Electives I and II Seventh Semesters
(Automobile Engineering)

ELECTIVE I

1. AE-415E Automotive Aerodynamics
2. AE-417E Hybrid Vehicles
3. AE-419E Tractor and Farm Equipments
4. AE-421E Modern Vehicle Technology
5. AE-423E Vehicle Design and Data Characteristics

ELECTIVE II

1. AE-425E Precision Engineering
2. AE-427E Process Planning and Cost Estimation
3. AE-429E Flexible Manufacturing Systems
4. AE-431E Marketing and Sales Management
5. ME-437E Maintenance Engineering

Elective - I & II will be offered as departmental elective for Automobile Engineering Students.

Electives III and IV Seventh Semesters
(Automobile Engineering)

ELECTIVE III

1. AE-418E Combustion Engineering
2. AE-420E Automotive Air-Conditioning
3. ME-420 E Non Conventional Manufacturing
4. ME-424E Manufacturing Management
5. ME-426E Total Quality Management

ELECTIVE IV

1. AE-422E Material Management
2. AE-424E Entrepreneurship Development
3. AE-426E Industrial Safety and Environment
4. ME-430E Energy Management
5. ME-432E Management Information System

Elective - III & IV will be offered as departmental elective for Automobile Engineering Students.

B. Tech. (Seventh Semester) Automobile Engineering
AE-401E MECHANICAL VIBRATIONS

L	T	P	
3	2	-	

Sessional: 50 Marks
Theory: 100 Marks
Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

BASIC CONCEPTS:

(A) Importance and scope, definition and terminology, representation of harmonic motions, introduction to various types of vibrations and types of excitation.

SINGLE DEGREE OF FREEDOM SYSTEMS

(B) UNDAMPED FREE VIBRATIONS:

D' Alembert's Principle. Energy method, Rayleigh method, simple applications of these methods, equivalent spring stiffness.

(C) DAMPED FREE VIBRATIONS:

Introduction to different types of damping, viscous damping, sub- critical, critical and overdamping, logarithmic decrement, frequency of damped oscillations.

UNIT II

FORCED VIBRATIONS:

(A) Solution for simple harmonic excitation, steady state vibrations, base excitation, vibration isolation and transmissibility, vibration measuring instruments, whirling of shafts without friction.

TWO DEGREE OF FREEDOM SYSTEMS:

(B) UNDAMPED VIBRATIONS:

Normal modes vibrations, natural frequencies, mode, shapes, forced harmonic vibrations, Torsional vibrations of two rotor systems.

(C) APPLICATIONS:

Dynamic vibration absorber, centrifugal pendulum absorber, Torsional vibration absorber, unturned vibration damper, gyroscopic effect on rotating shaft.

UNIT III

MULTI DEGREE OF FREEDOM SYSTEMS:

(A) Undamped free vibrations: Reciprocity theorem, Rayleigh and Dunkerley method, three rotor and geared systems.

CONTINUOUS SYSTEMS:

(B) Free vibration of the following for various end conditions.

Vibration of a string, longitudinal vibrations of bar, transverse vibration of beam, torsion of vibrations of circular shaft.

UNIT IV

MULTI DEGREE FREEDOM SYSTEMS.

1 Matrix Method: Eigen values & Eigenvectors, Matrix Expansion, Matrix Iteration.
2. Stodota's Iteration Method
3. Holzer's Method.
4. Hamilton's Principle.

BOOKS:

1. Mechanical Vibrations - V.P.Singh, Dhanpat Rai & Co. Pvt. Ltd. Nai Sarak, Delhi – 6.
2. Vibration of Engineers - K.K. Pujara - Dhanpat Rai & Sons, Delhi
2. Mechanical Vibration Analysis - P.Srinivasan, Tata McGraw Hill. New Deli
3. Mechanical Vibrations - A.H. Church, John Wilcy & Sons, New York.

REFERENCES:

1. Mechanical Vibrations - G.K. Grover - Nein Chand & Bros., Roorkee.
2. Theory and Practice of Mechanical Vibrations - J.S.Rao & K.Giipta -New International (Pvt.) Ltd.. New Delhi.

B. Tech. (Seventh Semester) Automobile Engineering
ME-403E MEASUREMENT AND CONTROL

L	T	P	
3	1	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT- I

Introduction:
Definition, application of measurement instrumentation, functional elements' of a generalized measuring system, measuring standards, types of measurement, types of input to measuring instruments and instrument system, classification of measuring instruments, merits and demerits of mechanical measuring systems, comparison of mechanical measuring system with electrical measuring systems, calibration.

Introduction, types of error, types of uncertainties, propagation of uncertainties in compound quantity, Static performance parameters: accuracy, precision, resolution, static sensitivity, linearity, hysteresis, dead band, backlash, and drift, sources of error, selection of measuring instruments, mechanical and electrical loading.

UNIT- II

Fundamentals of dynamic characteristics, generalized mathematical model of measuring systems, types of input, dynamic performance parameters: dynamic error, speed of response etc, dynamic response of a first order mechanical systems with different inputs e.g. step, ramp, sinusoidal and impulse input

Introduction, types of measuring data, statistical attributes, various method of presentation, estimation of presentation and uncertainties, confidence level, precision and statistical treatments of single and multi sample type experimental data, Chauvenet's criteria of rejecting a dubious data, curve fitting, best linear calibration and its precision, significant figures and rounding off. Overall uncertainty estimation of measuring systems, common sense approach, and engineering applications.

UNIT III

Introduction, primary function, classification, electrostatic transducers: principle theory, types, advantages, and limitations, Fixed contact mechano-resistive transducers: classification, and uses, Metallic resistance strain gauge: types, construction theory of operation, Adhesive: property, selection criteria, mounting of strain gauges, Mathematical analysis of ballast and DC Wheatstone bridge circuits

Characteristic and comparison of ballast and DC Wheatstone bridge circuits, temperature effects and their compensation Measurement of load, force, and thrust using resistant strain gauges, Elastic load cells, proving rings, fluid pressure measurement in pipe and containers, using strain gauges, Measuring of torque in transmission shaft under axial and bending loads in varying ambient conditions.

UNIT IV

Introduction, classification of control systems, control system terminology, servomechanism, process control and regulators, Manual and automatic control systems, physical systems and mathematical models, linear control systems, Laplace transform, transfer function, block diagram, signal flow graphs, system stability, Time and frequency domain.

Introduction, functional operation, desirable characteristics of hydraulic fluids, hydraulic control systems: hydraulic pump, hydraulic control valve, Pneumatic control systems: pneumatic nozzle, relay, advantages and limitation of such control systems.

Reference and Text Books:

1. Mechanical measurements & control - By D.S. Kumar, Metropolitan book
2. Instrumentation and Mechanical measurements-By A.K. Tayal, Galgotia Publ.
- Measurements systems application and design-By Ernest Doebelin, McGraw-Hill

B. Tech. (Seventh Semester) Automobile Engineering
AE-405E VEHICLE BODY ENGINEERING

L	T	P	Sessional: 50 Marks
3	-	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT- I

Car Body Details: Types: saloon, convertibles, limousine, estate car, racing and sports car. Visibility: regulations, driver's visibility, tests for visibility, methods of improving visibility and space in cars. Safety: safety design, safety equipments for cars. Car body construction; design criteria, prototype making, initial tests, crash tests on full scale model, Dummies and Instrumentation.

Bus Body Details: Types: mini bus, single-decker, double-decker, two level and articulated bus. Bus body layout; floor height, engine location, entrance and exit location, seating dimensions. Constructional details: frame construction, double skin construction, types of metal sections used, Regulations, Conventional and integral type construction.

UNIT-II

Vehicle Aerodynamics: Objectives - Vehicle drag and types -various types of forces and moments - Effects of forces and moments – Side wind effects on forces and moments - Various body optimization techniques for minimum drag – Wind tunnel testing: Flow visualization techniques, Scale model testing, Component balance to measure forces and moments.

Ergonomics: Man machine system, anthropometry data, and anthropometric considerations in the design of seat, controls and displays, gear lever, steering wheel, foot controls, etc. Dimensions of driver's seat in relation to controls. Visibility: regulations, driver's visibility, tests for visibility, methods of improving visibility in vehicles. Effect of Noise, vibration and heat on human body and their control, Driver Cab design.

UNIT- III

Commercial Vehicle Details: Types of body; flat platform, drop side, fixed side, tipper body, tanker body, Light commercial vehicle body types. Special Purpose Vehicle Details: Various types, Needs and constructional details - Fire station vehicle: tankers, pumping vehicles, ladder vehicle; Concrete mixer transport vehicles; Ambulance; Towing vehicle; Road trains. Off road vehicles.

Safety: Safety aspects in vehicle bodies. Safety equipments for cars – Anti roll bars, Roll over bar, Collapsible steering, multistage bumpers, side impact beams in doors, collision

crumple zones. Seat belts, Air bags, Bucket seats with headrest. Laminated/toughened glasses. Anti jamming door locks. Fibre fuel tanks. Testing of vehicle bodies for the safety.

UNIT-IV

Body Loads: Types of load carrying structures -closed, integral, open, flat types. Calculation of loading cases- static, symmetric and asymmetric vertical loads in a car, longitudinal load, and different loading situations. Load distribution, stress analysis of structure, body shell analysis.

Body: Body design requirement, car body space nomenclature. Body frame of passenger car and commercial vehicle. Different type of car door and window regulator, car roof, wind shield, car seats and their various design. BODY MATERIALS: Different types of ferrous and non-ferrous materials used in vehicle such as cast iron, Steel. Alloy steel, plastic, G.R.P., Glass etc. and their properties. Corrosion, anticorrosion methods. Selection of paint and painting process.

TEXT BOOK

1. J.Powloski - “Vehicle Body Engineering” - Business Books Ltd, London -1989

REFERENCE BOOKS

1. Giles.J.C. - “Body construction and design” - Liiffe Books Butterworth & Co. - 1971.
2. John Fenton - “Vehicle Body layout and analysis” - Mechanical Engg. Publication Ltd., London – 1982.
3. Braithwaite.J.B. - “Vehicle Body building and drawing” - Heinemann Educational Books Ltd., London – 1977.
4. Crouse W and Anglin D, Automotive Mechanics Tata Mcgraw hill publication 10th edition, 2004
5. Body Engineering -Sydney F Page
6. Vehicle body engineering - Gilcs J Pawlowski

B. Tech. (Seventh Semester) Automobile Engineering
AE-407E M&C & MECHANICAL VIBRATION LAB

L	T	P	
-	-	2	**Sessional: 25 Marks**
			Practical Exam: 25 Marks
			Total: 50 Marks

List of Experiments

1. Study of a strain gage based cantilever beam and measurement of strain on the beam
2. Study of a LVDT and measurement of linear displacement
3. Study of an inductive pick up and measurement of linear displacement
4. Study of a LDR and measurement of linear displacement
5. Study of capacitive pick up and measurement of angular displacement
6. Study of temperature transducers and measurement of temperature of fluid
7. Study of a pressure pick up and measurement of pressure of fluid.
8. To study undamped free vibrations of equivalent spring mass system and determine the natural frequency of vibrations
9. To study the free vibration of system for different damper settings. Draw decay curve and determine the log decrement and damping factor. Find also the natural frequency.
10. To study the torsional vibration of a single rotor shaft system and to determine the natural frequency.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B. Tech. (Seventh Semester) Automobile Engineering
AE-409E VEHICLE MAINTENANCE LAB

L	T	P	Sessional: 25 Marks
-	-	2	Practical Exam: 25 Marks
			Total: 50 Marks

List of Experiments

1. Study and layout of an automobile repair, service and maintenance shop.
2. Study and preparation of different statements/records required for the repair and maintenance works.
3. Study and preparation of the list of different types of tools and instruments required.
4. Minor and major tune up of gasoline and diesel engines
5. Fault diagnosis in electrical ignition system, gasoline fuel system, diesel fuel system and rectification.
6. Calibration of fuel injection pump.
7. Study of the electrical systems such as head lights, side or parking lights, trafficator lights, electric horn system, windscreen wiper system, starter system and charging system.
8. Study and checking of wheel alignment - testing of camber, caster.
9. Checking kingpin inclination, toe-in and toe-out.
10. To study the fuel filters (both gasoline and diesel engines) and air cleaners (dry and wet)
11. Practice the following:
    a) Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play
    b) Wheel bearings tightening and adjustment
12. Battery testing and maintenance
13. Brake adjustment and Brake bleeding.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B. Tech. (Seventh Semester) Automobile Engineering

Project-I

AE 411 E

L	T	P	
-	-	7	Practical: 100 marks Sessional: 100 marks Total: 200 marks

The students expected to take up a project under the guidance of teacher from the college. The project must be based on automobile engineering problems, which can be extended up to the full academic session. The students may be asked to work individually or in a group not more than four students in a group. Viva- voce must be based on the preliminary report submitted by students related to the project.

B. Tech. (Seventh Semester) Automobile Engineering
Practical training report
AE 413 E

L	T	P	Sessional: 125 marks
-	-	2	

Student will submit summer training (about 8 weeks industrial training) report for his/her assessment.

B. Tech. (Eighth Semester) Automobile Engineering
AE-402E TRANSPORT MANAGEMENT

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Organisation and Management: Forms of Ownership – principle of Transport Management – Staff administration – Recruitment and Training – welfare – health and safety. Basic principles of supervising. Organizing time and people. Driver and mechanic hiring - Driver checklist - Lists for driver and mechanic - Trip leasing - Vehicle operation and types of operations.

UNIT II

Transport Systems: Introduction to various transport systems. Advantages of motor transport. Principal function of administrative, traffic, secretarial and engineering divisions. chain of responsibility, forms of ownership by state, municipality, public body and private undertakings. **Maintenance:** Preventive maintenance system in transport industry, tyre maintenance procedures. Causes for uneven tyre wear; remedies, maintenance procedure for better fuel economy, Design of bus depot layout.

UNIT III

Scheduling and Fare Structure: Route planning - Scheduling of transport vehicles - Preparation of timetable – preparation of vehicle and crew schedule - Costs, fare structure – Fare concessions - Methods of fare collection - Preparation of fare table. Basic factors of bus scheduling. Problems on bus scheduling.

UNIT IV

Motor Vehicle Act: Schedules and sections - Registration of motor vehicles - Licensing of drivers and conductors - Control of permits - Limits of speed - traffic signs - Constructional regulations - Description of goods carrier, delivery van, tanker, tipper, municipal, fire fighting and break down service vehicle.

TEXTBOOK

1. John Duke - Fleet Management – McGraw-Hill Co, USA -1984.
2. Kitchin.L.D., - Bus Operation - Illiffee and Sons Co., London, III edition – 1992

REFERENCE BOOKS

1. Goverment Publication, *The Motor vehicle Act*, 1989.

2. Rex W Faulks, *Bus and Coach Operation*, Butterworth, 1987.
3. Kadiyali.L.R., *Traffic engineering and Transport Planning*.

B. Tech. (Eighth Semester) Automobile Engineering

AE-404E COMPUTER ADDED VEHICLE DESIGN

L	T	P	
3	1	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Introduction: Study and selection of vehicle specifications - Choice of Cycle, fuel, speed, cylinder arrangement, number of cylinders, method of cooling, material, design variables and operating variables affecting performance and emission.

UNIT II

Performance Curves: Residence, Power and torque curve, Driving force against vehicle speed – Acceleration and gradability in different gears for a typical car or truck plotted from specifications.

UNIT – III

Resistance to Vehicle Motion: Calculation and plotting the curves of air, rolling and gradient resistances, driving force – Engine power, speed, rear axle ratio, Torque and mechanical efficiency at different vehicle speeds.

UNIT – IV

Engine Design: Pressure volume diagram, frictional mean effective pressure, engine capacity, calculation of bore and stroke length, velocity and acceleration, gas force, inertia and resultant force at various crank angles – Side thrust on cylinder walls.

TEXT BOOKS

1. Giri. N.K. “Automobile Mechanics” Khanna Publishers – New Delhi – 2002.
2. Heldt P.M “High Speed Combustion Engine” Oxford & IBH Publishing Co., Calcutta 1989.

REFERENCES

1. Lichty “IC Engines”, Kogakusha Co., Ltd. Tokyo, 1991.

B. Tech. (Eighth Semester) Automobile Engineering
AE-406E MOTOR VEHICLE & ENVIRONMENT PROTECTION

L	T	P	Sessional: 50 Marks
3	-	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Emission Standards and Regulations, Emissions Measurement and Testing Procedures – Exhaust Emissions Testing for Light-Duty Vehicles, Exhaust Emissions Testing for Motorcycles and Mopeds, Exhaust Emissions Testing for Heavy-Duty Vehicle Engines, crankcase emissions, evaporative emissions, re-fueling emissions, On-road exhaust emissions. Vehicle Emission Factors – Gasoline-fueled vehicles, diesel-fueled vehicles, Motorcycles.

UNIT II

Emissions Control Technology for Gasoline-Fueled Vehicles (Spark-Ignition Engines) – Air-Fuel Ratio, Electronic Control Systems, Catalytic Converters, Crankcase Emissions and Control, Evaporative Emissions and Control, Fuel Dispensing/Distribution Emissions and Control.

Emissions Control Technology for Diesel-Fueled Vehicles (Compression-Ignition Engines) – Engine Design, Exhaust After treatment. Emission Control Options and Costs – Gasoline-Fueled Passenger Cars and Light-Duty Trucks, Heavy-Duty Gasoline-Fueled Vehicles, Motorcycles, Diesel-Fueled Vehicles.

UNIT III

Inspection Procedures for Vehicles with Spark-Ignition Engines – Exhaust Emissions, Evaporative Emissions, Motorcycle White Smoke Emissions. Inspection Procedures for Vehicles with Diesel Engines

Institutional Setting for Inspection and Maintenance: Centralized I/M, Decentralized I/ M, Comparison of Centralized and Decentralized I/M Programs, Inspection Frequency, Vehicle Registration, Roadside Inspection Programs, Emission Standards for Inspection and Maintenance Programs, Costs and Benefits of Inspection and Maintenance Programs.

UNIT IV

Fuel Options for Controlling Emissions**:** Gasoline – Lead and Octane Number, Fuel Volatility, Olefins, Aromatic Hydrocarbons, Distillation Properties, Oxygenates, Sulfur, Fuel Additives to Control Deposits, Reformulated Gasoline. Diesel – Sulfur Content, Cetane

Number, Aromatic Hydrocarbons, Other Fuel Properties, Fuel Additives.

Alternative Fuels: Natural Gas, Liquefied Petroleum Gas (LPG), Methanol, Ethanol, Biodiesel, Hydrogen. Factors Influencing the Large-Scale Use of Alternative Fuels, Cost, End-Use Considerations, Life-Cycle Emissions.

TEXTBOOK:

1. Faiz, Weaver, Walsh, 'Air Pollution from Motor Vehicles, Standards and Technologies for Controlling Emissions', The World Bank Washington D.C.

REFERENCES

1. V.Ganesan, 'Internal combustion Engines', Tata McGraw Hill Book Co, Eighth Reprint, 2005.
2. Crouse and Anglin, 'Automotive Emission Control', McGraw Hill company, Newyork 1993.

B. Tech. (Eighth Semester) Automobile Engineering
AE-408E COMPUTER ADDED VEHICLE DESIGN LAB

L	T	P	
-	-	3	**Sessional: 25 Marks**
			Practical: 50 Marks
			Total: 75 Marks

Design calculation, model and analyze the following automobile components.

1. Piston, piston pin and piston rings
2. Connecting rod.
3. Automobile valves
4. Crank shaft
5. Cam shaft
6. Vehicle Chassis
7. Leaf spring, coil spring and torsion bar.
8. Front axle system of a typical 4 Wheeled vehicle
9. Rear axle system of a typical 4 wheeled vehicle
10. Three speed and four speed gear boxes of a heavy vehicle

REFERENCES:

1. Dean Averns, " Automobile Chassis Design ", Illiffe Books Ltd, 1992.
1. Richard Stone, “Introduction to Internal Combustion Engines”, McMillan. London, 1985.
2. Bosch, “Automotive HandBook” 6th edition, SAE, 2004.
3. Heldt.P.M., " Automotive Chassis ", Chilton Co., New York, 1992.
4. Steeds.W., " Mechanics of Road vehicles ", Illiffe Books Ltd., London, 1990.
5. Giles.J.G., Steering, " Suspension and tyres ", Illiffe Books Ltd., London, 1988.
6. K. Newton, W.Steeds and T.K.Garret, “The Motor Vehicle”, 13th Edition,
7. Butterworth Heinemann, India, 2004.
8. Heldt.P.M., " Torque converter ", Chilton Book Co., New York, 1982.
9. Dr. N. K. Giri, “Automobile Mechanics”, Seventh reprint, Khanna Publishers, Delhi, 2005.
10. ACAD, CATIA and ANSYS software guide / manual

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B. Tech. (Eighth Semester) Automobile Engineering

PROJECT II
AE-410E

L	T	P	
-	-	9	**Sessional: 100 Marks**
			Practical: 100 Marks
			Total: 200 Marks

The student is expected to finish the remaining portion of the project.

B. Tech. (Eighth Semester) Automobile Engineering

SEMINAR
AE-412E

L	T	P	Sessional: 25 Marks
2	-	-	

Student will give a talk on some technical topics.

B. Tech. (Seventh Semester) Automobile Engineering
AE-415E AUTOMOTIVE AERODYNAMICS

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Introduction: Scope - historical development trends - Fundamental of fluid mechanics - Flow phenomenon related to vehicles - External & Internal flow problem - Resistance to vehicle motion - Performance - Fuel consumption and performance - Potential of vehicle aerodynamics.

UNIT II

Aerodynamic drag of cars: Cars as a bluff body - Flow field around car - drag force - types of drag force - analysis of aerodynamic drag - drag coefficient of cars - strategies for aerodynamic development - low drag profiles.

UNIT III

Shape optimization of cars: Front end modification - front and rear wind shield angle - Boat tailing - Hatch back, fast back and square back - Dust flow patterns at the rear - Effects of gap configuration - effect of fasteners. The origin of forces and moments on a vehicle - side wind problems - methods to calculate forces and moments - vehicle dynamics under side winds - the effects of forces and moments

UNIT IV

Vehicle handling: Characteristics of forces and moments - Dirt accumulation on the vehicle - wind noise - drag reduction in commercial vehicles.

Wind tunnels for automotive aerodynamic: Introduction - Principle of wind tunnel technology - Limitation of simulation - Stress with scale models – full scale wind tunnels - measurement techniques - Equipment and transducers - road testing methods – Numerical methods.

TEXT BOOKS: -

1. Wolf – Heinrich Hucho, *Aerodynamics of Road Vehicles*, SAE, **ISBN No:** 978-0-7680-0029-0, 1998.

REFERENCE BOOKS

1. Pope. A., Wind Tunnel Testing, John Wiley & Sons, 2nd edition, New York, 1974.
2. Sumantran. V, Gino Sovran, Vehicle Aerodynamics, SAE, 1994.

B. Tech. (Seventh Semester) Automobile Engineering
AE-417E HYBRID VEHICLES

L	T	P	
3	1	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Hybrid Vehicles: Performance characteristics of road vehicles, calculation of road load, predicting fuel economy, Grid connected hybrids.

Propulsion Methods: DC motors-series wound, shunt wound. Compound wound and separately excited motors AC motors - induction, synchronous, brushless DC motor, switched reluctance motors**.**

UNIT II

Hybrid Architecture: Series configuration- locomotive drives, series parallel switching, load tracking architecture. Pre transmission parallel and combined configurations-Mild hybrid, power assist, dual mode, power split, power split with shift, Continuously Variable transmission (CVT). Wheel motors.

UNIT III

Hybrid Power Plant Specifications: Grade and cruise targets, launching and boosting, braking and energy recuperation, drive cycle implications, engine fraction-engine downsizing and range and performance, usage requirements.

Sizing the Drive System: Matching electric drive and ICE, sizing the propulsion motor, sizing power electronics

UNIT IV

Energy Storage Technology: Battery basics, lead-acid battery, different types of batteries, battery parameters.

Fuel Cells: Fuel cell characteristics, fuel cell types - alkaline fuel cell, proton exchange membrane, direct methanol fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell, solid oxide fuel cell, hydrogen storage systems, reformers, fuel cell EV, super and ultra capacitors, flywheels.

TEXT BOOK

1. John M. Miller, Propulsion Systems for Hybrid Vehicles, published by The Institutions of Electrical Engineers, London, UK.

REFERENCE BOOKS

1. Curtis D. Anderson, J. Anderson, Electric and Hybrid Cars: A History, ISBN 978-0-7864-3301-8.

B. Tech. (Seventh Semester) Automobile Engineering
AE-419E TRACTOR AND FARM EQUIPMENTS

L	T	P	
3	1	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

General Design of Tractors: Classification of tractors - Different types and purpose - Main components of tractor – Safety rules. Working attachment of tractors - Farm equipment - Classification - Auxiliary equipments - Trailers and body tipping mechanism.

UNIT II

Control of the Tractor and Fundamentals of Engine Operation: Tractor controls and the starting of the tractor engines - Basic notions and definition - Engine cycles – Operation of multi cylinder engines - General engine design - Basic engine performance characteristics.

UNIT III

Engine Frame Work and Valve Mechanism of Tractor: Cylinder and pistons - Connecting rods and crankshafts - Engine balancing - Construction and operation of the valve mechanism - Valve mechanism components - Valve mechanism troubles.

UNIT IV

Cooling System, Lubrication System and Fuel System of A Tractor: Cooling system - Classification - Liquid cooling system - Components, Lubricating system servicing and troubles - Air cleaner and turbo charger - Fuel tanks and filters - Fuel pumps.

REFERENCE BOOKS

1. Rodichev and Rodicheva. G, *Tractor and Automobiles*, MIR Publishers, 1987.
2. Kolchin. A and Demidov. V, *Design of Automotive engines for tractor*, MIR Publishers, 1972.
3. John B Lllzedaw et-al., *Tractors and their power units*.

B. Tech. (Seventh Semester) Automobile Engineering
AE-421E MODERN VEHICLE TECHNOLOGY

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Trends in Automotive Power Plants: Hybrid Vehicles – Stratified charged / lean burn engines – Hydrogen Engines-Electric vehicles– Magnetic track vehicles solar powered vehicle Combined power source vehicle, types of hybrid drives, Toyota hybrid system.

UNIT II

Suspension Brakes and Safety: Interconnected air and liquid suspensions, Hydrolastic suspension system, Hydragas suspension, modern rear wheel brake, indirect floating calliper disc brake, self energising disc brake, brake limiting device, anti-slide braking system, Ford Escort and Orion anti lock system. Closed loop suspension; Regenerative braking – safety cage - air bags - crash resistance - passenger comfort

UNIT III

Emission and Noise Pollution Control: Introduction, Engine emissions, Catalytic converters and filters for particulate emission, types of catalytic conversion, open loop and closed loop operation to the oxidizing catalytic converter, Evaporative emissions, Internal and External Noise, Identification of Noise sources, Noise Control Techniques.

UNIT IV

Fuel Injection systems: SPFI, MPFI, DI, Pilot Injection, Unit Injection, CRDI; Two Wheeler Technology: DTS- i, DTS – Fi, DTS – Si; Four Wheeler Technology: VVT, Camless Engine, GDi.

REFERENCE BOOKS

1. K.K. Ramalingam, “Automobile Engineering”, Scitech Publications Pvt. Ltd., 2005
2. Dr. N.K. Giri, “Automobile Mechanic”, Khanna Publishers, 2006
3. Beranek.L.L. Noise Reduction, McGraw-Hill Book Co., Inc, New York, 1993.
4. Bosch Hand book, 3rd edition, SAE, 1993.
5. Crouse/Anglin “Automotive Mechanics”
6. K.Newton, W.Steeds “The Motor Vechicle”

B. Tech. (Seventh Semester) Automobile Engineering
AE-423E VEHICLE DESIGN AND DATA CHARACTERISTICS

L	T	P	
3	1	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Assumptions to be made in designing a vehicle, Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, gradability in different gears, Basics of Automobile Design.

UNIT II

Resistance to vehicle motion: Calculation, Tabulation and Plotting of Curves for Air and Rolling Resistances at various vehicle speeds, Calculation and Plotting of Driving force, Power requirement for different loads and acceleration, Maximum Power calculation.

UNIT III

Performance curves: Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure – Volume diagram, Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length.

UNIT IV

Connecting rod length to Crank Radius Ratio, Plotting of Piston Velocity and Acceleration against Crank Angle, Plotting Gas force, inertia force and Resultant force against Crank Angle, Turning Moment and Side Thrust against Crank Angle.

TEXT BOOKS

1. N. K. Giri, Automotive Mechanics, Khanna Publishers, New Delhi, 2005.
2. Heldt, P.M., High Speed Combustion Engines, Oxfore and I.B.H. Publishing Co., Kolkata, 2002.

REFERENCE BOOK

1. R.B.Gupta, Automobile Engineering.

B. Tech. (Seventh Semester) Automobile Engineering
AE-425E PRECISION ENGINEERING

L	T	P	
3	1	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Introduction - Accuracy & precision – Need – application precision machining –Tool based Micro & Ultra precision Machining grinding – Thermal effects – Materials for tools and machine elements – carbides – ceramic, CBN & diamond.

UNIT II

Tolerance and Fits: Tolerance – Zone – fits – Variation – Hole & shaft system – limits – expected Accuracy of machining processes – Selective assembly – gauges acceptance tests for machine tools.

UNIT III

Ultra Precision Machine Elements: Introduction – Guide ways – Drive systems – Spindle drive – preferred numbers – Rolling elements – hydrodynamic & hydrostatic bearings – pneumatic bearings.

UNIT IV

Error Control: Error – Sources – Static stiffness – Variation of the cutting force – total compliance –Different machining methods – Thermal effects – heat source – heat dissipation –Stabilization – decreasing thermal effects – forced vibration on accuracy – clamping & setting errors – Control – errors due to locations – principle of constant location surfaces.

TEXT BOOKS

1. Nakazawa, H. Principles of Precision Engineering, Oxford University Press, 1994.
2. Precision Engineering – R.L. Murthy

REFERENCE

1. Institute of Physics Publishing, Bristol and Philadelphia, Bristol, BSI 6BE U.K.

B. Tech. (Seventh Semester) Automobile Engineering
AE-427E PROCESS PLANNING AND COST ESTIMATION

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Work Study and Ergonomics: Method study – Definition – Objectives-Motion economy-Principles – Tools and Techniques-Applications – Work measurements- purpose – use – procedure – tools and techniques- Standard time –Ergonomics – principles – applications.

UNIT II

Process Planning: Definition – Objective – Scope – approaches to process planning- Process planning activities – Finished part requirements- operating sequences- machine selection – material selection parameters- Set of documents for process planning- Developing manufacturing logic and knowledge- production time calculation – selection of cost optimal processes.

UNIT III

Importance and aims of Cost estimation - Functions of estimation - Costing - Importance and aims of Costing, cost accounting- Elements of cost. - Difference between costing and estimation - Importance of realistic estimates - Estimation procedure

UNIT IV

Introduction - Material Cost - Determination of Material Cost Labour Cost - Determination of Direct Labour Cost - Expenses - Cost of Product (Ladder of cost) - Illustrative examples. Analysis of overhead expenses - Factory expenses - Depreciation - Causes of depreciation - Methods of depreciation - Administrative expenses - Selling and Distributing expenses - Allocation of overhead expenses.

TEXT BOOKS:

1. M.Adithan and B.S. Pabla, “Estimating and Costing ", Konark Publishers Pvt. Ltd., 1989.
2. A.K. Chitale and R.C. Gupta, “Product Design and Manufacturing ", Prentice Hall Pvt. Ltd., 1997.

REFERENCES:

1. Nanua Singh, " System approach to Computer Integrated Design and Manufacturing ", John Wiley & Sons, Inc., 1996.
2. Joseph G. Monks, " Operations Management, Theory & Problems ", McGraw Hill Book Company, 1982.

3. G.B.S. Narang and V.Kumar, " Production and Costing ", Khanna Publishers, 1995.
4. T.R. Banga and S.C. Sharma, " Estimating and Costing ", Khanna Publishers, 1986.

B. Tech. (Seventh Semester) Automobile Engineering
AE-429E FLEXIBLE MANUFACTURING SYSTEMS

L	T	P	
3	1	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

PRODUCTION SYSTEMS

Types of production-Job Shop, Batch & Mass production-Functions in Manufacturing-Organization and Information Processing in Manufacturing-Plant Layout-Batch production – Work in Progress inventory, Scheduling, Problems.

UNIT II

GROUP TECHNOLOGY

Formation of Part Families - Part Classification - Coding Systems-Optiz, Multi Class - Production Flow Analysis – Machine Cells Design -Clustering Methods-Modern Algorithms-Benefits of GT-system planning objective, guide line, system definition and sizing-human resources-objective, staffing, supervisor role.

UNIT III

FLEXIBLE MANUFACTURING SYSTEMS

Introduction-Evolution-Definition-Need for FMS-Need for Flexibility-Economic Justification of FMS Application Criteria-Machine tool Selection & Layout-Computer Control System-Data files-Reports-Planning the FMS-Analysis Methods For FMS- Benefits and Limitations.

UNIT IV

FLEXIBLE MANUFACTURING CELLS

Introduction-Cell Description and Classifications-Unattended Machining–Component Handling &storage system-cellular versus FMS-System- simulation, hardware configuration-Controllers, Communication networks- Lean production and agile manufacturing.

TEXT BOOKS

1. William W.Luggen, *Flexible Manufacturing Cells and Systems*, Prentice Hall, NJ, 1991.

2. Mikell P.Groover, *Automation Production Systems &Computer Integrated manufacturing*, PHI, 1989.

REFERENCE BOOKS

1. David J.Parrish, *Flexible Manufacturing*, Butterworth-Heinemann, 1990.
2. Buffa, E.S., *Modern Production and Operation Management*, 1985.

B. Tech. (Seventh Semester) Automobile Engineering
AE-431E MARKETING AND SALES MANAGEMENT

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Introduction: Market- definition, types. Kinds of goods, marketing role, characteristics. Marketing interface with other functional areas. Marketing management forces.

Consumer Behaviour: Consumer values, buyer behaviour- influencing factors, models. Consumer and industrial buyers-identifying target customers-market segmentation-positioning.

UNIT II

Marketing mix- **Product:** – what is product – consumer & industrial products – new product development – design-branding-packaging-labelling-product life cycle-sales forecasting & demand estimation –**Price:** Pricing – **Place:** Nature of distribution channel- channel design decisions- retailing-wholesaling. **Promotion:** Advertising and personal selling-direct selling.

UNIT III

Sales Management: Marketing management Vs. Sales management- sales management and business enterprise- the role of personal selling-skills for successful sales persons – designing the sales force strategy and structure –recruitment – selection – training-compensation-motivation of sales people.

UNIT IV

Current Trends in Marketing: Information technology and its impact in marketing decisions-e-commerce-multilevel marketing-consumer protection: awareness of consumer rights, laws and consumerism.

TEXT BOOK

1. Kotler p., and Armstrong, *Principles of Marketing*, 11th edition, PHI.

REFERENCE BOOKS

1. Still R.R., Cundiff E.W., and Govoni N.A.P., *Sales Management*, PHI.
2. Sherlekar, S.A., *Marketing Management*, 3rd edition, MacMillan, India.

B. Tech. (Seventh Semester) Automobile Engineering
AE-437E MAINTENANCE ENGINEERING

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Evolution of maintenance, objective of maintenance, maintenance policies and philosophies, maintenance concept, maintenance management & terotechnology, relationship with other functional areas, importance of maintenance, elements of good maintenance, economics of maintenance, training and safety aspects in maintenance. Classification of maintenance programs, corrective preventive and predictive maintenance, comparison of maintenance programs, preventive maintenance-concept, functions, benefits, limitations.

UNIT II

Objectives, what to monitor, when to monitor, principles of CBM, condition based maintenance techniques, manual inspections, performance monitoring, vibration monitoring, current monitoring, coil debris/spectroscopy, thermography and corrosion monitoring, steps in implementation of CBM, benefits of CBM. RCM logic, maintenance and RCM, benefits of RCM, total productive maintenance (TPM), introduction, key supporting elements of TPM, methodology, evaluation and benefits.

UNIT III

Purpose and challenges: Techniques, visual aids-boroscopes, endoscopes, fiber optics scanners, magnetic particles inspection, liquid penetrants, eddy current, ultrasonic radiography, selection of NDT technique, metrits/demerits and applications of various techniques. Basic ingredients, basic steps in maintenance management, maintenance planning and control system, documentation, maintenance-productivity areas for improvement

UNIT IV

Techniques for improvement of operational reliability, safety and availability of machines and production systems, maintainability criteria, checklist to assess the maintainability of a system, maintainability programs, objectives, key issues in availability improvements program, fault diagnosis, Pareto principle Ishikawa diagram. Data processing systems for integrated maintenance, maintenance information and reporting systems.

Text Books:

1. Maintenance Planning and Control by Higgin L.R., McGiaw Hill Book Co1,1900

2. Maintenance Planning and Control by Kelly Anthony, East West Press Private Ltd, New Delhi, 1991.
3. Maintainability principle and practices by Blanchard B.S. and Lowey E.E. McGrawHill Book co.
4. Practical NOT by Raj B. Jaya Kumar T and Thavasimulyi K., Narora Publishing House, New Delhi, 1996.
5. Engineering Maintenance Management by Niebel Benjamin W. Marcel Dekher, 1994.

B. Tech. (Eighth Semester) Automobile Engineering
AE-418E COMBUSTION ENGINEERING

L	T	P	
4	-	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Combustion of Fuels: Combustion equations, Theoretical air, excess air, air fuel ratio, equivalence ratio, exhaust gas composition, Air-fuel ratio from exhaust gas composition, and heating value of fuels.

UNIT II

Thermodynamics of Combustion: Thermo-chemistry, First law analysis of reacting systems, Adiabatic combustion temperature, Second law analysis of reacting systems, criterion for chemical equilibrium, Equilibrium constant for gaseous mixtures, Evaluation of equilibrium composition, chemical availability.

UNIT III

Kinetics of Combustion: Rates of reaction, Reaction order and molecularity complex reactions, chain reactions, Arrhenius rate equation, Collection theory, activated complex theory, Explosive and general oxidative characteristics of fuels.

Flames: Laminar and Turbulent flames, Premixed and Diffusion flames, Burning velocity and its determination, Factors affecting burning velocity, Quenching, Flammability and Ignition, Flame stabilization in open burners.

UNIT IV

Engine Combustion: Combustion in SI and CI engines, stages of combustion in SI and CI engines, Normal combustion and abnormal combustion, Emissions from premixed combustion, Emission from Non premixed combustion, Control of emissions.

TEXT BOOK

1. Stephen R.Turns, *An Introduction to Combustion*, McGraw Hill Book Company, 1996.

REFERENCE BOOKS

1. Irwin Glassman, *Combustion*, Third Edition, Academic Press, 1996.
2. Sharma. S. P and Chandramohan, *Fuels and Combustion*, Tata McGraw Hill Book Co., 1984.

3. Samir Sarkar, *Fuels and Combustion*, Orient Longman, 1984.
4. Kuo. K. K, *Principles of Combustion*, John Wiley & Sons, 1984.
5. Heywood. J. B, *Internal Combustion Engine Fundamentals,* McGraw Hill Book Co., 1988.

B. Tech. (Eighth Semester) Automobile Engineering
AE-420E AUTOMOTIVE AIR-CONDITIONING

L	T	P	Sessional: 50 Marks
4	-	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Air Conditioning Fundamentals: Basic air conditioning system - location of air conditioning components in a car, schematic layout of a refrigeration system, compressor components, condenser and high pressure service ports, thermostatic expansion valve, expansion valve calibration, controlling evaporator temperature, evaporator pressure regulator, evaporator temperature regulator.

UNIT II

Air Conditioner – Heating System: Automotive heaters, manually controlled air conditioner, heater system, automatically controlled air conditioner and heater systems, automatic temperature control, air conditioning protection, engine protection.

UNIT III

Refrigerant: Containers handling refrigerants, tapping into the refrigerant container, refrigeration system diagnosis, diagnostic procedure, ambient conditions affecting system pressures.

UNIT IV

Air Routing and Temperature Control: Objectives, evaporator airflow through the recirculating unit, automatic temperature control, duct system, controlling flow, vacuum reserve, testing the air control and handling systems.

Air Conditioning Service: Air conditioner maintenance and service, servicing heater system removing and replacing components, trouble shooting of air controlling system, compressor service.

TEXT BOOKS

1. William H. Crouse and Donald I. Anglin - “Automotive Air conditioning” - McGraw Hill Inc. - 1990.
2. Boyce H.DWiggins - ”Automotive Air Conditioning” - Delmar – 2002

REFERENCES

1. Mitchell information Services, Inc - “Mitchell Automatic Heating and Air Conditioning Systems” - Prentice Hall Ind. - 1989.
2. Paul Weiser - “Automotive Air Conditioning” - Reston Publishing Co., Inc., - 1990.
3. MacDonald, K.I., - “Automotive Air Conditioning” - Theodore Audel series – 1978
4. Goings.L.F. – “Automotive Air Conditioning” - American Technical services - 1974.
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B. Tech. (Eighth Semester) Automobile Engineering
ME-420E NON CONVENTIONAL MANUFACTURING

L	T	P	
4	-	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Unconventional machining processes, Rapid prototyping processes, their classification, considerations in process selection.

Ultrasonic Machining
Elements of process, design of cutting tool, metal removal mechanism, effect of parameters, economic considerations, limitations and applications, surface finish.

UNIT II

Electrochemical Machining
Elements of process, process chemistry, metal removal mechanism, tool design, accuracy, surface finish and work material characteristics, economics advantages, limitations and applications, Electrochemical grinding, debarring and honing, Chemical machining.

Electric Discharge Machining
Principle and mechanism of metal removal, generators, electrode feed control, electrode material, tool electrode design, EDM wire cutting, surface finish, accuracy and applications.

UNIT III

Jet Machining
Principal and metal removal mechanism of abrasive and water jet machining, process variables, design of nozzle, advantages, limitations and applications.

Plasma arc machining, Electron beam machining, laser beam machining, their principles and metal removal mechanism, process parameters, advantages and limitations, applications.

UNIT IV

Rapid Prototyping
Fundamentals, process chain, physics of processes, principles and process mechanism of SLA, SGC, LOM, FDM and SLS processes, their advantages and limitations, applications of RP processes, RP data formats, STL file format, STL file problems, STL file repair, other translators and formats.

Rapid Tooling Process

Introduction, fundamentals, classification, indirect RT processes, Principles of Silicone Rubber Molding, Epoxy Tooling, Spray Metal Tooling, Pattern for Investment Casting, Vacuum Casting, and Vacuum forming processes, direct RT processes, Shape Deposition manufacturing, their advantages, limitations and applications.

Reference and Text Books:

1. Modern machining processes -By P.C. Pandey and M.S. Shan, 1 Ml I.
2. Machining Science -By Ghosh and Mallik, Affiliated East West
3. Nontraditional Manufacturing processes -By G.F. Benedict, Maicel Dekker.
4. Advanced Methods of Machining -By J.A. McGeongh, Chapman and Hall.
5. Electrochemical Machining of Metals -By Rurnyantsev & Davydov, Mir Pub.
6. Rapid prototyping: Principles and applications in Manufacturing

B. Tech. (Eighth Semester) Automobile Engineering
ME-424E MANUFACTURING MANAGEMENT

L	T	P	
4	-	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Manufacturing Systems Designs: Definition, Systems, Subsystems, Systems Approach Fundamentals, Systems Approach for designing, Manufacturing Systems, Systematic Layout Planning (SLP), Computerized Plant Layout-CRAFT, ALDEP, CORELAP, Assembly Line balancing, Problems and solutions of assembly lines, Group Technology & Cellular Systems, Classification & Grouping, overview of FMS. Strategic consideration for comparison of various systems.

Manufacturing Systems Economics: Concept of time value of money, Preparation of time profile of project, Single payment, Equal Series payment, various machine and project selection & evaluation techniques: Payback period, Present worth, Equivalent annual cost, Cost- benefit ratio, Evaluation for both equal & unequal life. Depreciation concept various methods-straight line, declining balance, Sum of the digits, Sinking fund.

UNIT II

New Product Development (NPD): Product Development, Customer Need, Strategies for New Product Development, Product life cycle, Product status. Corporate Design Strategies, Japanese Approach to NPD. PUGH total Design approach, PAHL & BEITZ Approach, Project Approach, Cross functional Integration –Design, manufacturing, Marketing, Concurrent Engineering, Modular Design, Standardization Value Engineering & Analysis.

Manufacturing Planning & Control Systems: Overview of Aggregate Planning Models, Linear Decision Rules, Management Coefficient, Direct Search Methods, Master Production Schedule, Modular Bill and Materials, Capacity planning & control, language, medium range, short range capacity planning, Toyota Production System, Just- in Time (JIT), Manufacturing –Philosophy, Elements, KANBAN, effects on layout, workers & vendors, optimized production technology (OPT).

UNIT III

Forecasting Methods: Forecasting Framework, Forecasting cost and accuracy, Forecasting Uses and Methods – Delphi, Exponential Smoothing, Forecasting Errors – MAD, Regression Methods-Linear Model for single & multiple variables, Brief idea of computerized forecasting systems.

Material Requirements Planning (MRP): Definition of MRP systems. MRP versus Order point, MRP Elements, Types of MRP – MRP I & II. Structured Bill of Materials. Regenerative & Net change MRP, Operating an MRP, Integration of Production & Inventory Control.

UNIT IV

Maintenance & Reliability: Concept of preventive & breakdown maintenance, maintenance cost, optimal preventive maintenance simple replacement models-individual and group replacement, MAPI - methods, reliability definitions, failure analysis and curve, systems reliability- series parallel, redundancy, methods of improving reliability, MTBF, MTTR, Maintainability, availability, brief concept of terotechnology.

Text books:

1. Operations management – Schoroeder, Mc Graw Hill International
2. Production operations management – chary, TMH, New Delhi.

Reference books:

1. Production Operations Management – Adam & Ebert, PHI, New Delhi
2. Operational Management –Monks, Mcgraw Hill, Int.
3. Production & Operations Management – I. Hill, Prentice Hall Int.
4. Production Planning & Inventory Control – Narasimham etal, PHI, New Delhi
5. Production & Operation Management- Panneerselvam, PHI, New Delhi
6. Managing for Total Quality-Logothetis, PHI, New Delhi
7. Concept of Reliability Engineering –L.S. Srinath, Affiliated East West.
8. Revolutionizing Product Development – Wheelwright & Clark, Free press.
9. Management In Engineering – Freeman-Ball & Balkwill, PHI, New Delhi.
10. Production & operations management – Martinich, John Wiely , New Delhi.
11. The goal by Eliyahu M. Goldratt & Jeff Cox, Productivity Press India Ltd,, Bangalore
12. Toyota Production System by Taichi Ohno, Productivity Press India Ltd, Bangalore

B. Tech. (Eighth Semester) Automobile Engineering
ME-426E TOTAL QUALITY MANAGEMENT

L	T	P	
4	-	-	**Sessional: 50 Marks**
			Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Concept of Quality, Quality as the basis of market competition, Historical review, Quality philosophy of Deming, Juran, crossby etc., Obstacles, Integrating productivity and Quality.

Organization of Quality, Quality council, Total Quality Culture, Quality leadership, Quality awards, Total employee involvement, Quality circles, Attitude of top management, executives and workers, Operators responsibility of Quality, causes of operator's errors, Motivation.

UNIT II

Introduction lo TQM, Models for TQM. TQM implementation, Advantages of TQM, Obstacles to TQM, TQM in service sector.

Concepts of Quality function deployment, cause and effect diagram, SWOT analysis, Continuous improvement, PDCA cycle, Supplier partnership, Supplier certification, Pareto diagram, Scalier diagram, Benchmarking, Taguchi's Quality Engineering, Failure mode and effect analysis, Total productive maintenance, Introduction to JIT, JIT Quality management, SQC, SPC.DPR, Kaizen, Six sigma concept.

UNIT III

Introduction to ISO 9000 series of standards, other quality systems, Implementation, Documentation, Internal audits', Registration, Closing Comments.

UNIT IV

Beyond ISO 9000 horizon, Introduction to ISO 14000, Series standards, Concepts of ISO 14001, EMS Benefits, ISO 10011- 10014, Quality systems.

SUGGESTED BOOKS:

1. Total Quality Management: By Bosterfied el al., Pearson Education India, 2001.
2. The Essence of Total Quality Management: By Johan Bank, Prentice Hall of India 2000.
3. Managing for Total Quality: By Logothelis Prentice Hall of India, 2000.

4. Total Quality Management: By Sundra Raju, Tata Mcgraw Hills publishing company, 1997.
5. TQM and ISO 9000: By K.C. Arora, S.K. Kataria & Sons 2000.
6. ISO 9000 Quality System: By Dalde & Saurabh, Standard Publishing, 1994.

B. Tech. (Eighth Semester) Automobile Engineering
AE-422E MATERIAL MANAGEMENT

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Introduction: Objectives of materials-the function of purchasing and material management-significance of specifications standardization- make or buy decision, buying process.

UNIT II

Materials Planning and Control: Material forecasting-selection inventory control-Spare parts management-Inventory systems-lead time analysis, administrative lead time, supplier lead time, transport lead time and inspection lead time-flow charting techniques to reduce various types of lead time- materials requirement planning- aggregate inventory management.

UNIT III

Storage and Distribution: Codification of materials-storage design-stores layout - storage systems and equipment - stores preservation - stores procedures - stock valuation and verification - ware housing and distribution management.

UNIT IV

Purchase Function: Purchasing policies and procedures-legal aspects of purchasing-selection of sources of supply-vendor evaluation and rating, vendor development-price, cost analysis.

Materials Accounting and Budgeting: Evaluation of materials management performance-Information systems and computer in materials management.

TEXT BOOK

1. Gopalakrishnan, P., *Purchasing and Materials Management*, Tata McGraw Hill, 1990.

REFERENCE BOOKS

1. Camer Lee and Donald M Dubbler, Purchasing and Materials Management, Text and cases, Tata McGraw Hill, 1997.
2. Mark, J. V., Operations Management, McGraw Hill Publishers,1984.
3. Westing, J. K., Fine, E.V. and Zone, C.T., Purchasing Management Principles, John Wiley & Sons, New York, 1986.

B. Tech. (Eighth Semester) Automobile Engineering
AE-424E ENTREPRENEURSHIP DEVELOPMENT

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Entrepreneurship: Historical Perspective of Entrepreneurship-Entrepreneur-Traits of Entrepreneurs-Types of Entrepreneurs- Intrerpreneur-Difference between Entrepreneur and Intrepreneur-Entrepreneurship in Economic growth, Factors affecting Entrepreneurial Growth, Major motives influencing Entrepreneur.

UNIT II

Business: Small Enterprises-definition, Classification- Characteristics, Web and e business - Ownership structure-Project Formulation- Sources of Information- Steps involved in setting up a business- -Identifying, Selecting a good business opportunity, Market survey and research, Techno economic feasibility assessment-Preliminary Project report –Project Appraisal – Project implementation-Network Analysis, Techniques of PERT/CPM.

UNIT III

Marketing & Growth Strategies: Principles of Marketing, Assessment of market needs, Demand Forecasting, Product Life cycle-Sales Promotion Strategies- Product mix-Advertising- Distribution Channels. Growth Strategies- Expansion, Diversification, Joint venture, Merger, Sub-contracting

UNIT IV

Institutional Support to Entrepreneurs: Institutional support to Entrepreneurs-Government policy for small scale industries, Institutions for entrepreneurial growth – various schemes-Self Help Group-Sickness in industry-causes-steps for correction and rehabilitation (Field work-Collection of information on schemes of Entrepreneurial Support and Presentation).

TEXT BOOKS

1. Khanka, S.S., *Entrepreneurial Development*, S.Chand & Co Ltd, New Delhi, 1999.
2. Philip Kotler, *Principles of Marketing*, Prentice Hall of India, 1995.
3. Lamer Lee and Donald W.Dobler, *Purchasing and Materials Management*, Tata McGraw Hill, 1996

REFERENCE BOOKS

1. EDII –Faculty and External Experts, *A Hand Book of new Entrepreneurs*, Published by Entrepreneurship Development Institute of India, Ahmedabad, 1986
2. Saravanavel, P., *Entrepreneurial Development*, Ess Pee Kay Publishing House, Chennai, 1997

B. Tech. (Eighth Semester) Automobile Engineering
AE-426E INDUSTRIAL SAFETY AND ENVIRONMENT

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Accident Prevention: Definitions and theories:- Accident – Injury –unsafe act – unsafe condition – Dangerous occurrence –Theories and principles of accident causation – Cost of accidents – Accident reporting and investigations – Safety committees – need – types – advantages. Safety Education and training- Importance - various training methods – Accident prevention – Motivating factors – Safety suggestion schemes. Safety performance – Definitions connected with measuring safety performance as per Indian and International standards.

UNIT II

Safety in Material Handling: General safety consideration in material handling - Ropes, Chains, Sling, Hoops, Clamps, Arresting gears – Prime movers. Ergonomic consideration in material handling, design, installation, operation and maintenance of Conveying equipments, hoisting, traveling and slewing mechanisms. Selection, operation and maintenance of Industrial Trucks – Mobile Cranes – Tower crane.

Safety in Chemical Industries: Safety in the design process of chemical plants- Safety in operational and maintenance – Exposure of personnel, Operational activities and hazards – Safety in storage and Handling of chemical and gases – Hazards during transportation – pipeline transport – safety in chemical laboratories. Specific safety consideration for Cement, paper, pharmaceutical, petroleum, petro- chemical, rubber, fertilizer and distilleries.

UNIT III

Environmental Impact Assessment: Evolution of EIA – Concepts – Methodologies – Screening – Scoping — Checklist, Rapid and Comprehensive EIA – Legislative and Environmental Clearance procedure in India – Prediction tools for EIA. Assessment of Impact – Air – Water – Soil – Noise- Biological. Socio cultural environment – Public participation – Resettlement and Rehabilitation, Documentation of EIA .

UNIT IV

Regulations for Health, Safety and Environment: Factories act and rules; Indian explosive act - Gas cylinder rules. Environmental pollution act - Indian petroleum act and rules. Oil

industry safety directorate (OISD) - Indian Electricity act and rules. Mines act and rules - Indian motor vehicles act and rules.

TEXT BOOKS

1. Handlin, W., *Industrial Hand Book*, McGraw-Hill, 2000.
2. Anton, T. J., *Occupational safety and health management*, (2nd ed.). New York, NY: McGraw Hill, Inc, 1989.

REFERENCE BOOKS

1. Heinrich, H.W., *Industrial Accident Prevention*, McGraw-Hill, 1980
2. Rudenko, N., *Material Handling Equipments*, Mir Publishers, Moscow, 1981.
3. Lees, F.P., *Loss Prevention in Process Industries*, Butterworths, NewDelhi, 1986.
4. Canter, R. L., *Environmental Impact Assessment*, McGraw Hill.

B. Tech. (Eighth Semester) Automobile Engineering
ME-430E ENERGY MANAGEMENT

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Inerlialion phase, audit and analysis phase, implementation phase, general methodology for building and site energy audit, site survey, methodology, site survey-electrical system, steam and water systems, building survey methodology, basic energy audit instrumentation, measurement for building surveys.

General principles, the requirements for human comfort, description of typical systems-dual duct HVAC system. Multi zone HVAC systems, variable and volume systems, terminal repeat system, evaporative systems, package system, basic principle governing HVAC system, package system, basic principle governing HVAC system operation, energy management opportunities in HVAC systems, modeling of heating and cooling loads in buildings, problems.

UNIT II

General principles, illumination and human comfort, basic principles of lighting system, typical illumination system and equipment, fundamentals of single phase and 3 phase A.C. circuits, energy management opportunities for lighting systems, motors and electrical heat, electrical and analysis and their parameters, peak, demand control, problems.

General principles, process heat, combustion, energy saving in condensate return, steam generation and distribution, automotive fuel control, hot water and water pumping, direct and indirect fired furnaces over, process electricity, other process energy forms-compressed air and manufacturing processes, problems.

UNIT III

General consideration, life cycle costing, break-even analysis, cost of money, benefit/cost analysis, payback period analysis, and prospective rate of to return, problems. Environmental conformation, passive design, conservation building envelope design consideration, integration of building system, energy storage problems.

UNIT IV

Energy management principle involving computers, basics of computer use, analysis engineering and economic calculations, simulation, forecast, CAD/CAM controls -

microprocessor and minicomputers, building cycling and control, peak demand limiting and control: industrial power management, problems.

TEXT BOOK:

1. Energy Management Principles by Criag B. Smith, Published by Pergamon Press.
2. Energy systems and developments – Jyoti Parikh, Oxford University Press.

REFERENCE BOOKS:

1. Energy – resources, demand and conservation with reference to India – Chaman Kashkari, Tata Mc Graw Hill Co. Ltd.
2. Integrated renewable energy for rural development – Proceedings of Natural solar energy convention, Calcutta.

B. Tech. (Eighth Semester) Automobile Engineering
ME-432E MANAGEMENT INFORMATION SYSTEM

L	T	P	Sessional: 50 Marks
3	1	-	Theory: 100 Marks
			Total: 150 Marks

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

What is MIS? Decision support systems, systems approach, the systems view of business, MIS, MIS organization within the company management organizational theory and the systems approach. Development of organizational theory, management and organizational behaviour, management information and the system approach.
Evolution of an information systems, basic information systems, decision making and MIS, MIS as a technique for making programmed decision assisting information systems (r) strategic and project planning for MIS : General business planning, appropriate MIS planning-general, MIS planning -details.

UNIT II

Define the problems, set system objectives, establish system constraints, determine information needs, determine information sources, develop alternative conceptual ;designs and select one document the system concept, prepare the conceptual ;design report.

UNIT III

Inform and involve the organization, aim of detailed design, project management of MIS detailed design, identify dominant and trade off criteria, define the subsystems, Sketch the detailed operating subsystems and information flow. Determine the degree of automation of each operation, inform and involve the organization again, inputs, and processing, early system testing, software, hardware and tools, propose an organization to operate the system, document the detailed design, revisit the manager -user.

UNIT IV

Plan the Implementation , acquire floor space and plan space layouts, organize for implementation, develop, procedures for implementation, train (ho operating personnel, computer related acquisitions, develop forms for data collection and information dissemination, develop the files, test the system, cutover, document the system, evaluate the
MIS control and maintain the system (r). Pitfalls in MIS development: Fundamental weakness, soft spots in planning, design problems, implementation: The TARPIT.

TEXT BOOKS:

1. Management Information system by W.S. JawadeKar - Tata McGraw Hill.