P. Kothandraman**, New Age International.



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FACULTY OF: - Technology and Engineering
DEPARTMENT OF: - Automobile Engineering
SEMESTER: -V
CODE: - 4TE05ASD1
NAME: – Automobile System Design (ASD)

Teaching and Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE05ASD1	Automobile System Design	3	0	2	5	4	30	1.5	70	3	---	20	30	150

Objectives:

- The aim of this course is to learn systematic approach to Basic Fundamentals and Component Design of the machine elements.
- Provide students with the fundamental knowledge in the field of automotive design.
- To acquaint with the concepts of strength design related to various components.
- Identify the modes of failure and relevant theory for problem solving.
- Develop analytical abilities to give solutions to Automotive design problems.
- To recognize those factors constituting a practical, functional, efficient, and safe mechanical design.
- Use design data book to standardize component dimensions and select dimensional tolerances.
- To learn to use standard practices and standard data.

Prerequisite:

- Basic and analytical knowledge of Strength of Materials.
- Basic and analytical knowledge of Machine Design and Industrial Drafting
- They must know the derivatives and integration.

Course Outline:

Sr. No.	Course Content	Hours
1	Design Considerations: Aesthetic and Ergonomics consideration in design, design for manufacturing & assembly, Reliability, Thermal considerations, Wear considerations in design, Standardization, Preferred Series and Numbers. Contact Stresses.	07
2	Fatigue Loading: Design for fluctuating stresses, Endurance limit, Estimation of Endurance strength, Soderberg, Goodman and modified Goodman diagrams, fatigue failure, design consideration in fatigue, Design for creep	06

3	Design of Clutches and Brakes: Design of Clutches: Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, multi-plate clutch and centrifugal clutch. Design of Brakes: Design of Hydraulic Braking System, Design of Internal Expanding Shoe Brake and Disc Brake.	10
4	Design of Power Transmission Elements: Material Selection, Design of belt drives – Flat & V-belt drives, Condition for Transmission of max. Power, Selection of belt, Design of pulley, Wire rope and design of rope drives, design of chain drives with sprockets.	10
5	Design of Propeller Shafts and Axles: Design of Propeller shafts for bending, torsion for rigidity, Design of front & rear axles.	06
6	Design of Suspension and Steering System: General design considerations of suspension system, Design of leaf springs for automobile suspension system, Design considerations of Steering System.	06

Learning Outcomes:

- The students will develop the ability to make proper assumptions, perform correct analysis while designing specific automotive components.
- Design automotive component to meet desired needs.
- Apply the fundamental knowledge of Applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machine for actual design problems.
- Able to use design data books and different codes of design.

Books Recommended:-

1. Machine Design by **Khurmi Gupta**. S. Chand pub.
2. Automotive Chassis by **P. M. Heldt**, Chilton Co.,NY (1992)
3. Machine Design by **Pandya and Shah**, Charotar Publishing House.
4. Automotive suspension and steering systems by **Thomas W. Birch**, Delmar Cengage Learning, Third Edition.
5. Design of Machine Elements by **V. B. Bhandari**, Tata McGraw Hill Publishing Co.1994
6. Design of Machine Elements by **C. S. Sharma & Kamlesh Purohit**, Prentice Hall of India Pvt. Ltd.
7. Auto design Problems by **K. M. Agrawal**, Satyaprakashan.

Reference Books:-

1. P.S.G Design data book (PSG college of engg. & Tech.). DPV Printers,Coimbatore,2000
2. Machine Design by **P. C. Sharma and D. K. Aggarwal** S.K. Kataria & Sons 2009
3. Machine Design by **R. C. Patel and A. D. Pandya** Vol-1 and Vol-2,C.Jamnadas & Co.1992
4. Machine Design – An Integrated Approach Robert L Norton, Pearson Education.2005
5. Elements of Motor Vehicles Design by **DTB donkins**, TMH
6. Automobile Chassis Design by **Dean Avern**, Lllife Books Ltd (1992)
7. Machine elements: life and design by **Boris M. Klebanov, David M. Barlam, Frederic E. Nystrom**, CRC Press, Taylor and Iranics group, Boca Raton, London, Newyork.
8. Automobile Engg. Vol - I & II by **Kirpal Singh**, Standard Pub.
9. Auto Design by **R. B. Gupta**, Satya Prakashan
10. Mechanical Engineering Design by **Joseph Edward Shigley and Charles R. Mischke**, McGraw Hill International Edition,
11. Mechanical System Design by **Farazdak haideri**, Nirali Prakashan.
12. Machine Design by **R. K. Jain**,Khanna publications.
13. Steering, Suspension & Tyres ,**Giles J. G.**,– Lliffe Book Ltd.,London
14. Transmission System Design by **R. B. Patil**, TechMax Pub., Pune.



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FACULTY OF: - Technology and Engineering
DEPARTMENT OF: - Automobile Engineering
SEMESTER: - V
CODE: - 4TE05AMS1
NAME: – Automotive Maintenance and Safety (AMS)

Teaching and Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE05AMS1	Automotive Maintenance and Safety	4	0	2	6	5	30	1.5	70	3	---	20	30	150

Objectives:

- To study basics of vehicle maintenance.
- To study maintenance of vehicle systems and subsystems.
- To study different automotive diagnostic tools.

Prerequisite:

Basic knowledge of automobile system and subsystem

Course Outline:

Sr. No.	Course Content	Hours
1	Maintenance of Records and schedule: Importance of maintenance, preventive (scheduled) and break down (unscheduled) maintenance, requirements of maintenance, and preparation of check lists. Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.	08
2	Vehicle Maintenance Tools And Equipments: Specifications of standard tools, non-Standard tools, denting tools, painting equipments, testing equipments, Service station equipments, Automobile diagnosis kit, Hydraulic lift, Tyre changer, Tyre inflation gauge, Car Washer, Air Compressor, Spark Plug Cleaner and Tester, brake and transmission bleeding equipment, Grease Guns, Hydraulic Hoist, Analyzers: CO, HC, NOx, smoke meter, Engine analyzer- Petrol and Diesel, Ignition timing light, Wheel Balancer, Wheel aligner, Headlight aligner, Cylinder boring and honing, crankshaft grinder, Brake lathe m/c, ridge cutter and boring m/c, Trolley Jacks, Engine lifting cranes.	12
3	Engine maintenance – repair and overhauling: Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance, overhauling, engine tune up.	10

4	Chassis maintenance – repair and overhauling: Mechanical and automobile clutch and gear box, servicing and maintenance servicing of propeller shaft and differential system. Maintenance, servicing of suspension system. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.	10
5	Maintenance of fuel system, cooling system, lubrication system and vehicle body: Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, fuel injector test rig. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts. Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance. New technologies, processes and trends in the area of vehicle diagnostics.	10
6	Safety Concepts: Active safety: driving safety, conditional safety, perceptibility safety, operating safety passive safety: exterior safety, interior safety, deformation behaviour of vehicle body speed and acceleration characteristics of passenger compartment on impact.	05
7	Safety equipments: Seat belt, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, rear camera, bumper design for safety, regulations.	05

Learning Outcomes:

- The learners may able to get balanced treatment of the heat exchange in simple, lucid and easily understandable way without sacrificing emphasis on the fundamental aspects.
- Help to appreciate the importance of heat transfer in various fields of engineering.
- Impart knowledge to get cooler engine and effective radiator system.

Books Recommended:-

1. Automobile system by **Anil Chikara**, Satya prakashan
2. Automotive mechanics by **William Crouse**, TMH
3. Vehicle Body Engineering by **J. Powloski**, Business books limited, London - 1969.

Reference Books:-

1. Vehicle maintenance and garage practice by **Jigar A Doshi, Dhruv U Panchal and Jayesh P Maniar**, PHI.
2. Automotive Mechanics Principle and Practice by **Joseph Heitner** East west press, 2nd Edition 1999.
3. Automobile Engineering by **K. K. Ramlingan** SciTech Publication Vehicle Service book.
4. Vehicle service book.



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FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Automobile Engineering
SEMESTER: - V
CODE: - 4TE05AEE1
NAME: – Automotive Electrical & Electronics (AEE)

Teaching and Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE05AEE1	Automotive Electrical & Electronics	3	0	2	5	4	30	1.5	70	3	---	20	30	150

Objectives:

- To impart knowledge of construction and working of batteries and accessories
- To understand the working of starting system & charging system
- To provide knowledge about application of electronics in automobile Engine system

Prerequisite:

- Basic knowledge of Automobile Systems & Automobile Engines
- Fundamentals of Electrical Engineering.

Course Outline:

Sr. No.	Course Content	Hours
1	Introduction to automotive electrical systems : Automotive generation, storage & distribution systems, wiring harness, circuit diagrams and symbols, 12/24/42 volt system, positive earth and negative earth, earth return and insulated return systems, Multiplexed wiring systems, Electromagnetic compatibility, Electromagnetic interference, Controlled Area Networks (CAN).	05
2	Battery : Types, Principle of lead acid battery, Constructional details, Recharging the battery, Battery ratings, Battery Performance, Battery capacities, Battery efficiency, Battery tests, Battery failures, Alkaline battery, maintenance free batteries, hybrid batteries.	07
3	Starting system & charging systems: Condition at starting. Behavior of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units, care and maintenance of starter motor. Starter Switches. Generation of direct current. Shunt generator characteristics. Armature reaction. Third brush regulation. Cut-out. Voltage & current regulators. Compensated voltage regulator alternators principle & constructional aspects and bridge benefits.	08

4	Ignition systems: Types, Construction & working of battery coil and magneto ignition systems. Relative merits, Centrifugal and vacuum advance mechanisms, types and construction of spark plugs, Electronic Ignition system. Digital ignition system.	06
5	Lighting systems: Fundamentals, Headlight, types, lighting circuits, interior lighting, signaling, LED lighting, Gas discharge lighting. Automotive Equipments & Accessories : Fuel gauge, oil pressure gauge, Temperature gauges, Speedometer, Warning Lights, Electric Horn, Horn Relay, Wind Shield wipers, Heaters & defrosters, Electric windows.	06
6	Sensors and actuators: Introduction, basic sensor arrangement, types of sensors such as - oxygen sensors, Crank angle position sensors - Fuel metering, vehicle speed sensor and detonation sensor -Altitude sensor, flow sensor. Throttle position sensors, solenoids, stepper motors, relays.	04
7	Electronic systems: for CRDI & MPFI engine injection system regulation, control & Management. ECU for Engine, On Board Diagnostic (OBD) systems.	04
8	Vehicle motion control and stabilization systems: Vehicle motion control - Adaptive cruise control, Electronic transmission control. Vehicle stabilization system - Antilock braking system, Traction control system, Electronic stability program. Onboard diagnosis system.	05

Learning Outcomes:

- Describe the working of lead acid battery. The operation of lighting system, Horn and Wiper system
- Describe the condition at starting and behavior of starter during starting and the working and Maintenances of starter motor.
- Describe the working of different starter drive units and the working of onboard diagnostic system, security and warning system.

Books Recommended:-

1. Automotive Electrical Equipment by **P L Kohli** Tata McGraw-Hill Education
2. Modern Electrical Equipment of Automobiles by **Judge. A.W.** Chapman & Hall, London, 1992 Vehicle.

Reference Books:-

1. Automobile Electrical & Electronic Systems by **Tom Denton**, SAE International
2. Automobile Electrical Equipment by **Crouse. W. H.** McGraw Hill Book Co Inc., New York, 1980.
3. Automotive Computers and Control system by **Tom Weather Jr and Cland C.Hunter**, Prentice Hall Inc., New Jersey.
4. Understanding Automotive Electronics by **William B. Ribbens**, 5th Edition, Butterworth, Heinemann Woburn, 1998
5. Automobile Electrical Equipment by **Young. A. P. and Griffiths. L**, English Language Book Society and New Press.
6. Automobile Electrical equipment by **Crouse. W. H.**, McGraw Hill Book Co Inc., New York, 1955