MANAGEMENT AND ENTREPRENEURSHIP

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AU51	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	04		

Course objectives: The objectives of this course is to

1. Explain fundamentals management functions of a manager. Also explain planning and decision making processes.
2. Explain the organizational structure, staffing and leadership process.
3. Describe the understanding of motivation and different control systems in management.
4. Explain understanding of Entrepreneurships and Entrepreneurship development process.
5. Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur.
6. Summarize the preparation of project report, need significance of report. Also to explain about industrial ownership.

Module-I	
Management: Introduction - Meaning - nature and characteristics of Management, Scope and Functional areas of management - Management as art or science, art or profession - Management & Administration - Roles of Management, Levels of Management, Development of Management Thought - early management approaches - Modem management approaches. **Planning:** Nature, importance and purpose of planning process objectives - Types of plans (meaning only) - Decision making, Importance of planning - steps in planning & planning premises - Hierarchy of plans.	10 Hours
Module-II	
Organizing and staffing: Nature and purpose of organization, Principles of organization – Typesof organization-Departmentation Committees-Centralization V_s Decentralization of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of staffing-- :Process of Selection & Recruitment (in brief). **Directing:** Meaning and nature of directing Leadership styles, Motivation, Theories, Communication - Meaning and importance - coordination, meaning and importance and Techniques of coordination. **Controlling:** Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control (in brief).	10 Hours
Module-III	
Entrepreneur: Meaning of Entrepreneur; Evolution of .the Concept; Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur - an emerging. Class.	

Concept of Entrepreneurship - Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship - its Barriers.	10 Hours
Module-IV	
Small scale industries: Definition; Characteristics; Need and rationale; Objectives; Scope; roleof SSI in Economic Development. Advantages of SSI, Steps to start and SSI - Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GA TT Supporting Agencies of Government for SSI, Meaning, Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition Only). **Institutional support:** Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC SingleWindow Agency; SISI; NSIC; SIDBI; KSFC.	10 Hours
Module-V	
Preparation of project: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of. Business Opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study. **Industrial ownership**: Definition and meaning of Partnership, Characteristics of Partnership, Kinds of Partners, Partnership Agreement or Partnership Deed, Registration of Partnership Firm, Rights, Duties and Liabilities of Partners, Advantages and Disadvantages of Partnership, Sole proprietorship, Features, Scope Advantages and Disadvantages of Sole Proprietorship.	10 Hours

Course outcomes:

After completion of above course, students will be able to

1. Explain management functions of a manager. Also explain planning and decision making processes.
2. Explain the organizational structure, staffing and leadership processes.
3. Describe the understanding of motivation and different control systems in management.
4. Understanding of Entrepreneurships and Entrepreneurship development process.
5. Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur.
6. Summarize the preparation of project report, need significance of report. Also to explain about industrial ownership.

Question paper pattern:

1. The question paper will have ten questions.
2. Each full question consists of 16 marks.
3. There will be 2full questions (with a maximum of four sub questions) from each module.

4. Each full question will have sub questions covering all the topics under a module.
5. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Principles of Management – P. C. Tripathi, P.N. Reddy – Tata McGraw Hill.
2. Dynamics of Entrepreneurial Development & Management-Vasant Desai,Himalaya PublishingHouse.
3. Entrepreneurship Development – Poornima. M. Charantimath, Small Business Enterprises – PearsonEducation - 2006 (2 & 4).

Reference Books:

1. Management Fundamentals - Concepts, Application, Skill Development – RobersLusier, Thomson.
2. Entrepreneurship Development - S. S. Khanka, S. Chand & Co. New Delhi.
3. Management - Stephen Robbins, Pearson Education/PHI - 17thEdition, 2003.

DYNAMICS OF MACHINES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AU52	IA Marks	20
Number of Lecture Hours/Week	04 +1T	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	04		

Course objectives: The objectives of this course is to

1. Explain static and dynamic forces at various points in different types of mechanism.
2. Explain balancing of rotating masses and reciprocating masses.
3. Describe fluctuation of energy in flywheel and calculation of flywheel dimensions.
4. Describe the various types of governors and to understand method of finding controlling force.
5. Describe gyroscopic couple and to understand effect of gyroscopic couple.
6. Analyze cams for follower motions.

Module-I	
Static Force analysis: Introduction, Static equilibrium, Equilibrium of two force, three force and four force members, Members with two forces and torque, Free body diagrams, Static force analysis (graphical) of four bar mechanism and slider-crank mechanism without and without friction. **Dynamic/Inertia force analysis:** Introduction, D'Alembert's principle, Inertia force , inertia torque, dynamically equivalent systems, correction couple, line of action of inertia force in a link, inertia force analysis (graphical) of a four bar mechanism, inertia force analysis (analytical) of slider crank mechanism [(i) neglecting the mass of the connecting rod; (ii) considering the mass of the connecting rod].	10 Hours
Module-II	
Balancing of Rotating Masses Introduction, Static and dynamic balancing, balancing of single revolving mass by balancing masses in same plane and in different planes, Balancing of several masses revolving in the same plane, balancing of several masses revolving in different planes. **Balancing of Reciprocating masses** Introduction, primary balancing, secondary balancing, Inertia effect of crank and connecting rod, balancing of single cylinder engine, balancing of multi cylinder-inline engine, balancing of V - engines.	10 Hours
Module-III	
Flywheel Introduction, Turning moment diagrams, Fluctuation of Energy and speed, energy stored in a flywheel, determination of size of flywheels. **Governors** Introduction, Types of governors; force analysis of Porter and Hartnell governors. Controlling force, stability, condition for stability, sensitiveness, iso-chronisms, hunting, effort and power of governor.	10 Hours

Module-IV	
Friction Types friction, law of friction, force analysis of sliding body, screw friction, screw jack, flat pivot bearing, flat collar bearing. **Belt and Chain drives** Types of belts and chains, flat belts; angular velocity, law of belting, length of open and cross belts, centrifugal tension, condition for maximum power. V-belts, ratio of tensions, chain drives, chain pits and chain length.	10 Hours
Module-V	
Gyroscope Introduction, Vectorial representation of angular motion, gyroscopic couple, effect of gyroscopic couple on bearings, aircraft, ship, stability of two wheelers and four wheelers. **Analysis of cams** Introduction, Analysis of (i) tangent cam with roller follower (ii) Circular arc cam with flat faced follower.	10 Hours
Course outcomes: After completion of above course, students will be able to 1. Calculate static forces at various points in different types of mechanism. 2. Calculate fluctuation of energy in flywheel and dimensions of flywheel. 3. Balance rotating masses and of reciprocating masses in internal combustion engine, V engine, radial engine and to solve analytically and graphically to balance the systems. 4. Calculate gyroscopic effect on stability of vehicles, ship, aircraft etc. 5. Analyze effect of profile of cam on motion of followers.	
Question paper pattern: 1. The question paper will have ten questions. 2. Each full question consists of 16 marks. 3. There will be 2 full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under a module. 5. The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. Theory of Machines- Rattan S.S., Tata McGraw Hill Publishing Company Ltd 2. Theory of Machines- Sadhu Singh, Pearson Publications, New Delhi	
Reference Books: 1. Theory of Machines and Mechanisms- Joseph E. Shigley, Jr. Uicker John, McGraw Hill publications. 2. Dynamics of Machinery- A. R. Holowenko, John Wiley & sons. 3. Kinematics & Dynamics of Machinery- R L. Norton, Tata - McGraw Hill. 4. Theory of Machines- R. S. Khurmi and J. K. Gupta, S. Chand and Co. 5. Theory of Machines- P.L. Ballaney, Khanna Publishers, New Delhi	

DESIGN OF MACHINE ELEMENTS - I

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AU53	IA Marks	20
Number of Lecture Hours/Week	04+1T	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	04		

Course objectives: The objectives of this course is to

1. Define and explain basic terms related to the design of machine elements.
2. Develop skills to design various machine elements.

Module-I

Introduction:

Designation and Mechanical properties of Engineering Materials, design considerations, basic design concept (strength consideration), Failure of brittle materials, Failure of ductile materials, factor of safety, criteria for selection of factor of safety, design of simple machine members subjected to static loading (including eccentric load) [limited to biaxial stresses (normal, shear, bending, torsional, crushing/bearing, principal stresses)].

Theories of Failure:

Maximum normal stress theory, Maximum shear stress theory, Distortionenergy theory.

10 Hours

Module-II

Stress Concentration:

Stress concentration factor, design of simple elements with stress raisers.

Impact Strength:

Introduction, Impact stresses due to axial, bending and torsional loads, effect ofinertia.

Design for fatigue strength:

Introduction, types of fluctuating stresses, fatigue and endurance limit, S-N Diagram, Low cycle fatigue, High cycle fatigue, endurance limit modifying factors: load, size and surface factors, Stress concentration effects; notch sensitivity, design for infinite life, combined steady and variable stress, Soderberg and Goodman relationship, stresses due to combined loading, cumulative fatigue damage – Miner's equation.

10 Hours

Module-III

Design of Simple Machine Elements:

Design of Cotter and Knuckle joints. Keys: Types of keys, Design of keys, Couplings, types of couplings, design of flange type of rigid coupling, design of Bush and Pin type of flexible couplings.

Design of Shaft:

Introduction, types of shafts, shafts subjected to combined bending and twisting, shaft design (including hollow shafts) based on strength, shaft design based on torsional rigidity, ASME code for shaft design.

10 Hours

Module-IV	
Riveted Joints: Introduction, methods of riveting, Types of rivets, rivet materials, types of rivetedjoints, failures of riveted joints, joint efficiency. **Welded Joints:** Introduction, types of welded joints, design of welded joints (butt joints, fillet welds,axially loaded unsymmetrical welded joints, eccentrically loaded welded joints).	10 Hours
Module-V	
Threaded Joints: Introduction, basic terminology of screw threads, types of screw threads, types of screw fastenings, designations of screw threads, Stresses in threaded fasteners due to static loading, Effect of initial tension, threaded joints for cylinder covers, design of eccentrically loaded bolted joints. **Power Screws:** Introduction, Types of screw threads used for power screws, Design of Power Screws, efficiency, self-locking and over hauling. Design of screw jack	10 Hours
Course outcomes: After completion of above course, students will be able to 1.Explain the importance of Standards in Design, Selection of materials as per CODES & STANDARDS. 2.Analyze the various modes of failure of machine components under different static load conditions and use appropriate theories of failures to design machine components. 3.Compute the dimensions of simple machine components. 4.Design shafts for transmission of power under various conditions. 5.Design of welded joints, riveted joints and power screws	
Question paper pattern: 1 The question paper will have ten questions. 2 Each full question consists of 16 marks. 3 There will be 2 full questions (with a maximum of four sub questions) from each module. 4 Each full question will have sub questions covering all the topics under a module. 5 The students will have to answer 5 full questions, selecting one full question from each module.	
Design Data Hand Books: 1. Design Data Hand Book- K. Mahadevan and Balaveera Reddy, CBS Publication. 2 Design Data Hand Book- K. Lingaiah, McGraw Hill, 2nd Ed.2003.	
Text Books: 1 Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007. 2 A text book of Machine Design-R.S. Khurmi and J.K. Gupta, S.Chand& Co. 3 Mechanical Engineering Design- Joseph E shigley and Charles R. G. Budynas, McGraw hill international edition- 6 , 2009.	

Reference Books:

1. Theory and problems of Machine Design,Hall, Holowenko, Laughlin (Schaum's Outlines series), TataMcGraw Hill Publishing Company Ltd., New Delhi.
2. Machine design: Paul H. Black, McGraw-Hill International Book Company.
3. Machine design-I: J.B.K. Das, SapnaBook House, Bangalore.
4. Machine design: Robert L Norton, Prentice Hall.

AUTOMOTIVE FUELS AND COMBUSTION
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – V

Subject Code	15AU54	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	04		

Course objectives: The objectives of this course is to

1. Introduce understanding about available energy sources for ICE.
2. Distinguish between properties of difference fuels.
3. Explain fuel refining process.
4. Determine the A/F ratio for complete combustion.
5. Explain requirements of combustion chambers for S.I. and C.I. Engines
6. Define &differentiate between multi fuel& duel fuel engines.
7. Discuss the performance characteristics of multi fuel& duel fuel engines.

Module-I

Energy Sources:

Exhaustible sources - crude oil, Natural gas, Inexhaustible sources - Solar energy, Wind power, Tidal Power, Geo-thermal power. Energy from Bio-gas, Synthetic fuels-Fuel Cells, Hydrogen-only a brief introduction.

Liquid Fuels:

Origin of petroleum, its chemistry, normal paraffin's, iso-paraffins, olefins, naphthalene and aromatics. Refining of petroleum: Fractional distillation, Cracking, Reforming process, Thermal reforming, polymerization, alkylation, and isomerisation. Properties and tests : Specific Gravity, viscosity, flash and fire points, calorific value, rating of fuels, vapour pressure, cloud and pour point, annealing point, diesel index, carbon residue and ash content determination. — 10 Hours

Module-II

Petrol and Diesel Fuels:

Properties and rating of fuels, chemical energy of fuels, Reaction Equation, Properties of A/F mixture, combustion temp, combustion charts, Lead free gasoline's, low and ultra – low sulphur diesels, LPG, C NG, Alcohols, Biodiesels, Gaseous Fuel Injections, Dual Fueling and Controls – CNG and Gasoline, Hydrogen and Diesel, Alcohols and Diesels etc. — 10 Hours

Combustion Equations:

Combustion equation, conversion of gravimetric to volumetric analysis. Determination of theoretical minimum quantity of air for complete combustion. Determination of air fuel ratio for a given fuel. Numerical problems, flue gas analysis, gas Chromatograph.

Module-III

Combustion in S.I. Engines:

Initiation of combustion, flame velocities, effect of variables on flame propagation, normal and abnormal combustion, pre-ignition, surface ignition, detonation, theories of detonation, effects of engine variables on detonation, effects of detonation, control of detonation, features and design consideration

of combustion chambers, types of combustion chambers. **Combustion in C.I. Engines:** Various stages of combustion, vaporization of fuel droplets and spray formation, air motion, swirl, squish, tumble flow, velocities, diesel knock and its effect, methods of controlling diesel knock, features and design considerations of combustion chambers, types of combustion chambers.	10 Hours
Module-IV	
Engine testing and Performance: Performance parameters, Basic measurements, Measurements of Speed, Fuel consumption, air consumption, brake power and different types of dynamometers, frictional power measurement by willam's line method, Morse test and other methods, indicated power, blow by measurement, performance maps, heat balance and related numerical.	10 Hours
Module-V	
Dual fuel and Multi-fuel Engines: Combustion in dual fuel engines, Factor affecting combustion. Main types of gaseous fuels, Supercharge knock control & Performance of diesel fuel engines. Characteristics of multi fuel engines, Modification of fuel system, suitability of various engines as multi fuel unit, performance of multi fuel engines.	10 Hours
Course outcomes: After completion of above course, students will be able to 1. Explain available energy sources for internal combustion engine. 2. Determine A/F ratio for a given fuel. 3. Explain stages of combustion in S.I. & C.I. engines. 4. Design SI& CI engine combustion chambers. 5. Explain and differentiate between multi fuel and duel fuel engines.	
Question paper pattern: 1.The question paper will have ten questions. 2.Each full question consists of 16 marks. 3.There will be 2 full questions (with a maximum of four sub questions) from each module. 4.Each full question will have sub questions covering all the topics under a module. 5.The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. I.C. Engines-Mathur& Sharma, DhanpatRai& Sons, New Delhi, 1994 2. Fuels & Combustion- S.P. Sharma & Chandra Mohan, Tata McGraw-Hill, New Delhi,1987	
Reference Books: 1. Internal Combustion Engines- Ganesan, V, Tata McGraw Hill Book Co., 1995. 2. Internal Combustion Engine Fundamentals- John B. Heywood, McGraw Hill Book, 1998. 3. Internal Combustion Engine and Air Pollution- Obert, E.F., International Text Book Publishers, 1983. 4. I.C. Engines by Maleev- CBS Publications, New Delhi.	

CAD / CAM

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AU551	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
Credits	03		

Course objectives: The objectives of this course is to

1. Describe the fundamental theory and concepts of the CAD/CAM.
2. Explain the Basic hardware structure and components used in CAD systems.
3. Develop transformations for 2D geometric modeling.
4. Describe the principles of Computer Aided Designing systems and the concepts of Geometric Modeling, solid modeling, and feature-based design modeling.
5. Explain the concepts of NC and CNC programming and machining.
6. Compare and distinguish the difference between the operation and programming of a CNC machine tool using manual programming and the operation and programming of CNC machine tool using CAM systems.
7. Apply both practices (manually and CAM) to develop the G-code program. And explain the basics of FEA and Robotics.

Module-I	
Introduction: Role of computers in design and manufacturing. Influence of computers in manufacturing environment. Product cycle in conventional and computerized manufacturing environment. Introduction to CAD, Introduction to CAM. Advantages and disadvantages of CAD and CAM. **Hardware for CAD:** Basic Hardware structure, Working principles, usage and types of hardware for CAD – Input devices, output devices, memory, CPU, hardcopy and storage devices.	8 Hours
Module-II	
Computer graphics: Software configuration of a graphic system, function of graphics package, construction of geometry, wire frame and solid modeling, Geometry transformation – two dimensional and three dimensional transformation, translation, scaling, reflection, rotation, CAD/CAM integration. Desirable modeling facilities. Introduction to exchange of modeling data- Basic features of IGES, STEP, DXF, and DMIS **Introduction to Finite element analysis:** Introduction, basic concepts, discretization, element types, nodes and degrees of freedom mesh generation, constraints, loads, preprocessing, and application to static analysis.	8 Hours
Module-III	
Numerical Control (NC) and CNC machine tools: Basic components of an NC Systems , NC procedure , NC co-ordinate systems , open loop & closed loop system (position controlled NC) NC motion control systems, application of NC. Advantage & limitations of NC. Functions	8 Hours

of CNC, CNC machining centers, CNC turning centers, high speed CNC machine tools.	
Module-IV	
NC, CNC, DNC Technologies: NC, CNC, DNC, modes, NC elements, advantages and limitations of NC, CNC. Functions of computer in DNC **CNC tooling:** Turning tool geometry, milling tooling system, tool presetting, ATC, work holding. **CAM Programming:** Overview of different CNC machining centers, CNC turning centers, highspeed machine tools	8 Hours
Module-V	
CNC Programming: Part program fundamentals-steps involved in development of a part program.Manual part programming, milling, turning, turning center programming. **Introduction to Robotics:** Introduction, robot configuration, robot motion, programming ofrobots, end effectors work cell, control and interlock, robot sensor, robot applications	8 Hours
Course outcome: After completion of above course, students will be able to 1. Describe the fundamental theory and concepts of the CAD/CAM. Explain the Basic hardware structure and components used in CAD systems. 2. Compare the different types of modeling techniques and explain the central role solid models. 3. Describe the principles of Computer Aided Designing systems and the concepts of Geometric Modeling, solid modeling, and feature-based design modeling. 4. Explain the basic concepts of NC and CNC programming and machining. 5. Compare and distinguish the difference between the operation and programming of a CNC machine tool using manual programming and the operation and programming of CNC machine tool using CAM systems. 6. Apply both practices (manually and CAM) to develop the G-code program, and explain the basics of FEA and Robotics.	
Question paper pattern: 1. The question paper will have ten questions. 2. Each full question consists of 16 marks. 3. There will be 2 full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under a module. 5. The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. CAD/CAM Principles and Application- P.N. Rao, Tata McGraw Hill. 2. CAD/CAM- Groover, Tata McGraw Hill, New Delhi	
Reference Books: 1. Introduction to the Design and Analysis of Algorithms - S.E. Goodman, S.T. Headetmiemi,	

McGraw Hill Book Company – 1988.
2. Principles of Interactive Computer Graphics-Newman and Sproull, Tata McGraw Hill, 1995.
3. NC Machine Programming and Software Design-Chno-H wachang, Michel. A. Melkanoff, Prentice Hall, 1989.
4. Numerical control and CAM- Pressman RS and Williams JE, John Wiley.
5. CAD-CAM- Chris McMahon & Jimmie Browne – Pearson Education Asia 2001.
6. CAD/CAM – Ibrahim Zeid, Tat McGraw Hill, 1999.
7. Computer Aided Manufacturing- P.N. Rao, N.K. Tewari and T.K. Kundra Tata McGraw Hill 1999.
8. Introduction to FEM- T Chandra patta Ashok D Bebgundu.

VEHICLE TRANSPORT MANAGEMENT

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AU552	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
Credits	03		

Course objectives: The objectives of this course is to

1. Introduce infrastructure required for Fleetoperation and maintenance.
2. Understand organizational structure and importance and methods of route planning.
3. Analyze different methods of fare collection systems.
4. Calculate fleet operating costs.
5. Explain different methods of accident prevention.

Module-I	
Introduction: Historical background, the growth of a network, trams, trolley buses, buses, private cars, subsidies. Motor vehicle act 1988. **The Infrastructure:** Road, Highway network, traffic control, Bus priorities, pedestrianization, out town shopping centers, Bus-stops, shelters, Bus stations-drive through type, head on type, facilities for passengers, bus garages, requirement, layout of premises, size, function, ,location, design, equipment, use of machinery, garage organization, large scale overhaul conveyance of staff, requirement of facilities at depot., legal provisions for depot. Layouts. **Maintenance:** Preventive, breakdown, overhauling - major, minor, repair schedules & workshop, facilities,documentation, analysis & corrective maintenance schedules.	8 Hours
Module-II	
Organization and Management: Forms of ownership, municipal undertaking, company undertaking, traffic, secretarial and engineering department, management, principle of transport, - internal organization-centralized control, de-centralized control, staff administration: industrial relation, administration, recruitment and training, drivers and conductors duties, training of drivers and conductors, factors affecting punctuality, welfare, health and safety. **Route planning:** Source of traffic, town planning, turning points, stopping places, shelters, survey of route, preliminary schedule test runs, elimination of hazards, factors affecting frequency, direction of traffic flow, community of interest, estimating, traffic volume, probable weekday travelers, passengers during various periods of the day, estimated number of passengers, estimated traffic, possibility of single verses double deck and frequency	8 Hours

Module-III	
Fare collections & Fare structure Need, Principles of collection, tickets, the way bill, stage by stage, bell punch system, bell-graphic system, reduced ticket stocks will brew system, mechanical ticket machines, T.I.M and straight machines, Vero meter, one-man operation, two stream boarding, pre paid tickets, lensonparason coach tickets exchanges, the fare box, electronic ticket machines, box system personal and common stock flat fare platform control. Fare structure: Basis of fares, historical background, effects of competition and control, calculating average zone system, concession fares, straight and tapered scale elastic and inelastic demand co-ordination of fares concessions fares changes for workman, standard layout of fare table, anomalies double booking inter availability through booking and summation, private hire charges.	8 Hours
Module-IV	
Operating cost and types of vehicles: Classification of costs, average speed, running costs, supplementary costs, depreciation obsolescence, life of vehicles, sinking fund, factor affecting cost per vehicles mile incidence of wages and overheads, 100 seats miles basis, average seating capacity, vehicles size and spread over, types of vehicle economic considerations authorization of trolley, bus services, statuary for hire car. **Public relations divisions:** Dissemination of information, maintaining goodwill- handling complaints, traffic advisory committees- local contractors co-operation with the press news and articles- facilities for visitors- forms of publicity - importance of quality - inter departmental liaison advertisements, sings, notice and directions general appearance of premises, specialized publicity.	8 Hours
Module-V	
Prevention of accidents: Emphasis of safe driving, annual awards, bonus encouragement, vehicle design, platform layout, location of stops, scheduled speed, route hazards, records, elimination of accident prone drivers. **Timing, Bus working and Schedules:** Time table layout, uses of flat graph method of presentation, preparation of vehicle and crew schedule preparation of the duty roster, co-operation with employers, use of the vehicle running numbering determination of vehicle efficiency checking efficiency of crew, duty arrangements. **Vehicle design:** Buses & coaches, types & capacities, basic features, entrances & exits, comfort & capacity, steps & staircases, miscellaneous arrangements & fitments, articulated buses, standardization. The future: a projection from the past, future demand, environmental and social issues, the energy situation, new technology, hybrid ,battery/trolley bus, other types of hybrid, lead acid battery bus, advanced battery bus.	8 Hours

Course outcomes:

After completion of above course, students will be able to

1. Determine infrastructure required for Fleet maintenance.
2. Plan routes for fleet.
3. Analyze fare collection system.
4. Calculate fleet operating costs.

Question paper pattern:

1. The question paper will have ten questions.
2. Each full question consists of 16 marks.
3. There will be 2 full questions (with a maximum of four sub questions) from each module.
4. Each full question will have sub questions covering all the topics under a module.
5. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Bus operation- L .D .Kitchen, Iliffe&Sons , London.
2. Bus & coach operation - Rex W. Faulks, Butterworth Version Of 1987, London.

Reference Books:

1. Compendium of transport terms - CIRT, Pune.
2. M.V. Act 1988 - Central Law Agency, Allahabad.
3. The elements of transportation - R.J. Eaton.
4. Goods vehicle operation - C.S. Dubbar.
3. Road transport law - L.D. Kitchen,Iliffe&Sons , London.

AUTOMOTIVE AIR CONDITIONING AND REFRIGERATION

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AU553	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
Credits	03		

Course objectives: The objectives of this course is to

1. Introduce basic concepts of air conditioning and refrigeration.
2. Analyze various gas cycles for refrigeration.
3. Describe layouts and construction of central and unitary air conditioning system.
4. Analyze refrigeration, heating and air conditioning load calculations and effect of air conditioning on engine performance.
5. Describe air distribution, air routing and temperature control.
6. Detained information about basic concepts of air conditioning servicing

Module-I	
Air conditioning Fundamentals: Basic air conditioning system,- Air conditioning principles, Air-conditioning types, temperature and pressure fundamentals, types of compressors and refrigerants. **Gas cycle refrigeration:** Introduction, reverse cornot cycle, bellcoleman cycle, advantages and disadvantages of gas refrigeration system. Analysis of gas refrigeration, relatednumerical.	8 Hours
Module-II	
Air conditioning systems: Classification, layouts, central /unitary air conditioning systems, components like compressors, evaporators, condensers, expansion devices, fan blowers, heating systems, Automotive heaters, Types, Heater Systems, Air conditioning protection, Engine protection.	8 Hours
Module-III	
Load Analysis: Outside & inside design consideration, factors forming the load on refrigeration & air conditioning systems, cooling & heating load calculations, load calculations for automobiles, effect of air conditioning load on engine performance.	8 Hours
Module-IV	
Air Distribution Systems: Distribution duct system, sizing, supply /return ducts, type of grills, diffusers, ventilation, air noise level, layout of duct systems for automobiles and their impact on load calculations. **Air Routing & Temperature Control:** Objectives, evaporator air flow, through the re-circulating unit, automatic temperature control, duct system, controlling flow, vacuum reserve, testing the air control of air handling systems.	8 Hours

Module-V	
Air conditioning service: Air conditioner maintenance & service- causes of air conditioner failure, leak testing guide, discharging the system, Evacuating the system, charging the system, servicing heater system, removing & replacing components, trouble shooting of air conditioning system, compressor service, methods of dehydration, charging & testing. **Air Conditioning Control** Common control such as thermostats, humidistat, control dampers, pressure cut outs, relays.	8 Hours

Course outcomes:

After completion of above course, students will be able to

1. Explain basic concepts of air conditioning and refrigeration.
2. Analyze various gas cycles for refrigeration.
3. To design required layouts of central and unitary air conditioning system.
4. Analyze refrigeration, heating and air conditioning load and effect of air conditioning on engine performance.
5. Design air distribution, air routing and temperature control in air conditioning system.
6. Explain basic concepts of air conditioning servicing.

Question paper pattern:

1. The question paper will have ten questions.
2. Each full question consists of 16 marks.
3. There will be 2 full questions (with a maximum of four sub questions) from each module.
4. Each full question will have sub questions covering all the topics under a module.
5. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Automotive Heating & Air Conditioning- Mark Schnubel, Thomson Delmar Learning, 3rd edition, NY.
2. Automotive Air Conditioning- William H. Crouse & Donald L. Anglin,McGrawHill, Inc., 1990.
3. Refrigeration and Air conditioning- C. P Arora, TMH.

Reference Books:

1. Automotive Air-Conditioning-Boyace H. Dwiggins.
2. HVAC Fundamentals- SamSugarman, Fairmont Press- IS BN0-88173-489-6.
3. Automotive Air Conditioning- Paul Weisler, Reston PublishingCo.Inc.1990.
4. Automotive Air Conditioning- Paul Lung, C.B, S. Publisher & Distributor, Delhi.
5. Automotive Air Conditioning- MacDonald K. L, The odoreAudel series, 1978.

HYDRAULICS AND PNEUMATICS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AU554	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
Credits	03		

Course objectives: The objectives of this course is to

1. Introduce basics of Hydraulics and pneumatics.
2. Describe Various components of hydraulic system and maintenance of hydraulic system
3. Design hydraulic system.
4. Describe layout and details of pneumatic systems.

Module-I	
Introduction to Hydraulic Power: Pascal's law, The Source of Hydraulic Power: Pumps Pumping theory, pump classification, gear pumps, vane pumps, piston pumps, pump performance, variable displacement pumps. **Hydraulic Actuators and Motors:** Linear Hydraulic Actuators [cylinders], Mechanics of Hydraulic Cylinder loading, Hydraulic Rotary Actuators, Gear motors, vane motors and piston motors.	8 Hours
Module-II	
Control Components in Hydraulic Systems: Directional Control Valves – Symbolic representation, Constructional features, pressure control valves – direct and pilot operated types, flow control valves. **Maintenance of Hydraulic systems:** Hydraulic oils – Desirable properties, general type of fluids, sealing devices, reservoir system, filters and strainers, problem caused by gases in hydraulic fluids, wear of moving parts due to solid particle contamination, temperature control, trouble shooting.	8 Hours
Module-III	
Hydraulic Circuit Design and Analysis: Control of single and Double – acting Hydraulic cylinder, regenerative circuit, pump unloading circuit, Double pump Hydraulic system, Counter Balance Valve application, Hydraulic cylinder sequencing circuits. Locked cylinder using pilot check valve, cylinder synchronizing circuits, speed control of hydraulic cylinder, speed control of hydraulic motors, accumulators and accumulator circuits.	8 Hours
Module-IV	
Pneumatic controls: Choice of working medium, characteristics of compressed air. Pneumatic Actuators: Linear cylinders – Types, conventional type of cylinder working, end position cushioning, seals. Rod – less cylinders – types, working advantages. Rotary cylinder types construction. **Directional Control valves**	8 Hours

Design and constructional aspects, poppet valves, slide valves spool valve, suspended seat type slide valve. **Simple Pneumatic Control** Direct and indirect actuation pneumatic cylinders. Flow control valves and speed control of cylinders supply air throttling and exhaust air throttling use of quick exhaust valve.	
Module-V	
Multi-cylinder applications: Coordinated and sequential motion control. Motion and control diagrams – Signal elimination methods. Cascading method – principle. Practical application examples (up to two cylinders) using cascading method (using reversing valves). **Electro-Pneumatic control:** Principles-signal input and output pilot assisted solenoid control of directional control valves, use of relay and contactors. Control circuitry for simple single cylinder applications. **Compressed air:** Production of compressed air – compressors, preparation of compressed air- Driers, Filters, Regulators, Lubricators, Distribution of compressed air- Piping layout.	8 Hours
Course outcomes: After completion of above course, students will be able to 1. Describe Various components of hydraulic system and maintenance of hydraulic system. 2. Design hydraulic system. 3. Describe layout and details of pneumatic systems.	
Question paper pattern: 1. The question paper will have ten questions. 2. Each full question consists of 16 marks. 3. There will be 2 full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under a module. 5. The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. Fluid Power with applications- Anthony Esposito, Fifth edition Pearson education, Inc. 2000. 2. Pneumatics and Hydraulics- Andrew Parr,Jaico Publishing Co. 2000.	
Reference Books: 1. Oil Hydraulic Systems – Principles and Maintenance- S.R. 2002 Majumdar, Tata McGraw Hill publishing company Ltd. 2001. 2. Pneumatic systems - S. R. Majumdar, Tata McGraw Hill publishing Co., 1995. 3. Industrial Hydraulics -Pippenger Hicks, McGraw Hill, New York.	

AUTOMOTIVE ENGINE COMPONENTS LAB

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AUL57	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	39	Exam Hours	03
Credits	02		

Course objectives:

The objectives of this course is to

1. To write technical specifications of different types of engines
2. To dismantle and assemble the S. I and C.I Engines and to inspect the engine parts for wear, cracks, etc.
3. Perform vacuum and compression test on diesel and Petrol engine.
4. To dismantle and assemble different units of fuel system, cooling system, lubricating system.

Laboratory Experiments:

PART-A

1. Study of Hand tools- sketching , material and their application
2. Writing Technical specifications and description of all types of engines
3. Dismantling and assembly of engines (SI and CI), identification of major components, inspection of different components for wear, cracks, measurement and comparison of dimensions of major components with standard
4. Compression and vaccum test on diesel and petrol engines

PART-B

Dismantling & assembly and inspection of :

1. Carburetors, Fuel injection pumps, Injectors, Fuel filters, Fuel pumps
2. CRDI system
3. Turbo-chargers
4. Cooling systems and Lubricating systems.

Identification of location of above components in a vehicle and note their functions along with the brand names.

Course outcomes:

After completing all above experiments students will be able to:

1. write technical specifications of different types of engines.
2. Dismantle and assemble the S. I and C.I Engines and to inspect the engine parts for wear, cracks, etc.
3. Perform vaccum and compression test on diesel and Petrol engine.
4. To dismantle and assemble different units of fuel system, cooling system, lubricating system.

Scheme of Examination:

One Question from Part – A	30 marks
One Question from Part – B	40 marks
Viva - Voce	10 marks
Total:	**80 marks**

FLUID MECHANICS AND FUELTESTING LAB

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15AUL58	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	02		

Course objectives:

The objectives of this course is to

1. To apply the basic concepts/knowledge gained in Fluid mechanics and Fuel testing for verifying basic laws governing flow of fluids and to determine various properties of fuels used for automotive internal combustion engines.

Laboratory Experiments:

PART-A

Fluid Mechanics

1. Determination of coefficient of discharge of venturi meter and orifice meter.
2. Determination of major and minor losses in pipe flow (sudden enlargement, contraction, bend, entry and exit).
3. Performance testing of fluid pumps(Centrifugal, reciprocating and gear pumps).
4. Performance testing of air blowers.

PART-B

Fuel Testing

1. Determination of flash and fire point of fuels.
2. Determination of calorific value of solid, liquid and gaseous fuel.
3. Determination of viscosity of oils using redwood, saybolt and Torsion viscometer.
4. Determination of carbon residue and moisture content in a fuel.
5. Determination of cloud and pour point of oils.

Course outcomes:

After completing all above experiments, students will be able to:

1. Determine coefficient of discharge of venture meter and orifice meter.
2. Determine major and minor losses in flow through pipes.
3. Investigate performance characteristics of various fluid pumps.
4. Determine flash point, fire point, calorific value, viscosity, cloud point, moisture content of fuel and lubricants.

Scheme of Examination:

One Question from Part – A	40 marks
One Question from Part – B	30 marks
Viva – Voce	10 marks
Total:	**80 marks**