V Sem

Course Contents

Category of Course	Course Title	Course Code	Credits-6C			Theory Papers (ES)
			L	**T**	**P**	
Automobile Engineering DC-II	Automobile Engineering- I	BTAE 501	3	1	2	

Branch: Automobile Engineering III Semester
Course: BTAE 501 Automobile Engineering - I

Unit I

Historical Development of Automobiles classification of Automobiles, Type of Automobile Engines, Principle of engine operation, classification of engine, engine parts and their function, cylinder head, piston, piston rings, piston pin, connecting rod, crank shaft, flywheel, camshaft, valve and valve machanism and crank case.

Unit II

Fuel system in petrol engine, carburetion, petrol injection system.

Unit III

Fuel system in Diesel Engine – Diesel fuel pump principle, fuel pump, simple and multiple unit pumps, C. A. V. Bosch pump, modern distributers type fuel pumps.

Unit IV

Cooling system in Automobile- Lubricants system – ignition system and super charging.

Unit V

Duel Fuel 7 Multi Fuel Engine: Combustion in Duel Fuel engines factors affecting combustion in duel fuel engines performance of dual fuel engines, advantages of dual fuel engines.

Multifuel engines, characteristics of Multifuel engines, modification of fuel system, performance of multifuel engines. Brief introduction to working of stratified charged engine, Stirling engine, wanked engine, variable compression engine, Air Cleancers & Silencers.

Text Book:

1. A Course in IC Engine by M. L. Mathur & R. P. Sharma, (Dhanpat Rai Publications)
2. Automotive mechanics by William H. Crouse, Donald L. Anglin, Tata McGraw Hill Publications.

Note: Practicals of the subject will be based on above contents.

Course Contents

Category of Course	Course Title	Course Code	Credits-6C			Theory Papers (ES)
			L	**T**	**P**	
Departmental Core	Automotive Transmission	BTAE 502	3	1	2	

Branch: Automobile Engineering, V Semester
Course: BTAE 502 Automotive Transmission

Unit I
TRANSMISSION REQUIREMENTS:
Requirements of transmission system - General arrangement of power transmission - General arrangement of rear-engined vehicle with live axles - General arrangement of dead- axle and axleless transmission - Four wheel drive transmission.

Unit- II
CLUTCHES:
Requirements of clutches - Principle of friction clutch - Types: Cone clutch, Single-plate clutch, Diaphragm spring clutch, Multi-plate clutch, Centrifugal clutches, Ferlec Electromagnetic clutch - Materials used - over running clutch - Principle of construction and design details of roller and sprag types of clutches.

Unit- III
GEAR BOX:
Requirements of Gear boxes - Different types of gear boxex: Sliding mesh, Constant mesh gear boxes, Epicyclic gear box - Synchronizers: Principle, Early Warner Synchronizer, Later Warner Synchronizer, Vauxhall Synchronizer - Gear materials - Lubrication and design of Gear box.

Unit- IV
HYDRDYNAMIC DRIVE:
Advantages and limitations - Fluid coupling - Principle of operation of fluid coupling - constructional details of a typical fluid coupling - torque capacity - performance characteristics - Drag torque - Methods of minimizing drag torque.

Unit-V
TORQUE CONVERTER:
Principle of operation - Performance characteristics - Single and multistage and polyphase torque converters - Converter - couplings - Performance characteristics of converter - coupling - Blade angles and fluid flow - Design of converter blade ngles - Constructional details of typical torque converter - Converter fluids.

Unit - VI

AUTOMATIC TRANSMISSION:

Chevrolet "Turboglide" Transmission - Powerglide Transmission - Hydraulic control systems of automatic transmission.

Unit- VII

HYDROSTATIC DRIVE:

Advantages and limitations - Various types of hydrostatic systems - principles of hydrostatic drive systems - Comparison of hydrostatic drive with hydrodynamic drive - Construction and working of typical Jahny Hydrostatic drive.

Unit- VIII

ELECTRIC DRIVE:

Advantages and limitations - Principles of early and modified Ward Leonard control systems - Modem electric drives for buses. Performance Characteristics.

TEXT:

1. Heldt, P.M., Torque converters, Chilton Book Co.

REFERENCE:

1. Newton, Steeds & Garrot, Motor Vehicles, lliffe Publishers.
2. Judge, A.W., Modern Transmission Systems, Champman & Hall Ltd.
3. Check Chart, Automatic Transmission, A Harper & Row Publication.

Course Contents

Category of Course	Course Title	Course Code	Credits-6C			Theory Papers (ES)
			L	**T**	**P**	
Departmental Core	Engineering Design	BTAE 504	4	2	0	

Branch: Automobile Engineering, V Semester
Course: BTAE 504 Engineering Design

Unit I

INTRODUCTION:
Classification of Design-National and International Symbols- Engineering materials and their physical properties as applied to design-Selection of materials - Factor of safety in design- Dimensioning and detailing- Elementary concepts of functional, aesthetic and form design- Principles of design optimization - Future trends- CAD. Euler's formula. End fixity co-efficient - Radius of gyration and plane of buckling. Rankine's formula- Tetmajer's formula- Johnson formula. Design of push rods and eccentrically loaded columns.

Unit II

ST A TIC AND VARIABLE STRESSES:
Static and variable loading in machine elements-Stress concentration- Goodmen and Soderberg method for design- Design of power transmission shafts- subjected to torsion, bending and axial loads- design of closely coiled helical springs.

Unit III

GEAR DESIGN:

Design considerations- Strength of gear teeth. Lewis equation- Dynamic tooth load. Design of helical gears, Herringbone gears, Bevel Gears and warm gears.

Unit - IV
FLYWHEELS:
Determination of the mass of a flywheel for a given co-efficient of speed fluctuation. Engine flywheels stresses in rim of flywheels. Design of hubs and arms of flywheel.

Unit - V
BEARING DESIGN:
Theory of lubrication - Bearing area - Sliding bearing and rolling bearings. Bearing materials. Design of bearing caps and bolts. Anti friction bearings. Radial ball bearings. Roller bearings. Selection of bearings. Bearing load. Temperature influence of bearings.

TEXT

1. R.S.Khurmi and J.K.Gupta, A text book of machine design.

REFERENCES:

1. R.K.Jain, Machine Design
2. J.E.Shigley, Mechanical Engineering Design, McGraw- Hill Book Co.
3. N.F.Spotts, Design of Machine Elements, Prentice Hall of India
4. PSG Design Data Handbook, Kalaikathir Publications, Coimbatore.
5. W.H.Mayall, Industrial Design for Engineers, llliffe Books, London.
6. N.C. Pandya and C.S. Shah, Elements of machine design.

Course Contents

Category of Course	Course Title	Course Code	Credits-6C			Theory Papers (ES)
			L	**T**	**P**	
Departmental Core	Instrumentation & Metrology	BTAE 503	3	1	2	

Branch: Automobile Engineering, V Semester
Course: BTAE 503 Instrumentation & Metrology

Unit I
UNITS AND STANDARDS:
Fundamental units, supplementary units, derived units, Micrometer, Vernier type instruments, Comparators, Limits, Fits, Tolerences, Slip gauges, Ring gauges, Snap gauges, Go and No Go gauges.

Unit - II
SCREW THREAD AND GEAR MEASUREMENT:
Thread gauges, Three wire and two wire method of thread measurement, Gear tooth vernier caliper, Gear checking methods, Angle measurement, Vernier protractor, Sine bar, Spirit Level, Surface finish measurement.

Unit - III
PRESSURE MEASUREMENT:
Bourdon's pressure gauge, Diaphragms & Bellows as pressure sensors, Inductive, Resistive capacitive and piezo electric transducers for pressure measurement, Farnboro Engine indicator, ,High speed engine indicators using piezo electric transducers, low pressure measurement using Pirani gauge, Thermocouple thermal conductivity gauges.

Unit - IV
TEMPERATURE MEASUREMENT:
Physical change easuring thermometers, Liquid expansion, Vapour pressure and bimetal thermometers, Resistance thermometers and their measuring circuits, Thermistors, Thermocouple, Thermocouple laws, Different types of thermocouples, Optical pyrometers.

Unit - V
FLOW MEASUREMENT:
Orifice plate, venturimeter, Flow nozzles, Pitot tubes, Rotameters, Alcock viscous flow meters, Hot wire anemometers, Ultrasonic flowmeters.

Unit - VI
LOAD AND TORQUE MEASUREMENT:
Force measuring devices, Balances, Platform scale weight bridges, Load cell, Torque measurement, Prony brake, Water brake, Hydraulic dynamometers, Transmission Dynamometers, Chassis Dynamometers.

TEXT :

1. Patrnabis D. Principles of Industrial Instrumentation, Tata McGraw Hill, Publishing Co. New Delhi.

REFERENCE BOOKS :

1. Rangan, Sarma & Mani, Instrumentation Devices and Systems, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

2. Beckwith, T.G. & Buck, N.L. Mechanical Measurements, Oxfor and IBH Publishing House, New Delhi.

3. Judge, A. W. Engineering Precision Measurements, Chapman & Hall Ltd. 37,Essex Street, W.C.2.

4 Jain.R.K. Mechanical & Industrial Measurements, Khanna Publishers, New Delhi.

Course Contents

Category of Course	Course Title	Course Code	Credits-6C			Theory Papers (ES)
			L	T	P	
Departmental Core	Production Technology	**BTAE 505**	3	1	2	

Branch: Automobile Engineering, V Semester
Course: BTAE 505 Production Technology

Unit I
THEORY OF METAL CUTTING:
Cutting forces, Chip formation and types, tool wear and life, tool materials, cutting fluids, machinability index.

Unit -II

ADVANCE WELDING PROCESSES:
Tungsten inert gas welding, MIG welding, Submerge arc welding, Friction and electro slag welding, Electron beam welding, Laser welding.

Unit -III

CONVENTIONAL MACHINING:
General principles (with schematic diagrams only) of working, Types and commonly performed operations in the following Machines: Lathe, Shaper, Planner, Milling Machine and Gear cutting Grinding Machine, Concept of NC Machines.

Unit-IV

UNCONVENTlONAL MACHINING PROCESSES:

Need for unconventional machining processes - classification - Principles (with

schematic diagrams only) and applications of the following processes:
Abrasive Jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Electro chemical grinding, Chemical machining, Laser beam machining, Electron beam machining, Plasma arc machining.

Unit - V

METAL FORMING AND POWDER METALLURGY:
Basic concepts and classification of fonning processes, Principles, Equipment used and application of following processes: Forging, Rolling, Extrusion, Wire drawing, Deep drawing, Spinning- Powder metallurgy- Procedural steps involved, merits and lirnitations,Applications.

REFERENCES~~

1. Choudhary, H. Elements of workshop technology, Vol-I, Vol-II
2. Pandey, P.C. & Shah, H.S. Modern Machining Processes, Tata Mcgraw Hill Publication.
3. Ghosh, R. & Mallik,A.K. Manufacturing Sciences.
4. Jain, R.K. Production Technology
5. Martin, S.J. Numerical Control of Machine Tools, The English Language Book Society, London.
6. Richard L. Little, Welding & Welding Technology, Tata McGraw Hill

VI Sem

Course Contents

Category of Course	Course Title	Course Code	Credits- 4			Theory Papers (ES)
			L	T	P	
Automobile Engineering	Automotive Chassis – I	**BTAE 601**	3	1	0	

Branch: Automobile Engineering IV semester
Course: BTAE 601 Automotive Chassis - I

Unit I

Introduction:

Types of chassis layout with reference to power plant locations and drive. Vehicle frames. Various types of frames. Constructional details. Materials. Testing of vehicle frames. Unitised frame body construction; Loads acting on vehicle frame.

Unit II

Front Axle and Steering System:

Types of front axles, Construction details, Materials, Front wheel geometry viz. Castor. Camber, King and pin inclination, Toe-in Conditions for true rolling motion of wheels during steering. Steering geometry, Ackermans and Davis Steering System. Constructional details of steering linkages, Different types of steering gear boxes, Steering linkages and layouts, Power and power assisted steering.

Unit III

Drive Line:

Effect of driving thrust and torque reactions, Hotch Kiss drive, torque tube drive and radius rods, Propeller shaft, Universal Joints, Constant velocity universal joints, Front wheel drive.

Unit IV

Final Drive Differential:

Different types of final drive. Worm wheel, straight bevel gear, Spiral bevel gear and hypoid gear final drives. Double reduction and twin speed final drives. Differential Principles, Construction details of differential Unit, Non- slip differential, Differential locks, Differential housings.

Unit V

Real Axles:

Construction of rear axles, Types of loads acting on rear axles, Full floating, Three quarter floating and semifloating rear axles, Rear axle housing, Construction of different types of axle housings: Multi axled vehicles. Construction details of multi drive axle vehicle.

Text : Heldt, P.M. Automotive chassis, Chilton Co., New York, 1990

Reference Books:

1. Steed, W. Mechanics of Road vehicles, Llliffe Books Ltd., London, 1960
2. Newton, Steeds & Garrot, Motor Vehicles, Butter worths., London, 1983
3. Judge, A.W. Mechanism of the car, Chapman and Halls Ltd., London, 1986
4. Giles, J.G. Steering, Suspension and tyres, Llliffe Book Co., London, 1988
5. Kripal Sing, Automobile Engineering. Standard Publishing Distributor. New Delhi, 1983

Note: Practical of the subject will be based on above contents

Course Contents

Category of Course	Course Title	Course Code	Credits- 4			Theory Papers (ES)
Automobile Engineering	Automotive Air Conditioning	BTAE 603	*L*	**T**	**P**	
			3	1	0	

Branch: Automobile Engineering VI semester
Course: BTAE 603 Automotive Air Conditioning

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 conditioners – heater systems – Ford automatically controlled air conditioners & heater systems – automatic temperature control – air conditioning protection – engine protection.

Unit III

Refrigerant:

Containers – Handling Refrigerant – Tapping into refrigerant container – refrigeration system diagnosis – diagnostic procedure – ambient conditions affecting system pressure.

Unit IV

Air Routing and Temperature Control:

Objective – Evaporator care airglow – through – the Dash Re-circulating Unit – Automatic temperature control – Duct system-controlling controlling flow – vacuum reserve – testing the air control & handling system.

Unit V

Air Conditioning Servicing:

Air conditioning maintenance & service – servicing heater system removing & replacing components – Troubleshooting of Air conditioning systems – compressor service.

Text

1. William H. Crouse & D.L. Anglin, Automotive air Conditioning, McGraw Hill, Inc.

Reference:

1. Mitchell Information services, Inc., Mitchell automatic heating & air conditioning systems, Prentice – Hall, Inc.

2. Paul Weisler, Automotive air conditioning, Reston Publishing Co. Inc.

Course Contents

Category of Course	Course Title	Course Code	Credits- 6			Theory Papers (ES)
			L	**T**	**P**	
Automobile Engineering	Automotive Design	BTAE 604	3	1	2	

Branch: Automobile Engineering VI semester
Course: BTAE 604 Automotive Design

Unit I

Introduction:

Auto Design: Definition, Various aspects, Classification, Requirements, general Procedure of design.

Unit II

Design of Engine Parts:

Design of Piston ring, Piston Pin – Crank shaft, crank pin – Constructing Rod small end & big end.

Unit III

Clutches:

Types of friction clutches, Requirement of clutch. Design the equation for the power transmitted through single plate & Multi plate clutch for (a) Uniform wear (b) Uniform pressure. Design for Dimensions of clutch. Equation of centrifugal clutch.

Unit IV

Frame:

Shear force & bending Moment diagrams for Different types of frames.

Unit V

Front Axle:

Design of front axle Beam

Unit VI

Suspension Springs:

Types of suspension system, Types of suspension springs, Design of leaf spring, Coil spring.

Text

1. Heldt, P.M., Automotive Chassis, Chilton Book Co.

Reference:

3. Heldt, P.M. Torque Converters, Chilton Book Co.
4. Dean Averns, Automobile Chassis Design, Illiffe Book Co.
5. Giri, N.K. Automobile Mechanics, Khanna Publishers, New Delhi.

Course Contents

Category of Course	Course Title	Course Code	Credits- 6			Theory Papers (ES)
Automobile Engineering	Automotive Electrical & Electronics	BTAE 602	*L*	**T**	**P**	
			3	1	2	

Branch: Automobile Engineering VI semester
Course: BTAE 602 Automotive Electrical & Electronics

Unit I

Storage Batteries:
Principles, Construction & operation of Lead Acid Battery, Capacity, Efficiency, Rating of battery, Determination of size Electrolyte, test on Batteries, Charging methods, Battery Faults.

Unit II

Starter & charging System:
Requirements of stating system, Characteristics of starter motor, types of starting motor drive mechanisms, starter switch, Starting system faults. Working principle of DC generator & AC alternator, Armature reaction, cut-out, voltage & current regulator systems.

Unit III

Auxiliary Systems:
Lightening systems such as Head light, tails Ligths, Trafficator lights, Principle of Automobile illumination, speedometer, Electric Horn, Wind screen Wipers, Signaling device, Different type of gauges.

Unit IV

Engine Vehicle Sensors:
Introduction, Basic sensors arrangements, types of sensors such as oxygen sensors, Fuel metering/ Vehicle speed sensors & detonation sensors.

Unit V

Electronic Fuel Injection System :
Introduction, Fuel Back Carburetor system,(FBC), Trouble Body injection & multiport or point fuel injection, Robert Bosch, Gasoline Fuel Injection system, Ford Electronic Gasoline Fuel Injection system, Injection system controls.

Unit VI

Electronic Ignition System:
Advantages of electronic ignition systems, Types of solid state ignition system & their principle of operations, Contact less electronic ignition system, Electronic spark timing – control.

Unit VII

Microprocessors:

Architecture Intel 8085, Instruction set, Assembly Language Programming, Data Transfer Schemes, Interfacing devices, Automotive applications, Development of high speed, High precision learning control system for the engine control.

Text

1. Judge, A.W. Modern Electrical Equipment of Automobiles, Chapman and Hall, London

Reference:

6. Young A.P. and Griffiths, L., Automobile Electrical Equipment, English Language Book Society and New Press.
7. Course, W.H. Automobile Electrical Equipment, McGraw Hill Book Co., Inc., New York.
8. Robert N. Brady, Automotive Computers and Digital Instrumentation, A Reston Book, Prentice Hall, Eagle Wood Cliffs, New Jersey.

Course Contents

Category of Course	Course Title	Course Code	Credits- 6			Theory Papers (ES)
Automobile Engineering	Vehicle Body Engineering	BTAE 605	L	T	P	
			3	1	2	

Branch: Automobile Engineering VI semester
Course: BTAE 605 Vehicle Body Engineering

Unit I

Car Body Details:

Types: Saloon, Convertibles, Limousine, Estate Van, Racing & Sports Car Visibility, Regulation, driver's visibility, test for visibility – method of improving visibility & space in cars – safety design equipments for car. Car body construction.

Unit II

Vehicle Aerodynamics:

Objectives – Vehicles drag and types – various types of forces & moments – effect of force & moments – side wind effects on force & moments – various body optimization, technique for minimum drag- Wind tunnel testing: flow visualization techniques, Scale model testing, component balance to measure force & moments.

Unit III

Bus Body Details:

Types: Mini bus, Single Decker, Double Decker, Spirit Level & Articirculated bus- bus body Layout – floor height – Engine location – Entrance & Exit location - Sitting dimensions – Construction details: Frame construction, Double skin construction - Types metals sections used – Regulation – Conventional & integral type construction.

Unit IV

Commercial Vehicle Details:

Types of body: Flat plateform, Drop side, Fixed Side, Tipper body, tanker body – light commercial vehicle body types – dimension of driver seat in relation to control – Driver's cab design.

Unit V

Body Materials, Trim & Mechanism:

Steel sheet, timber, plastic, GRP, Properties of materials – corrosion – anticorrosion methods – scalation of paint & painting process – Body trim items – body mechanisms.

Unit VI

Body Loads:

Idealized structure – Structural surface – shear panel method – Symmetric & assymetrical vertical loads in a car – longitudinal loads – Different Loading situations.

Text:

1. Powloski, J., Vehicle Body Engg. Business books Ltd.

Reference:

9. Giles J.C. Body construction & Design, lliffe books, Butter worth & Co.

VII Sem

Course: BTAE 704 Total Quality Management

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDIT-4C			THEORY PAPER
			L	T	P	
Departmental Electives	Total Quality Management	***BTAE 704***	3	1	0	

COURSE CONTENTS

Unit-I

Quality Concepts And Management

Evolution of quality control, Quality journey : Inspection to TQM, Quality of design, conformance, performance, functions, Global scenario, concept of Quality costs.

Unit-II

Standardization and Quality Assurance

Quality assurance: Concept, need; ISO 9000 systems, ISO 14000; Quality audit, documentation.

Unit-III

Statistical Quality Control

Basic statistical concepts, Probability distribution-Binomial, Poisson and Normal, control chars for variables and attributes, CUSUM charts, Multivariate charts, Process capability, Tolerances and selective assembly, Acceptance sampling.

Unit-IV

Diagnosis and Prevention of Defects

Defect study, Identification and analysis of defects, Corrective measure, Factors affecting reliability, MTBF, MTTR, Calculation of reliability, Building reliability in the product, Evaluation of reliability, Interpretation of test results, Reliability control, Maintainability, FMEA, Guarantee, Warrantee and claims.

Unit-V

Quality Awards

Break through in quality management, Quality gurus: Deming, Crosby, Ishikawa, Juran etc., Seven quality tools, Quality circle, Kaizen, Concepts of poka yoke, 5 S campaign, Six sigma, Qquality function deployment, Benchmarking, National quality award model;

Malcom Balbridge, National Quality Awards , Quality in service sector, Administration etc., Case Studies.

References:

- Lt. Gen. H. Lal, “Total Quality Management”, Wiley Eastern Limited.
- Greg Bounds, : Beyond Total Quality Management”, McGraw Hill.
- Besterfield, Total Quality Management, Pearson Education, Asia.
- Menon, H.G., “TQM in New Product Manufacturing”, McGraw Hill.
- Mitra, Total Quality Control, Pearson Publication.
- Quality assurance and TQM by K.C. Jain and A.K. Chitale.

Course Contents

Category of Course	Course Title	Course Code	Credits-6C			Theory Papers (ES)
Departmental Core	Automotive Chassis - II	BTAE 701	**L**	**T**	**P**	
			3	1	2	

Branch: Automobile Engineering, V Semester
Course: BTAE 701 Automotive Chassis - II

Unit I
VEHICLE SUSPENSION SYSTEM:
Need of suspension system. Types of suspension. Factors influencing ride comfort. Suspension springs. Constructional details & characteristics of leaf spring, Coil Springs & Torsion bar spring used for suspension. Spring materials. Independent suspension. Rubber suspension, Pneumatic suspension. Closed loop suspension system. Shock absorbers. Liquid filled, Gas filled absorbers.

Unit-II
BRAKING SYSTEM:
Classification of brakes: Principle of drum brakes. Constructional details. Materials, braking torque by leading & trailing shoes. Disc brake theory. Constructional details. Brake actuating systems. Mechanical, hydraulic, pneumatic brakes. Factors affecting brake performance. Operating temperature, area of brake lining, clearance. Exhaust brakes. Vaccum brakes, power & power assisted brakes.

Unit- III
RETARDERS & BRAKE PERFORMANCE EVALUATIONS:
Eddy current retarders, permanent magnet retarders, hydraulic retarders. Hill holding devices: testing of brakes, road test, garage test & laboratory test.

Unit- IV
WHEELS & TYRES:
Types of wheels, construction of wheel assembly. Spoked wheel, disc wheel & built up wheel. Tubes of tyres and their constructional details. Static & rolling

properties of pneumatic tyres. Wheel balancing: tyre rotation. Types of tyre wear and their causes.

Unit-V

AUTOMOTIVE BEARING AND CHASIS LUBRICATION:

Bearings: bush, shell, and anti friction bearings. Ball & roller bearings. Thrust bearings and radial bearings. Types of lubricants: liquid, gaseous and solid lubricants. Properties of lubricants- grease lubrication.

TEXT

1. Heldt, P.M. Automotive chassis, Chilton co., New York

REFERENCES

1. Steed, W.,Mechanics of Road vehicles, llliffe Books Ltd., London.
2. Newton, Steeds & Garrot, Motor Vehicles, Butterworths, London.
3. Judge, A.W., Mechanism of the car., Chapman and Hall Ltd. London.
4. Giles, J.G., Steering, Suspension and tyres, llliffe book Co. London.
5. Kripal Singh, Automobile Engineering, Standard Publishing Distributor, New Delhi.
6. Narang, G.B.S., Automobile Engineering, Khanna Publishers, New Delhi.
7. William Crouse, Automotive Mechanics, McGraw Hill publishers.
8. George Wills, J., Lubrication Fundamentals, Marcel Dekker Inc., Newyork.

Course: BTAE 702 CAD/CAM

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 6C			THEORY PAPERS
			L	T	P	
Departmental Core	CAD/CAM	BTAE 702	3	1	2	

COURSE CONTENTS

Unit-I

Introduction: An overview of CAD-Computer Fundaments, Classification of computer-Data communication - Configuration of computer system for design, design work stations. Interactive display device input devices, Output devices, Computer software.

Unit-II

CAD/CAM definitions, the product cycle and CAD/CAM automation and CAD/CAM computer technology. Computer configuration for CAD applications. Three dimensional transformations and projections. Solid modeling-Representation of 3D objects.

Unit-III

Fundamentals of CAD, CAD hardware, Computer graphics software and data base introduction to auto CAD, Drawing commands in Auto CAD- working with different units and grids, Isometric view-Working with modify commands Hatching and dimensioning and drawing, Working with texts, Drawing and objects.

Unit-IV

Design of automobile engine parts such as piston. Piston ring, Piston pin, Connecting rods, Engine cylinders, Crankshafts, Gears with the help of Auto CAD.

Unit-V

Conventional Numerical control-Developments in CNC controllers and machine tool Robots-FMS design, Simulation and control methods. Part programming through Numerical control computer controls in Numeric Control, Introduction to CIM.

References:

- Radhakrishnan, P. and Kothandarman, C.P. Computer Graphics and Design, Dhanpat Rai and Sons, New Delhi.
- D. Radhakrishnan., CAD/CAM/CIM.
- V. Ramamurthi, V., Computer Aided Design in Mechanical Engineering, TMH.

Course: BTAE 703 Combustion and Heat Transfer

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 6C			THEORY PAPERS
			L	T	P	
Departmental Core	Combustion and Heat Transfer	BTAE 703	3	1	2	

COURSE CONTENTS

Unit-I

Combustion

Combustion phenomena of S.I. and C.I. engines, Stages of combustion-Photographic studies of combustion process- p-q diagrams in S.I. and CI engines. Abnormal combustion-Effect of engine variables on knock-Factors controlling combustion chamber design. Combustion chambers: Diesel engine combustion chambers open, Divided, Swirl, Turbulent and Ricardo's M Combustion chambers.

Unit-II

Heat Transfer in IC engines

Heat transfer, Temperature distribution and thermal stress in Piston, Cylinder Liner, cylinder head, Fins and valves. Variation of gas temperatures, Heat transfer coefficient and combustion system-Effect of engine load on piston temperature heat rejected to coolant quantity of water required.

Unit-III

Measurements

Flow meters-Volumetric type, gravimetric type-fuel consumption measurement in vehicles-Air consumption: Air box method, Viscous air flow meter. Flame temperature measurement and pressure measurement.

Unit-IV

Introduction to heat transfer

Temperature, Heat and thermal equilibrium, Modes of basic laws of heat transfer i.e. conduction, Convection and Radiations. Fourier equation and Thermal Conductivity, Derivation of the general form of heat conduction equation in Cartesian, Cylindrical Spherical Co-ordinates.

Unit-V

Conduction Heat Transfer

Steady State Conduction, Heat conduction through plane wall, Composite wall, Cylindrical wall, Multi layer cylindrical wall, and through spheres. Effect of variable conductivity, Critical thickness of Insulation.

Conduction with heat generation, plane wall with uniform heat generation, Dielectric heating, Cylinder with uniform heat generation, Heat transfer through Piston crown. Heat transfer from extended surface, steady flow of heat along a rod, Governing differential equation and its solution, Heat dissipation from and infinitely long fin, Fin performance.

Unit-VI

Convection Heat Transfer

Free and forced convection, Laminar and Turbulent flow, Newton-Rekhman Law: Convection rate equation, Nusselt Number.

Radiation heat exchanger

Salient features and characteristics of radiation, Absorptive, reflectivity and transmissivity. Spectral and spatial energy distribution, Wavelength distribution of black body radiation, plank's Law. Total emissive power: Stefan Boltzman Law, Wien's displacement law, Kirchoffs Law, Gray body and selective emitters, intensity of radiation and Lambert's Cosine Law.

References:

- Arora and Domkundwar, Heat and Mass Transfer
- D.S. Kumar, Heat and Mass Transfer.
- Frank Kreith, Heat Transfer
- P.M. Heldt, Internal combustion engines.
- V. Ganeshan Internal combustion engines.
- Eckert and Drake, Introduction to heat transfer.
- Jakob and Hawkins, Elements of Heat Transfer
- Holman, Heat Transfer
- S.P. Sukhatme, Heat Transfer
- Kothandaraman, Heat Transfer Data Handbook.

Course: BTAE 705 Vehicle Vibration & Noise Control

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 6C			THEORY PAPERS
			L	T	P	
Departmental Core	Vehicle Vibration & Noise Control	BTAE 705	3	1	2	

COURSE CONTENTS

Unit-I

Undamped free vibration

Introduction, Single degree of freedom System, Undamped free vibration, Natural frequency of free vibration. Raleigh Method stiffness of spring elements, Effect of Spring mass.

Unit-II

Damped Free Vibration

Introduction, Single degree of freedom system, Different type of damping. Concepts of critical damping and its importance, response study of viscous damped system for case of under damping. Critical damping and over damping Logarithmic decrement.

Unit-III

Forced Vibrations

Single degree of freedom system, Steady state solution with viscous damping due to harmonic force. Solution by complex algebra, Concept of response reciprocating and rotating unbalance vibration Isolation, Transmissibility ration, Energy dissipated by damping, Equivalent viscous damping, Structural damping, Sharpness of resonance, Base excitation.

Vibration measuring instruments, Accelerometer and vibrometer, Whirling of shafts with and without damping, discussion of speeds above and below critical speeds.

Unit-IV

System with Two degree of freedom System

Introduction, Principle modes and normal modes coordinate coupling, generalized and principle coordinates. Free vibrations in terms of initial conditions, geared systems.

Forced oscillations- Harmonic excitation. Applications-Vehicle suspension. Dynamic vibration absorber, Dynamics of reciprocating engines.

Unit-V

Continuous Systems

Introduction, Vibration of spring, Longitudinal vibrations of rods, Torsional vibrations of rods, Euler equations for beams, Simple problems.

Unit-VI

Noise Control

Noise and Noise Control-Sound, Noise Decibel scale, Pressure and density level, addition of levels, Overall Noise from different frequency Ranges, Sound Level meters, Perceived Noise level, Traffic Noise Index, NC curves, Building Acoustics, Effect of Noise on people, Noise reduction, Noise due to industrial equipments, Important I.S. Codes related to Noise.

References:

- Prof. G.K. Grover, Mechanical Vibration
- V.P. Singh, Mechanical Vibrations.
- Kewal Pujara, Vibration and Noise for engineers
- William I Thomson, Vibration Theory and Application.
- William. W. Theory and Problems of Mechanical Vibration, Schaum's Outline Series.
- Timeshenko, Vibration Problems in Engineering
- Church, Mechanical Vibrations
- Den Hartog, Mechanical Vibrations.

VIII Sem

Course: BTAE 802 Road Transportation & Economics

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 4C			THEORY PAPERS
			L	T	P	
Departmental Elective	Road Transportation & Economics	BTAE 802	3	1	0	.

COURSE CONTENTS

Unit-I

Signification of Road Transportation- Road transportation as an agent of change and development, the national scene, transport policy and co-ordination.

Operating characteristics in transportation, Engineering flexibility, speed and acceleration, dependability and safety, performance criteria etc.

Transportation planning : Need, Steps, Guiding principles.

Transport terminology- Important terms used in road, transportation like HMV, LMV, Fleet utilization, vehicle utilization, break down rate, accident rate, route, seat kilometer, load factor,

Unit-II

Cost of service – Capital costs and operating costs, fixed cost and variable cost, Direct and indirect costs, variable cost and variable cost carriers, excess capacity and effect on routes.

Infrastructure in road transportation organisation : Garages, essential requirement of garages, fleet maintenance, staffing general layout of a garage, vehicle maintenance records, bust station, bus shelter, bus stops, essential requirements staffing, Management of transport organisation, its objectives, organisation all structure, motivation.

Unit-III

Operational productivity and efficiency – Productivity in road transportation orgainsations, the environment of a road transport system, optimizing fleet and vehicle utilization, conservation of fuel and oil economy, control of breakdowns, effective traffic operations.

Vehicle legislation in India and abroad- Introduction to Motor vehicle act 1989, national and international safety standards regarding automobile emission, noise brakes, drivers restraints, crash test, energy absorbing bumpers, lighting visibility.

Road safety and health, Driving and age, driving in comfort, avoiding fatigue, the road to exhaustation, poisonous car fumes, car sickness, drugs and driving first aid for motorist, first aid kits, braking and stopping, interpreting the signs, rain, floods, fog, mist-care and precautions, ice, snow skidding, emergencies and road observations.

Unit-IV

Accidents-Definition of accident, legal obligation, causes of road accidents, analysis and prevention of road accidents, insurance documentation and investigation, road safety and driver's role, a defensive driver, driver selection test and driver's training.

Security devices- Seat belts, Child's safety chair, carrycot restraint, dog restraint, fog rear guard lamp, reversing light, bonnet and brake locks, vibrator alarm, fog lamps and tyre chains, demisters, tow-bar, roof racks and luggage containers, emergency equipments, auxiliary instruments.

Unit-V

Future requirements of road transportation-Future requirements of national road transportation development, fund raising, road improvement and fuel consumption saving, remedial measures to road transportation problems, fuel conservation and alternate fuels, hybrid vehicle, intermediate public transport (IPT), Urban transport development, environmental impact, planning perspectives for tomorrow.

References:

- P.G. Patankar, Road Passenger transport in India, CIRT Publication
- Santosh Sharma, Productivity in road transportation, (ASRTV Publication)
- Motor Vehicle Act, 1989.

- Compendum of Transport terms, CIRT, Pune.
- Kitchin, L.D., Bus Operation, Illiffe and sons Ltd., London.
- Kandiyali L.R. Traffic Engineering and Transport Planning.

Course: BTAE 803 Alternative Fuels and Automotive Pollution Control

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 4C			THEORY PAPERS
			L	T	P	
Departmental Elective	Alternative Fuels and Automotive Pollution Control	BTAE 803	3	1	0	

COURSE CONTENTS

Unit-I

Introduction about the alternate fuels and renewable sources of energy in automobile field- availabilities, Storage, Handling and Safety aspects- Costs and other factors.

Unit-II

Alternate Fuels:

Alcohols-CNG-LPG vegetable oils- Hydrogen and Biogas properties performance and Emission characteristics. Solid fuels coal and wood Ash fusibility test.

Modification requited use of Alternate fuels in SI and CI engines- Combustion equation. Conversion of gravimetric to volumetric analysis flue gas analysis.

Unit-III

Renewable sources of energies

Introduction about the solar energy collectors- Concentrating, Flat plate collectors- application wind energy-Bio energy, Geo thermal energy- Chemical energy: Fuel cells, Batteries. Hydrogen energies- Energy conservations in sterling and heat pumps.

Unit-IV

Pollutants

Pollutants- Sources of SI and CI Engines, Tow Stroke (SI and CI) engine pollution formation. Indian Emission Standards for SI and CI engines- European Emission Standards Comparison with alternate fuel emissions.

Unit-V

Pollution control Techniques

Control Techniques and Test procedures, Optimization of operating factor-EGR-Fumigation-Air injection-PCV system (opens Closed) Catalytic Converters-Catalyst use of unleaded petrol. Gas Analyzers-Different Smoke meters-Different test methods.

Electric Vehicles

Simple layout-Traction batteries-Re Charging methods-rating pollution factors, Fuel Cells.

References:

- V. Ganesan, Internal Combustion Engines.
- P.M. Held, High speed Combustion Engines
- Alcohols as Motor Fuels.
- GD Rai, Non Conventional sources of Energy.

- PM Heldt., Internal Combustion Engines.
- E.F. Obert, Internal Combustion Engines.
- SAE Transaction-Vehicle emission.
- John. H. Jhonson, Diesel Particulate Emissions Landmark Research