UNIVERSITY DEPARTEMENTS

ANNA UNIVERSITY :: CHENNAI 600 025

REGULATIONS - 2013

M.E AUTOMOBILE ENGINEERING (FT & PT)

I TO IV SEMESTERS CURRICULUM AND SYLLABUS

SEMESTER I

SL. NO	CODE	COURSE TITLE	L	T	P	C
THEORY						
1	AM8101	Automotive Chassis	3	1	0	4
2	AM8102	Automotive Engines and Subsystems	3	0	0	3
3	AM8103	Automotive Transmission	3	0	0	3
4	MA8155	Advanced Numerical Methods	3	1	0	4
5		Elective I	3	0	0	3
6		Elective II	3	0	0	3
PRACTICAL						
7	AM8111	Engine and Chassis Laboratory	0	0	3	2
		TOTAL	**18**	**2**	**3**	**22**

SEMESTER II

SL. NO	CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	AM8201	Automotive Electrical and Electronics	3	0	0	3
2.	AM8202	Automotive Pollution and Control	3	0	0	3
3.	AM8203	Vehicle Body Engineering	3	0	0	3
4.	AM8254	Vehicle Dynamics	3	0	0	3
5		Elective III	3	0	0	3
6		Elective IV	3	0	0	3
PRACTICAL						
7	AM8211	Automotive Electrical and Electronics Laboratory	0	0	3	2
		TOTAL	**18**	**0**	**3**	**20**

SEMESTER III

SL. NO	CODE	COURSE TITLE	L	T	P	C
THEORY						
1	AM8301	Engine Management Systems	3	0	0	3
2		Elective V	3	0	0	3
3		Elective VI	3	0	0	3
PRACTICAL						
4	AM8311	Computer aided Vehicle Design Laboratory	0	0	3	2
5	AM8312	Project Work Phase I	0	0	12	6
		TOTAL	**9**	**0**	**15**	**17**

SEMESTER IV

SL. NO	CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	AM8411	Project Work Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF DEGREE = 71

ELECTIVES FOR M.E. AUTOMOBILE

SL. NO	CODE	COURSE TITLE	L	T	P	C
1	AM8001	Advanced Thermodynamics for Automobile Engineers	3	0	0	3
2	AM8002	Alternative Fuels and Propulsion Systems	3	0	0	3
3	AM8003	Automotive Aerodynamics	3	0	0	3
4	AM8004	Automotive Air Conditioning Systems	3	0	0	3
5	AM8005	Automotive Safety	3	0	0	3
6	AM8006	Combustion Thermodynamics and Heat Transfer	3	0	0	3
7	AM8007	Electric and Hybrid Vehicles	3	0	0	3
8	AM8008	Finite Element Methods in Automobile Engineering	3	0	0	3
9	AM8009	Hydraulic and Pneumatic Systems	3	0	0	3
10	AM8010	IC Engine process Modeling	3	0	0	3
11	AM8011	Instrumentation and Experimental Techniques	3	0	0	3
12	AM8012	Novel Materials in Automobile Technology	3	0	0	3
13	AM8013	Production of Automobile Components	3	0	0	3
14	AM8014	Simulation of Vehicle systems	3	0	0	3
15	AM8015	Special Types of Vehicles	3	0	0	3
16	AM8016	Theory of Fuels and Lubricants	3	0	0	3
17	AM8017	Two and Three Wheelers	3	0	0	3
18	AM8018	Vehicle Control Systems	3	0	0	3
19	AM8019	Vehicle maintenance	3	0	0	3

UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY :: CHENNAI 600 025

REGULATIONS - 2013

CURRICULUM I TO VI SEMESTERS (PART TIME)

M.E. AUTOMOBILE ENGINEERING

SEMESTER I

SL. NO	CODE	COURSE TITLE	L	T	P	C
THEORY						
1	MA8155	Advanced Numerical Methods	3	1	0	4
2	AM8101	Automotive Chassis	3	1	0	4
3	AM8102	Automotive Engines and Subsystems	3	0	0	3
PRACTICAL						
4	AM8111	Engine and Chassis Laboratory	0	0	3	2
		TOTAL	**9**	**2**	**3**	**13**

SEMESTER II

SL. NO	CODE	COURSE TITLE	L	T	P	C
THEORY						
1	AM8254	Vehicle Dynamics	3	0	0	3
2	AM8201	Automotive Electrical and Electronics	3	0	0	3
3	AM8202	Automotive Pollution and Control	3	0	0	3
PRACTICAL						
4	AM8211	Automotive Electrical and Electronics Laboratory	0	0	3	2
		TOTAL	**9**	**0**	**3**	**11**

SEMESTER III

SL. NO	CODE	COURSE TITLE	L	T	P	C
THEORY						
1	AM8103	Automotive Transmission	3	0	0	3
2		Elective I	3	0	0	3
3		Elective II	3	0	0	3
PRACTICAL						
4	AM8311	Computer Aided Vehicle Design Laboratory	0	0	3	2
		TOTAL	**9**	**0**	**3**	**11**

SEMESTER IV

SL. NO	CODE	COURSE TITLE	L	T	P	C
THEORY						
1	AM8203	Vehicle Body Engineering	3	0	0	3
2		Elective III	3	0	0	3
3		Elective IV	3	0	0	3
		TOTAL	**9**	**0**	**3**	**9**

SEMESTER V

SL. NO	CODE	COURSE TITLE	L	T	P	C
THEORY						
1	AM8301	Engine Management Systems	3	0	0	3
2		Elective V	3	0	0	3
3		Elective VI	3	0	0	3
PRACTICAL						
4	AM8312	Project Work Phase I	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SEMESTER VI

SL. NO	CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	AM8411	Project Work Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF DEGREE = 71

ELECTIVES FOR M.E. AUTOMOBILE

SL. NO	CODE	COURSE TITLE	L	T	P	C
1	AM8001	Advanced Thermodynamics for Automobile Engineers	3	0	0	3
2	AM8002	Alternative Fuels and Propulsion Systems	3	0	0	3
3	AM8003	Automotive Aerodynamics	3	0	0	3
4	AM8004	Automotive Air Conditioning Systems	3	0	0	3
5	AM8005	Automotive Safety	3	0	0	3
6	AM8006	Combustion Thermodynamics and Heat Transfer	3	0	0	3
7	AM8007	Electric and Hybrid Vehicles	3	0	0	3
8	AM8008	Finite Element Methods in Automobile Engineering	3	0	0	3
9	AM8009	Hydraulic and Pneumatic Systems	3	0	0	3
10	AM8010	IC Engine process Modeling	3	0	0	3
11	AM8011	Instrumentation and Experimental Techniques	3	0	0	3
12	AM8012	Novel Materials in Automobile Technology	3	0	0	3
13	AM8013	Production of Automobile Components	3	0	0	3
14	AM8014	Simulation of Vehicle systems	3	0	0	3
15	AM8015	Special Types of Vehicles	3	0	0	3
16	AM8016	Theory of Fuels and Lubricants	3	0	0	3
17	AM8017	Two and Three Wheelers	3	0	0	3
18	AM8018	Vehicle Control Systems	3	0	0	3
19	AM8019	Vehicle maintenance	3	0	0	3

MA8155 ADVANCED NUMERICAL METHODS L T P C
3 1 0 4

OBJECTIVE:

- To impart knowledge on numerical methods that will come in handy to solve numerically the problems that arise in engineering and technology. This will also serve as a precursor for future research.

OUTCOME:

- It helps the students to get familiarized with the numerical methods which are necessary to solve numerically the problems that arise in engineering.

UNIT I ALGEBRAIC EQUATIONS (9+3)

Systems of linear equations: Gauss Elimination method, pivoting techniques, Thomas algorithm for tridiagonal system – Jacobi, Gauss Seidel, SOR iteration methods - Systems of nonlinear equations: Fixed point iterations, Newton Method, Eigenvalue problems: power method, inverse power method, Faddeev – Leverrier Method.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS (9+3)

Runge Kutta Methods for system of IVPs, numerical stability, Adams-Bashforth multistep method, solution of stiff ODEs, shooting method, BVP: Finite difference method, orthogonal collocation method, orthogonal collocation with finite element method, Galerkin finite element method.

UNIT III FINITE DIFFERENCE METHOD FOR TIME DEPENDENT PARTIAL DIFFERENTIAL EQUATION (9+3)

Parabolic equations: explicit and implicit finite difference methods, weighted average approximation - Dirichlet and Neumann conditions – Two dimensional parabolic equations – ADI method; First order hyperbolic equations – method of characteristics, different explicit and implicit methods; numerical stability analysis, method of lines – Wave equation: Explicit scheme- Stability of above schemes.

UNIT IV FINITE DIFFERENCE METHODS FOR ELLIPTIC EQUATIONS (9+3)

Laplace and Poisson's equations in a rectangular region: Five point finite difference schemes, Leibmann's iterative methods, Dirichlet and Neumann conditions – Laplace equation in polar coordinates: finite difference schemes – approximation of derivatives near a curved boundary while using a square mesh.

UNIT V FINITE ELEMENT METHOD (9+3)

Partial differential equations – Finite element method - orthogonal collocation method, orthogonal collocation with finite element method, Galerkin finite element method.

L:45 +T: 15 TOTAL: 60 PERIODS

BOOK FOR STUDY:

1. Saumyen Guha and Rajesh Srivastava, "Numerical methods for Engineering and Science", Oxford Higher Education, New Delhi, 2010.
2. Gupta S.K., "Numerical Methods for Engineers", New Age Publishers, 1995.
3. Burden, R.L., and Faires, J.D., "Numerical Analysis – Theory and Applications", Cengage Learning, India Edition, New Delhi, 2009
4. Jain M. K., Iyengar S. R., Kanchi M. B., Jain , "Computational Methods for Partial Differential Equations", New Age Publishers, 1993.
5. Morton K.W. and Mayers D.F., "Numerical solution of partial differential equations", Cambridge University press, Cambridge, 2002.

AM8101 AUTOMOTIVE CHASSIS L T P C
3 1 0 4

OBJECTIVE:

- Study of the Constructional details and Theory of important drive line, Structural, Steering, Braking and Suspension Systems of Automobiles.Problem–Solving in Steering Mechanism, Propeller Shaft, Braking and Suspension Systems are to be done.

UNIT I LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM 13

Basic construction of chassis, Types of Chassis layout, with reference to Power Plant location and drive, various, types of frames, Loads acting on vehicle frame, materials for frames, Testing of frames, Types of Front Axles and Stub Axles, Front Wheel Geometry – Castor, Camber, King Pin Inclination and Toe–in, Toe-out. Condition for True Rolling Motion. Ackerman's and Davis Steering Mechanisms, Steering Linkages, Different Types of Steering Gear boxes, Slip Angle, Over–Steer and Under–Steer, Reversible and Irreversible Steering, Power–Assisted Steering. Steering of Crawler Tractors.

UNIT II DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL 12

Driving Thrust and its effects, torque reactions and side thrust, Hotchkiss drive, torque tube drive, radius rods and stabilizers, transfer case, Propeller Shaft, Slip joints, Universal Joints, Constant Velocity Universal Joints, Final drive, types of final drive – Worm and Worm wheel, straight bevel gear, spiral bevel gear, helical gear and hypoid gear final drive. Double reduction and twin speed final drives, Differential principle. Constructional details of differential unit, Differential housings, Non–Slip differential, Differential locks, Final drive of Crawler Tractors.

UNIT III REAR AXLES, WHEELS, RIMS AND TYRES 11

Construction of rear axles, Types of Loads acting on rear axles, Full –Floating, Three–Quarter Floating and Semi–Floating Axles, Types, Multi axle vehicles. Constructional Details of Different Types of axle Housings, Wheels and Rims. Tyres – Types and constructional details.

UNIT IV SUSPENSION SYSTEM 12

Requirements of Suspension System, Types of Suspension – Constructional details and characteristics of Single Leaf, Multi–Leaf spring, Coil spring and Torsion bar, Rubber, Pneumatic and Hydro – elastic Suspension, Independent Suspension System, Shock Absorbers.

UNIT V BRAKE SYSTEM 12

Need for Brake system, Stopping Distance, Time and Braking Efficiency, Effect of Weight Transfer during Braking, Leading and Trailing Shoes, Braking Torque, Types and constructional details – Drum Brakes and disc brakes, Hydraulic Braking System, Mechanical Braking System, Pneumatic Braking System, Power–Assisted Braking System, Servo Brakes, Retarders, Anti–Lock Braking System.

TOTAL : 60 PERIODS

TEXT BOOKS

1. T. Kenneth Garrett, Kenneth Newton and William Steeds, "The Motor Vehicle" 13th Edition, Butterworth-Heinemann Limited**,** London, 2005.
2. Heinz Heisler, "Vehicle and Engine Technology", Second Edition, SAE, USA, 1999.
3. Kripal Singh, "Automobile Engineering (Volume - 1)", 12th Edition, Standard Publishers Distributors, 2011.

REFERENCES

1. Heldt P.M., "Automotive Chassis" Chilton Co., New York, 1952
2. R.K. Rajput, "A Text Book of Automobile Engineering", Laxmi Publications Private Limited, 2007
3. N.K. Giri, "Automotive Mechanics" Khanna Publishers, New Delhi, 2005.

AM8103 AUTOMOTIVE TRANSMISSION L T P C
3 0 0 3

OBJECTIVES:

The main objective of this course is to impart knowledge in automotive transmission. The detailed concept, construction and principle of operation of various types of mechanical transmission components, hydrodynamic devices, hydrostatic devisees and automatic transmission system will be taught to the students. The design of clutch and gearbox will also be introduce to the students. At the end of the course the students will have command over automotive transmission concepts and application.

UNIT I CLUTCH 9

Requirements of Transmission system. Clutches – Functions, Principle of operation and types – single plate, multi plate, diaphragm and overrunning clutches.

UNIT II GEAR BOX 9

Purpose of gear box. Construction and working principle of sliding, constant and synchromesh gear boxes. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & power and acceleration. Determination of gear box ratios for different vehicle applications.

UNIT III HYDRODYNAMIC TRANSMISSION 9

Fluid coupling – principles - Performance characteristics – advantages – limitations – drag torque – reduction of drag torque. Torque converter - principles - Performance characteristics – advantages – limitations – multi and poly stage torque converters.

UNIT IV AUTOMATIC TRANSMISSION 9

Introduction to epicycle gear trains - Ford – T model gear box, Wilson gear box- Cotal electric transmission. Chevrolet “Turboglide” transmission. – Hydraulic control systems of automatic transmission. Continuously Variable Transmission (CVT) – types – Operations.

UNIT V HYDROSTATIC DRIVE AND ELECTRIC DRIVE 9

Hydrostatic drive – various types of hydrostatic transmission – principle - Advantages and limitations. Comparison of hydrostatic transmission with hydrodynamic transmission. Construction and working principle of Janny hydrostatic drive. Electric drive- Principle of Early and modified Ward Leonard control system – advantages and limitations.

L : 45 TOTAL NUMBER OF PERIODS: 45

TEXTBOOK:

1. Heldt P.M, Torque Converters, Chilton Book Co., 1992.
2. T. Kenneth Garrett, Kenneth Newton and William Steeds, “The Motor Vehicle” 13th Edition, Butterworth-Heinemann Limited**,** London, 2005.

REFERENCES:

1. Heinz Heisler, “Advanced Vehicle Technology”, second edition, Butterworth – Heinemann, New York, 2002
2. Dr. N. K. Giri, “Automobile Mechanics”, Seventh reprint, Khanna Publishers, Delhi, 2005
3. James Larminie “Electric Vehicle Technology Explained”, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England

AM8102 AUTOMOTIVE ENGINES AND SUBSYSTEMS L T P C
3 0 0 3

AIM:

To impart the knowledge on basic concepts on Automotive Engines and its various sub components along with its functions.

OBJECTIVE:

The main objective of this course is to impart knowledge in automotive engine. The detailed concept, construction and principle of operation of engine and various engine components, combustion, cooling and lubrication systems will be taught to the students. At the end of the course the students will have command over automotive engines and the recent development in the area of engines.

UNIT I ENGINE BASIC THEORY 9

Engine types – otto, diesel, dual operating cycles - Engine design and operating parameters - Two and four stroke engines - Typical performance curves for automobile engines- two stroke engine - performance and pollution aspects.

UNIT II FUEL SUPPLY AND IGNITION SYSTEMS 9

Theory of carburetion and carburetors — Design aspects — Diesel fuel injection - pumps and injectors, Introduction to Petrol Injection system - conventional ignition systems, advance mechanisms.

UNIT III COOLING AND LUBRICATING SYSTEMS 9

Air cooling and water cooling – thermo syphon cooling, forced cooling systems. Fins and radiator - design aspects. Theory of lubrication — types of lubrication, splash lubrication system, petroil lubrication system, forced feed lubrication system.

UNIT IV AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS 9

Premixed combustion, diffused combustion, laminar and turbulent combustion of fuels in engines. Droplet combustion — combustion in SI and CI engines. - Cylinder pressure data and heat release analysis. Optimized design of combustion chambers. Supercharger and Turbochargers.

UNIT V NEW ENGINE TECHNOLOGY 9

Lean Burn engine – Different approaches to lean bum – LHR engine – Surface ignition concept – catalytic ignition – homogenous charge compression ignition – variable valve timing – Multi Port Injection System - Gasoline Direct Injection – Common Rail Direct Injection – Recent Trends.

TOTAL: 45 PERIODS

TEXTBOOK

1. J.B.Heywood, ‘Internal combustion engine Fundamentals’, McGraw Hill Book Co, 1989.
2. V.Ganesan, ‘Internal combustion Engines’, Tata McGraw Hill Book Co, Eighth Reprint, 2005.

REFERENCES:

1. Edward F.Obert, ‘Internal combustion engines and air pollution’ Harber and Row Publishers, 1973.
2. M.Khovakh, ’Motor Vehicle Engines’, Mir Publishers, Mascow,1976
3. W.H.Crouse and A.L.Anglin, ‘Automotive Emission control’, McGraw Hill Book Co, 1995.
4. G.S.Springer and A.J.Patterson, ’Engine emissions and pollutant formation’, plenum press, Newyork, 1985.
5. M. L. Mathur, R. P. Sharma, "Internal combustion engines", Dhanpat Rai Publication, 2005
6. William Crouse, Donald Anglin, "AUTOMOTIVE MECHANICS", Tata McGraw Hill Book Co, 2006

AM8111 ENGINE AND CHASSIS LABORATORY L T P C
0 0 3 2

OBJECTIVE:

The main objective of this course is to impart knowledge in the assembling and dismantling and study of different types of an engine and its various systems like steering system, transmission system, electrical system, ignition system, injection system, Braking system. At the end of the course the student will be well versed in the assembling and dismantling of any vehicles.

LIST OF EXPERIMENTS

1. Performance and emission Test of SI Engine.
2. Performance and emission Test of CI Engine.
3. Heat balance test on IC engines
4. Performance test on variable compression ratio multi fuel diesel engine.
5. Determination of in-cylinder pressure vs crank angle.
6. Study of chassis system, Chassis dynamometer.
7 Study of Wheel Alignment System
8. Assembling and dismantling of the following
    i. SI engine.
    ii. CI engine
    iii. V engine
    iv. Single plate, Diaphragm Clutch.
    v. Constant mesh, Sliding mesh gear box
    vi. Transfer case
    vii. Differential
    viii. Front axle, Rear axle
    ix. Brake system
    x. Steering system

TOTAL: 45 PERIODS

AM8254 VEHICLE DYNAMICS L T P C
3 0 0 3

UNIT I BASIS OF VIBRATION 9

Definitions, Modeling and Simulation, Global and Vehicle Coordinate System, Free, Forced, Undamped and Damped Vibration, Response Analysis of Single DOF, Two DOF, Multi DOF, Magnification factor, Transmissibility, Vibration absorber, Vibration measuring instruments, Torsional vibration, Critical speed. Modal analysis

UNIT II TYRES 9

Tyre forces and moments, Tyre structure, Longitudinal and Lateral force at various slip angles, rolling resistance, Tractive and cornering property of tyre. Performance of tyre on wet surface. Ride property of tyres. Magic formulae tyre model, Estimation of tyre road friction. Test on Various road surfaces. Tyre vibration.

UNIT III VERTICAL DYNAMICS 9

Human response to vibration, Sources of Vibration. Design, analysis and computer simulation of Passive, Semi-active and Active suspension using Quarter car, half car and full car model. Influence of suspension stiffness, suspension damping, and tyre stiffness. Control law for LQR, H-Infinite, Skyhook damping. Air suspension system and their properties.

UNIT IV LONGITUDINAL DYNAMICS AND CONTROL 9

Aerodynamic forces and moments. Equation of motion. Tyre forces, rolling resistance, Load distribution for three wheeler and four wheeler. Calculation of Maximum acceleration, Reaction forces for Different drives. Braking and Driving torque. Prediction of Vehicle performance. ABS, stability control, Traction control. Case Studies.

UNIT V LATERAL DYNAMICS 9

Steady state handling characteristics. Steady state response to steering input. Testing of handling characteristics. Transient response characteristics, Direction control of vehicles. Roll center, Roll axis, Vehicle under side forces. Stability of vehicle on banked road and during turn. Effect of suspension on cornering.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Singiresu S. Rao, Mechanical Vibrations (5th Edition), Prentice Hall, 2010
2. J. Y. Wong, Theory of Ground Vehicles, 3rd Edition, Wiley-Interscience, 2001
3. Rajesh Rajamani, Vehicle Dynamics and Control, 1st edition, Springer, 2005
4. Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Society of Automotive Engineers Inc, 1992

REFERENCES:

1. Dean Karnopp, Vehicle Stability, 1st edition, Marcel Dekker, 2004
2. G. Nakhaie Jazar, Vehicle Dynamics: Theory and Application, 1st edition, Springer, 2008
3. Michael Blundell & Damian Harty, The Multibody Systems Approach to Vehicle Dynamics, Elsevier Limited, 2004
4. Hans B Pacejka, Tyre and Vehicle Dynamics, 2nd edition, SAE International, 2005
5. John C. Dixon, Tyres, Suspension, and Handling, 2nd Edition, Society of Automotive Engineers Inc, 1996
6. Jan Zuijdijk, Vehicle dynamics and damping, AuthorHouse, 2009

AM8201 AUTOMOTIVE ELECTRICALS AND ELECTRONICS L T P C
3 0 0 3

AIM:

The student will have to know about all theoretical information and about electrical components used in a vehicle.

OBJECTIVE

To impart knowledge to the students in the principles of operation and constructional details of various Automotive Electrical and Electronic Systems like Batteries, Starting System, charging System, Ignition System, Lighting System and Dash – Board Instruments, Electronic ignition system, various sensors and the role of ECU.

UNIT I BATTERY AND STARTING SYSTEMS 9

Types of Batteries – Principle, Construction and Electrochemical action of Lead – Acid battery, Electrolyte, Efficiency, Rating, Charging, Testing and Maintenance. Starting System, Starter Motors – Characteristics, Capacity requirements. Drive Mechanisms. Starter Switches.

UNIT II CHARGING AND LIGHTING SYSTEMS 9

D.C. Generators and Alternators their Characteristics. Control cutout, Electrical, Electro-mechanical and electronic regulators. Regulations for charging. Wiring Requirements, Insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods. Lighting design.

UNIT III ELECTRONIC IGNITION AND INJECTION SYSTEMS 9

Types of electronic ignition systems - variable ignition timing, distributor less ignition. Spark timing control. TBI, MPFI, GDI Systems. Engine mapping.

UNIT IV ELECTRICAL SYSTEMS 9

Warning and alarm instruments : Brake actuation warning system, traficators, flash system, oil pressure warning system, engine over heat warning system, air pressure warning system, speed warning system, door lock indicators, neutral gear indicator, horn design, permanent magnet horn, air & music horns. Wind shield wiper. window washer, instrument wiring system and electromagnetic interference suppression, wiring circuits for instruments, electronic instruments, dash board illumination.

UNIT V MICROPROCESSOR IN AUTOMOBILES 9

Microprocessor And Microcomputer controlled devices in automobiles such as instrument cluster, Voice warning system, Travel information system, Keyless entry system, Automatic Transmission. Environmental requirements (vibration, Temperature and EMI).

TOTAL : 45 PERIODS

TEXTBOOK:

1. Judge. A.W., Modern Electrical Equipment of Automobiles, Chapman & Hall, London, 1992.
2. William B. Ribbens -Understanding Automotive Electronics, 5th edition- Butter worth Heinemann, 1998
3. Young. A.P., & Griffiths. L., Automobile Electrical Equipment, English Language Book Society & New Press, 1990.

REFERENCES:

1. Vinal. G.W., Storage Batteries, John Wiley & Sons inc., New York, 1985.
2. Crouse.W.H., Automobile Electrical Equipment, McGraw Hill Book Co Inc., New York, 1980.
3. Spreadbury.F.G., Electrical Ignition Equipment, Constable & Co Ltd., London, 1962.
4. Robert N Brady Automotive Computers and Digital Instrumentation, Prentice Hall, Eagle Wood Cliffs, New Jersey, 1988.
5. Kohli P L., "Automotive Electrical Equipment", Tata McGraw Hill Publishing Co., Delhi, 2004.

AM8203 VEHICLE BODY ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

The main objective of this course is to impart knowledge in the construction of vehicle, aerodynamic, concept, paneling of passenger car body trim. At the end of the course the student will be well versed in the design and construction of external body of the vehicles.

UNIT I CAR BODY 8

Types of Car body - Saloon, convertibles, Limousine, Estate Van, Racing and Sports car – Visibility-regulations, driver's visibility, improvement in visibility and tests for visibility. Driver seat design -Car body construction-Various panels in car bodies. Safety aspect of car body.

UNIT II BUS BODY 9

Types of bus body: based on capacity, distance traveled and based on construction.– Layout for various types of Bus body, Types of metal sections used – Regulations – Constructional details: Conventional and integral. Driver seat design - Safety aspect of bus body.

UNIT III COMMERCIAL VEHICLE BODY 9

Types of commercial vehicle bodies – LCV, MCV, HCV. Construction details of - Flat platform body, Trailer, Tipper and Tanker body – Dimensions of driver's seat in relation to controls – Drivers cab design.

UNIT IV VEHICLE AERODYNAMICS 10

Vehicle drag and types. 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 tunnels – Principle of operation, Types. Wind tunnel testing such as: Flow visualization techniques, Airflow management test – measurement of various forces and moments by using wind tunnel. Drag reducing devices.

UNIT V BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR 9

Types of materials used in body construction-Steel sheet, timber, plastics, GRP, properties of materials. Body trim items-body mechanisms. Hand tools - power tools -panel repair-repairing sheet metal-repairing plastics-body fillers-passenger compartment service- corrosion: Anticorrosion methods, Modern painting process procedure-paint problems

TOTAL : 45 PERIODS

TEXTBOOK:

1. Powloski, J., Vehicle Body Engineering, Business Books Ltd., 1998.
2. James E Duffy, Body Repair Technology for 4-Wheelers,Cengage Learning,2009.

REFERENCES:

1. Giles, G.J., Body construction and design, Illiffe Books Butterworth & Co., 1991.
2. John Fenton, Vehicle Body layout and analysis, Mechanical Engg. Publication Ltd., London, 1992.
3. Braithwaite, J.B., Vehicle Body building and drawing, Heinemann Educational Books Ltd., London, 1997.
4. Dieler Anselm., The passenger car body, SAE International, 2000.

AM8202 AUTOMOTIVE POLLUTION AND CONTROL L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in automotive pollution control. The detailed concept of formation and control techniques of pollutants like UBHC, CO, NO_x, particulate matter and smoke for both SI and CI engine will be taught to the students. The instruments for measurement of pollutants and emission standards will also be introduced to the students. At the end of the course the students will have command over automotive pollution and control.

UNIT I EMISSION FROM AUTOMOBILES 8

Sources of Air Pollution. Various emissions from Automobiles — Formation — Effects of pollutants on environment and human beings. Emission control techniques – Modification of fuel, after treatment devices. Emission standards. Automotive waste management, old vehicle disposal, recycling, tyre recycling

UNIT II EMISSION FROM SPARK IGNITION ENGINE AND ITS CONTROL 10

Emission formation in SI Engines- Carbon monoxide & Carbon di oxide - Unburned hydrocarbon, NO_x, Smoke —Effects of design and operating variables on emission formation – controlling of pollutants - Catalytic converters, Charcoal Canister, CCS, Positive Crank case ventilation system, Secondary air injection, thermal reactor, Laser Assisted Combustion.

UNIT III EMISSION FROM COMPRESSION IGNITION ENGINE AND ITS CONTROL 10

Formation of White, Blue, and Black Smokes, NOx, soot, sulphur particulate and Intermediate Compounds – Physical and Chemical delay — Significance Effect of Operating variables on Emission formation — Fumigation, Split injection, Catalytic Coating, EGR, HCCI, Particulate Traps, SCR, Fuel additives — Cetane number Effect.

UNIT IV NOISE POLLUTION FROM AUTOMOBILES 8

Sources of Noise — Engine Noise, Transmission Noise, vehicle structural Noise, aerodynamics noise, Exhaust Noise. Noise reduction in Automobiles — Encapsulation technique for noise reduction — Silencer Design.

UNIT V TEST PROCEDURES AND EMISSION MEASUREMENTS 9

Constant Volume Sampling I and 3 (CVSI &CVS3) Systems- Sampling Procedures — Chassis dyno - Seven mode and thirteen mode cycles for Emission Sampling — Sampling problems — Emission analysers —NDIR, FID, Chemiluminesecent, Smoke meters, Dilution Tunnel, SHED Test, Sound level meters.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. G.P.Springer ad D.J.Patterson, Engine Emissions, Pollutant formation, Plenum Press, New York, 1986.
2. D.J.Patterson and N.A.Henin, 'Emission from Combustion Engine and their control', Anna Arbor Science Publication,1985.

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.
3. L.Lberanek, 'Noise Reduction', Mcgrawhill Company., Newyork1993.
4. C.Duerson, 'Noise Abatment', Butterworths ltd., London1990.
5. A.Alexander, J.P.Barde, C.lomure and F.J. Langdan, 'Road traffic noise', Applied science publisher ltd., London,1987.

AM8211 AUTOMOTIVE ELECTRICAL AND ELECTRONICS LABORATORY

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS:

1. Testing of
    a. battery
    b. starting systems
    c. charging systems
    d. ignition systems
    e. body controller systems
2. Study of automotive lighting system and adjustment of head lights beam
3. Study of Logic gates, Adders, Flip flops
4. Study of SCR and IC Timers
5. Interfacing amplifier, filter, Multiplexer and De-multiplexer
6. Interfacing seven segment displays
7. Basic microprocessor and microcontroller programming like arithmetic and Logic operation, code conversion, waveform generation, look up table
8. Interfacing ADC and DAC for Data Acquisition and Control Application

9. Interfacing Sensors for Measurements of position, displacement, velocity, force, temperature, proximity/range etc
10. Display, Keyboard, Stepper Motor and DC Motor interface using microcontroller.
11. Study of Virtual Instrumentation
12. Study of Development of Embedded Systems
13. Mini Project

AM8301 ENGINE MANAGEMENT SYSTEMS L T P C
3 0 0 3

OBJECTIVE:
To explain the principle of engines electronic management system and different sensors used in the systems.

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS 9
Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Switches, active resistors, Transistors, Current mirrors/amplifiers, Voltage and current references, Comparator, Multiplier. Amplifier, filters, A/D and D/A converters.

UNIT II SENSORS AND ACTUATORS 9
Inductive, Hall Effect, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, mass air flow, crank shaft position, cam position, engine speed sensor, exhaust oxygen level (two step, linear lambda and wideband), knock, manifold temperature and pressure sensors. Solenoid, relay(four and five pin), stepper motor

UNIT III SI ENGINE MANAGEMENT 9
Layout and working of SI engine management systems. Group and sequential injection techniques. Advantages of electronic ignition systems. Types of solid state ignition systems and their principle of operation, Contactless (BREAKERLESS) electronic ignition system, Electronic spark timing control.

UNIT IV CI ENGINE MANAGEMENT 9
Fuel injection system parameters affecting combustion, noise and emissions in CI engines. Electronically controlled Unit Injection system. Common rail fuel injection system. Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter, EGR valve.

UNIT V DIGITAL ENGINE CONTROL SYSTEM 9
Cold start and warm up phases, idle speed control, acceleration and full load enrichment, deceleration fuel cutoff. Fuel control maps, open loop and closed loop control – Integrated engine control system, Electromagnetic compatibility – EMI Suppression techniques – Electronic dash board instruments – Onboard diagnosis system.

TOTAL : 45 PERIODS

TEXT BOOKS:
1. Understanding Automotive Electronics William B Ribbens, SAE 1998
2. Automobile Electronics by Eric Chowanietz SAE

REFERENCES:
1. Diesel Engine Management by Robert Bosch, SAE Publications, 3rd Edition, 2004.
2. Gasoline Engine Management by Robert Bosch, SAE Publications, 2nd Edition, 2004.

AM8311 COMPUTER AIDED VEHICLE DESIGN LABORATORY L T P C
0 0 3 2

Design, model and (Structural / Thermal) analysis of the following components

1. Engine Cylinder
2. Piston Assembly.
3. Connecting rod.
4. Valves.
5. Crank shaft.
6. Cam shaft.
7. Vehicle Frame.
8. Suspension Spring.
9. Front axle.
10. Rear axle.
11. Gear box.

TOTAL: 45 PERIODS

REFERENCES:

1. Dean Averns, " Automobile Chassis Design ", Illiffe Books Ltd, 1992.
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. T. Kenneth Garrett, Kenneth Newton and William Steeds, “The Motor Vehicle” 13th Edition, Butterworth-Heinemann Limited**,** London, 2005.
7. Heldt.P.M., " Torque converter ", Chilton Book Co., New York, 1982.
8. Dr. N. K. Giri, “Automobile Mechanics”, Seventh reprint, Khanna Publishers, Delhi, 2005
9. ACAD, CATIA and ANSYS software guide / manual

AM8001 ADVANCED THERMODYNAMICS FOR AUTOMOBILE ENGINEERS L T P C
3 0 0 3

UNIT I BASIC CONCEPTS 9

Systems, property, state, path and process- quasi static process, work, modes of work. Review of laws of thermodynamics – first and second law of thermodynamics – Application of the energy equation to the engine combustion process. Application to closed and open systems of automobile. internal energy, specific heat capacities, enthalpy, and steady flow process.

UNIT II ENTROPY 9

Absolute Zero and the Third Law of Thermodynamics. Entropy – Mathematical Definition, Characteristics. Relation between ds, dq and T during an Irreversible Process. Entropy Change in Internally Reversible Processes. Isentropic Processes. Absolute Entropies. Helmholtz and Gibbs Free Energies. Entropy of Mixing of Ideal Gases.

UNIT III COMBUSTION THERMODYNAMICS 9

Combustion processes. Combustion of simple hydrocarbon fuels. Enthalpy of formation. Bond energies. Chemical Reactions and Combustion. Air – Fuel ratio calculation, Equivalence Ratio, problems.

UNIT IV FLAMES AND CHEMICAL KINETICS 9

Flames – premixed, diffusion, Laminar and turbulent – Explosion limits, Flammability limits, Ignition, Engine combustion systems. Chemical Kinetics – Reaction rates - Rate constant, Pollutants formed through chemical kinetics

UNIT V CHEMICAL EQUILIBRIUM AND DISSOCIATION 9

Chemical equilibrium. Criterion for reaction equilibrium. Equilibrium constant for gaseous mixtures - evaluation of equilibrium composition. The Vant Hoff relationship between equilibrium constant and heat of reaction. Calculation of chemical equilibrium and the law of mass action. Dissociation. Effect of pressure and temperature on dissociation. Problems.

TOTAL: 45 PERIODS

REFERENCES :

1. Kenneth Wark Jr., Advanced Thermodynamics for Engineers, McGraw-Hill Inc., 1995.
2. Bejan, A., Advanced Engineering Thermodynamics, John Wiley and Sons, 1988.
3. Desmond E Winterbone, Advanced Thermodynamics for Engineers. John Wiley & Sons, Inc., 1997.
4. Holman,J.P., Thermodynamics, Fourth Edition, McGraw-Hill Inc., 1988.
5. Sonntag, R.E., and Van Wylen, G, Introduction to Thermodynamics, Classical and Statistical, Third Edition, John Wiley and Sons, 1991.

AM8002 ALTERNATIVE FUELS AND PROPULSION SYSTEMS L T P C
3 0 0 3

OBJECTIVES

At the end of the course, the student will be able to acquire knowledge of alternate fuels and the changes in the engine design for handling them and understand various propulsion systems for use in the automobiles.

UNIT I ALCOHOLS AS FUELS 9

Alternative fuels. Availability of different alternative fuels for engines. Alcohols – Properties, Production methods and usage in engines. Blending, dual fuel operation, surface ignition, spark ignition and oxygenated additives. Performance, combustion and emission Characteristics in engines. Issues & limitation in alcohols

UNIT II VEGETABLE OILS AS FUELS 9

Vegetable oils and their important properties. Methods of using vegetable oils – Blending, preheating, Transesterification and emulsification – Performance, combustion and emission Characteristics in diesel engines. Issues & limitation in Vegetable Oils

UNIT III HYDROGEN AS ENGINE FUEL 9

Hydrogen – Properties, problems, Production methods, storage and safety aspects. Issues & limitation in Hydrogen. Methods of using hydrogen in engines. Performance, combustion and emission Characteristics in engines.

UNIT IV BIOGAS, NATURAL GAS AND LPG AS FUELS 9

Biogas, Natural gas and LPG – Properties and production methods. CO_2 and H_2S scrubbing in Biogas, Modifications required for use in Engines- Performance, combustion and emission Characteristics in engines. Issues & limitation in Gaseous fuels.

UNIT V HYBRID AND ELECTRIC VEHICLES 9

Hybrid and Electric vehicle – Layout, Merits, demerits and components, Electronic control system – Different configurations of Hybrid vehicles. Power split device. Energy regeneration. High energy and power density batteries – Introduction to PEM Fuel cell.

TOTAL :45 PERIODS

REFERENCES

1. Ayhan Demirbas, ' **Biodiesel A Realistic Fuel Alternative for Diesel Engines',** Springer-Verlag London Limited 2008,ISBN-13: 9781846289941
2. Gerhard Knothe, Jon Van Gerpen, Jargon Krahl, **The Biodiesel Handbook,** AOCS Press Champaign, Illinois 2005.
3. Richard L Bechtold P.E., **Alternative Fuels Guide book,** Society of Automotive Engineers, 1997 ISBN 0-76-80-0052-1.
4. Transactions of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.).
5. Science direct Journals (**Biomass & Bio energy, Fuels, Energy, Energy conversion Management, Hydrogen Energy**, etc.) on biofuels.

AM8003 AUTOMOTIVE AERODYNAMICS L T P C
3 0 0 3

OBJECTIVE

At the end of the course, the students will be able to apply basic principles of aerodynamics for the design of vehicle body.

UNIT I INTRODUCTION 10

Scope – historical development trends – Fundamentals of fluid mechanics – Flow phenomenon related to vehicles – External & Internal flow problems – Resistance to vehicle motion – Fuel consumption and performance – Significance of vehicle aerodynamics.

UNIT II AERODYNAMIC DRAG OF CABS 8

Car 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 CABS 7

Front end modification – front and rear wind shield angle – Boat tailing – Hatch back, fast back and square back – Dust flow patterns at the rear – Effect of gap configuration – effect of fasteners.

UNIT IV VEHICLE HANDLING 10

Force and moments – Origin, calculation, effects and characteristics. Side wind problems – vehicle dynamic under side winds – Dirt accumulation on the vehicle – wind noise – drag reduction in commercial vehicles.

UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS 10

Principles of wind tunnel technology – Types, Stress with scale models – full scale wind tunnels – measurement techniques – Equipment and transducers – road testing methods. Introduction to CFD.

TOTAL : 45 PERIODS

TEXTBOOK:

1. Hucho, W.H., Aerodynamics of Road vehicles, Butterworths Co. Ltd., 4th Edition, SAE 1998.

REFERENCES:

1. Pope, A, Wind Tunnel Testing, John Wiley & Sons, 2nd Edn., New York, 1994.
2. Automotive Aerodynamics: Update SP-706, SAE, 1987.
3. Vehicle Aerodynamics, SP-1145, SAE, 1996.

AM8004 AUTOMOTIVE AIR CONDITIONING SYSTEM L T P C
3 0 0 3

OBJECTIVE

At the end of the course, the students will be able to understand the components of the automotive air-conditioning and their functions and the latest developments in this field.

UNIT I FUNDAMENTALS

Terminology, design factors and concepts related to air conditioning system - Construction and Working principles of Thermostatic Expansion valve and Orifice tube based system- Heating system types -detailed study of HVAC components like compressor, evaporator, condenser, TXV, orifice tube , Receiver-drier, heater core etc. Location of air conditioning components in a vehicle.

UNIT II REFRIGERANTS & AIR MANAGEMENT SYSTEMS

Refrigerants:

Temperature and pressure relation, Properties of R-12 and R134a- refrigerant oil. Simple problems - Containers - Handling refrigerants - Tapping into the refrigerant container - Ozone Layer Depletion.

Air management system:

Air routing for manual, semi and automatic system- cases and ducts- Air distribution, control head and doors- Defrost system

UNIT III AUTOMATIC CLIMATE CONTROL SYSTEM

Block diagram - types of Sensors and Actuators, - Control Logic Electrical wiring diagram of manual and automatic system - multiplexing between BCM and PCM- control of compressor clutch, blower motor etc.- diagnostics tools and features.

UNIT IV DESIGN OF AIR-CONDITIONING COMPONENTS

Modeling of Fixed and variable Displacement type compressor, evaporator modeling - heat transfer correlations for the fluids inside the evaporator, analysis of evaporator frosting- condenser modeling - improvement of refrigerant flow control method.

UNIT V AIR CONDITIONING DIAGNOSIS AND SERVICES

AC system diagnosis based on temperature and pressure measurements, sight glass, sound etc. - refrigerant leak detection- Trouble shooting and Servicing of compressor, evaporator, condenser, heater core etc. – HVAC equipment , recovery and charging. Air routing system service.

TOTAL: 45 PERIODS

TEXTBOOK:

1) Tom Birch, “Automotive Heating and Air Conditioning” Pearson Education Inc., 2003.
2) Boyce H. Dwiggins, Jack Erjavec., “Automotive Heating and Air-Conditioning”, Delmer publisher., 2001.
3) William H Crouse and Donald L Anglin, “Automotive air conditioning”, McGraw - Hill Inc., 1990

REFERENCES

1) Goings. L.F., “Automotive air conditioning”, American Technical services, 1974
2) Paul Weiser, “Automotive air conditioning”, Reston Publishing Co Inc., 1990.

3) MacDonald, K.L., “Automotive air conditioning”, Theodore Audel series, 1978.
4) James D. Halderman, “Automotive Heating, Ventilation, and Air Conditioning Systems”, Pearson Education Inc., 2004.
5) SAE paper No: 931121,900084, 850040,931137,870029 etc.
6) Vehicle service manuals.

AM8005 AUTOMOTIVE SAFETY L T P C
3 0 0 3

OBJECTIVE:
At the end, the student will have good exposure to Automotive safety aspects including safety equipments.

UNIT I INTRODUCTION 9
Automotive safety – Introduction, Types. Active safety: driving safety, conditional safety, perceptibility safety, operating safety- Passive safety: exterior safety, interior safety-Advantages

UNIT II PASSIVE SAFETY CONCEPTS 9
Design of body for safety, engine location, deceleration of vehicle, passenger compartment, deceleration on impact with stationary and movable obstacles. Deformation behavior of vehicle body. Concept of crumble zone, Safety Cage.

UNIT III PASSIVE SAFETY EQUIPMENTS 9
Regulations, Seat belt, automatic seat belt tightener system and importance , collapsible steering column, tiltable steering column with advantages , air bags, Designing aspcets of automotive bumpers and materials for bumpers.

UNIT IV ACTIVE SAFETY AND CONVENIENCE SYSTEM 9
Antiskid braking system, Secondary braking system. Stability Control. Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system, manual and automated wiper system, Driver alertness detection system.

UNIT V VEHICLE INTEGRATION AND NAVIGATION SYSTEM 9
Intelligent vision system, Adaptive cruise control, Warning systems, Collision Avoidance systems Vehicle Network system. Global Positioning System. Road Network, Navigation System. Telematics.

TOTAL: 45 PERIODS

TEXT BOOK:
1. Bosch, “Automotive HandBook”, 6th edition, SAE, 2004.

REFERENCES:
1. J.Powloski - “Vehicle Body Engineering” - Business books limited, London - 1969.
2. Ronald.K.Jurgen - “Automotive Electronics Handbook” - Second edition- McGraw-Hill Inc., - 1999.
3. ARAI Safety standards

AM8006 COMBUSTION THERMODYNAMICS AND HEAT TRANSFER L T P C
3 0 0 3

OBJECTIVE:
The objective of this course is to make the students to know and understand the principle of engine combustion and to introduce the various heat transfer models and its measuring methods.

UNIT I THERMODYNAMICS OF COMBUSTION 10
Premixed and diffusion combustion process in IC engines. First and Second Law of Thermodynamics applied to combustion- combustion Stoichiometry- chemical equilibrium, spray formation and droplet combustion.

UNIT II CHEMICAL KINETICS OF COMBUSTION 10
Combustion kinetics, rate of reaction, equation of Arrhenius, activation energy. Chemical thermodynamic model for Normal Combustion.

UNIT III FLAMES 9
Laminar - premixed and diffusion flames – flame speed correlations- quenching, flammability, and ignition, flame stabilization, turbulent premixed, diffusion flames-Damkohler number.

UNIT IV HEAT TRANSFER IN IC ENGINES 8
Engine Heat transfer and heat Balance. Measurement of Instantaneous heat transfer rate. Heat transfer modeling. Heat transfer coefficients, radiative heat transfer. Temperature measurement in Piston, Cylinder, Cylinder Head, Liner and valves.

UNIT V INSTRUMENTATION 8
Pressure sensors, crank angle encoder. Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines. In-cylinder pressure measurement and Rate of heat release calculation.

TOTAL : 45 PERIODS

REFERENCES

1. Spalding.D.B., "Some fundamentals of Combustion", Butterworth Science Publications, London, 1985.
2. Irvin Glasman, “Combustion” Academic Press, London, 1987, ISBN 0-12-285851-4.
3. Taylor.E.F. “The Internal Combustion Engines ", International Text Book Co., Pennsylvania, 1982.
4. Ashley Campbel, “Thermodynamic analysis of combustion engine”, John book company, Newyork, 1979.
5. J.I.Ramos, “Modeling of Internal Combustion Engine”, Mcgraw hill book company New york 1990
6. John. B. Heywood,’ “Internal Combustion Engines", Tata McGraw Hill Co., Newyork, 1988.
7. Ganesan.V. "Computer Simulation of Spark Ignition Engine Process ", Wiley eastern India ltd,1996.

AM8007 ELECTRIC AND HYBRID VEHICLES L T P C
3 0 0 3

OBJECTIVES :
- To understand the methods of representation of system and thier transfer finction models
- To provide adquate knowledge in the time response of systems and steady state error analysis
- To give basic knowledge in obtainig the open loop and closed loop frequency responses of system
- To understand the concept of stablity of control system and methos of stablity analysis
- To study the three way of designing compensators for a control system

UNIT I NEED FOR ALTERNATIVE SYSTEM 9

Need of electric vehicles hybrid vehicles – comparative study of diesel, petrol, pure electric and hybrid vehicles. Limitations of electric vehicles. Specification of some electric and hybrid vehicles

UNIT II ENERGY SOURCES : BATTERIES AND FUEL CELLS 9

Battery Parameters-Power requirement of electric vehicles- Different types of batteries - Lead acid-Nickel based-Sodium based-Lithium based- Metal Air based. Battery charging- Charger design- Quick charging devices- Battery Modeling. Different type of energy storage – Solar, wind, compressed fluid.

Fuel Cell- Fuel cell characteristics- Fuel cell types-Hydrogen fuel cell- Connecting cell in series- water management in the PEM fuel cell- Thermal Management of the PEM fuel cell

UNIT III PROPULSION MOTORS AND CONTROLLERS 12

Characteristic of permanent magnet and separately exited DC motors. AC single phase and 3-phase motor – inverters – DC and AC motor speed controllers.

UNIT IV VEHICLE DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES 6

Aerodynamic-Rolling resistance- Transmission efficiency- Vehicle mass- Electric vehicle chassis and Body design considerations- Heating and cooling systems- Controllers- Power steering- Tyre choice-Wing Mirror, Aerials and Luggage racks

UNIT V HYBRID VEHICLES 9

Types of Hybrid- Series, parallel, split – parallel, series - parallel - Advantages and Disadvantages. Power split device – Energy Management System - Design consideration - Economy of hybrid vehicles

TOTAL: 45 Periods

TEXT BOOKS:

1. James Larminie and John Lowry, “Electric Vehicle Technology Explained “ John Wiley & Sons,2003
2. Iqbal Husain, “ Electric and Hybrid Vehicles-Design Fundamentals”, CRC Press,2003
3. Mehrdad Ehsani, “ Modern Electric, Hybrid Electric and Fuel Cell Vehicles”, CRC Press,2005

REFERENCES:

1. Ron HodKinson, “ light Weight Electric/ Hybrid Vehicle Design”, Butterworth Heinemann Publication,2005
2. Lino Guzzella, “ Vehicle Propulsion System” Springer Publications,2005

AM8008 FINITE ELEMENT METHODS IN AUTOMOBILE ENGINEERING L T P C

3 0 0 3

OBJECTIVE:

The objective of this course is to make the students to know and understand the principle of FEM and its application in automotive component design.

UNIT I INTRODUCTION 9

Engineering design analysis-meaning and purpose, steady state, propagation and transient problems. Concepts of FDM, FEM, FVM. Steps involved in FEM. Applicability of FEM to structural analysis, heat transfer and fluid flow problems. Advantages and limitations of FEM. Test for convergence. Element choice. Commercial finite element packages. Solution of Boundary value problem - Integral formulation for numerical solution - Variational methods - Minimum total potential energy formulation.

UNIT II 1D ELEMENTS 9

Use of bar and beam elements in structural analysis. Bar Element – Stiffness matrix formulation by direct and polynomial methods. Boundary condition and assemblage concepts. Beam element characteristics matrix. Global, local, natural coordinates.

UNIT III 2D ELEMENTS 9

Rectangular elements - Quadratic quadrilateral elements - Linear Triangular elements - 2D elements applications for plane stress, plane strain and axi-symmetric problems. Treatment of boundary condition. Mesh generation techniques. Numerical integration schemes. Iso Parametric elements. Introduction to 3D Elements.

UNIT IV STRUCTURAL AND DYNAMIC ANALYSIS 9

1D & 2D problems in Solid mechanics. Dynamics problems representation in FE. Free vibration problem formulation. Torsion of non circular shaft - axisymmetric problem. Case Studies like Structural analysis of Chassis Frame, Whirling speed of propeller shaft, contact analysis of gears, modal analysis of suspension system, impact, crash worthiness etc.

UNIT V HEAT TRANSFER ANALYSIS AND FLOW ANALYSIS 9

1D & 2D problems in fluid mechanics and heat transfer by conduction and convection. Transient thermal analysis. Case Studies like Heat transfer analysis of piston, fins.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Segerlind,L.J., Applied Finite Element Analysis, Second Edition, John Wiley and Sons Inc., New York, 1984
2. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, “Concepts and applications of finite element analysis”, 4th edition, John Wiley & Sons, 2007.

REFERENCES

1. Krishnamurthy,C.S., Finite Element Analysis, Tata McGraw Hill, 1987.
2. Ramamurthi,V., Computer Aided Design in Mechanical Engineering, Tata McGraw Hill, 1987.
3. Bathe,K.J. and Wilson,E.L., Numerical methods in finite element analysis, Prentice Hall of India Ltd., 1983.
4. J. N. Reddy, “Finite Element Methods”, 2nd Edition, 6th Reprint, Tata McGraw Hill, 2005.
5. Singiresu S. Rao, “The Finite Elements Methods in Engineering”, 4th Edition, USA, 2005.

AM8009 HYDRAULIC AND PNEUMATIC SYSTEMS L T P C
3 0 0 3

OBJECTIVE:

The objective of this course is to introduce the essential principles of hydraulic and pneumatic system and related automobile applications.

UNIT I INTRODUCTION 6

Properties - hydraulic fluids and air. Hydraulic fluids, types, factors affecting oil performance, selection, power unit. Selection of pipe / tubing, couplings. Packing and seals, packing standards. Comparison between pneumatic and hydraulic system. Symbols of pneumatic and hydraulic elements.

UNIT II PNEUMATIC SYSTEMS 12

Basic requirement. Elements of pneumatics, constructional details of air compressors, types, specifications, air generation and distribution. Air motors, control valves, actuators and mountings, filter, lubricator, regulator. General approach of system design, travel step diagram. Types - sequence control, cascade, step counter method. K.V.Mapping for minimization of logic equation. Simple circuits.

UNIT III HYDRAULIC SYSTEMS 12

Cylinder, Pumps and motors - types, characteristics., construction details. Valves for control of direction, flow and pressure – types and construction details. Power pack– elements and design. Pipes- material, pipe fittings. seals and packing. Maintenance of hydraulic systems. Selection criteria for cylinders, valves, pipes.

UNIT IV SERVO AND PLC SYSTEMS 9

Electro pneumatics, ladder diagram. Servo and Proportional valves - types, operation, application. Hydro-Mechanical servo systems. PLC-construction, types, operation, programming.

UNIT V AUTOMOTIVE APPLICATIONS 6

Hydraulic tipping mechanism, power steering, fort lift hydraulic gear, hydro-pneumatic suspension, air brake. Maintenance and trouble shooting. Design and analysis of a hydraulic / Pneumatic system. Case Study

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Anthony Espisito, " Fluid Power with Application", Pearson Education (Singapore) Pte.Ltd, Delhi, India, Fifth Edition, First Indian Reprint, 2003
2. Werner Deppert and Kurt Stoll, "Pneumatic Controls : An introduction to principles", Vogel-Druck Wurzburg, Germany, 1975
3. Pippenger, J.J, "Industrial Hydraulic & Pneumatics", McGraw Hill, 2002.

REFERENCES:

1. Majumdar, S.R., "Oil Hydraulic Systems: Principles and Maintenance", Tata McGraw- Hill Publishing Company Ltd., New Delhi, Fourth Reprint, 2003.
2. Peter Rohner, "Fluid Power Logic Circuit Design – Analysis, Design Method and Worked Examples", The Macmillan Press Ltd., UK, 1979.
3. Festo KG, "Pneumatic Tips", Festo, Germany, 1987.
4. Andrew Parr, "Hydraulic and Pneumatics", Jaico publishing house, 1999.

AM8011 INSTRUMENTATION AND EXPERIMENTAL TECHNIQUES L T P C
3 0 0 3

OBJECTIVE:

Study of the theory, construction and operation of different measurement technology, instruments transducers and their application in automotive industry.

UNIT I MEASUREMENT SYSTEMS 8

Static and Dynamic Measurement systems-importance of measurement system – methods of measurement -applications - characteristics of measuring system-static and dynamic characteristics of measuring system – Analysis of experimental detail, Error analysis-types of errors-limiting errors

UNIT II TRANSDUCERS, MODIFIERS AND TERMINATING DEVICES 8

Transducers for Automotive Applications – Amplifiers-Classifications and application in automobile – filters -types – Data Acquisition system - analog and digital type DAS- Indicators, Printers and display device –Signal Analyzing with example of automobile applications.

UNIT III MECHANICAL MEASUREMENT 10

Instrumentation for Measuring Weight, Force, torque , pressure, power, temperature, fluid flow and special methods , vibration piezo electric effect, rotational speed .Measuring Velocity, acceleration and angular motion with respect to automobile applications

UNIT IV ENGINE EXPERIMENTAL TECHNIQUES 10

I.S Code for Engine testing – Instrumentation for performance testing of engine, Instrumentation for Research and development, Instrumentation for noise, vibration, in cylinder gas flow, flame temperature Dynamic Cylinder pressure measurements.

UNIT V VEHICLE EXPERIMENTAL TECHNIQUES 9

Laboratory tests- test tracks - Endurance Tests- crash tests- wind tunnel tests- Dynamic cornering fatigue, dynamic radial fatigue tests – procedure, bending moment and radial load calculations. Impact test – road hazard impact test for wheel and tyre assemblies, test procedures, failure criteria and performance criteria. Bumpers - types of tests, pendulum test, fixed collision barrier test, procedure, performance criteria. Air and hydraulic brake test, air brake actuator, valves test, performance requirements.

TOTAL: 45 PERIODS

TEXTBOOK:

1. J.G. Giles, 'Engine and Vehicle Testing', Illiffe books Ltd., London,1968.
2. T.G. Beckwith and Buck, 'Mechanical Measurements', Oxford and IBH Publishing House, New Delhi, 1995

REFERENCES

1. A.W. Judge, 'Engineering Precision Measurement', Chapman and Hall Ltd, Essex Street W.C.,1951,
2. D.Patambis, 'Principle of Industrial Instrumentation', Tata McGraw Hill Publishing Co, New Delhi, 1990.
3. Rangan, Sharma and Mani, 'Instrumentation Devices and systems', Tata McGraw Hill Publishing Co., Ltd., 1990

AM8012 NOVEL MATERIALS IN AUTOMOTIVE TECHNOLOGY L T P C

3 0 0 3

OBJECTIVE:

The objective of this course is to make the students to know and understand the development in materials and its application in automotive component design.

UNIT I INTRODUCTION 9

Elasticity-forms - Stress and strain relationship in engineering materials - Deformation mechanism - Strengthening material - Strain hardening, alloying, polyphase mixture, martensitic precipitation, dispersion, fibre and texture strengthening - iron carbon diagram.

UNIT II METALLIC MATERIALS 9

Cast irons - types, properties, structures, compositions and applications, plain carbon steels, low alloy steels and effects of alloying elements, high alloy steels, stainless steel types, castability, formability, machinability, hardenability and weldability of the material, high temperature steels and super alloys. Applications in Automobiles

UNIT III COMPOSITES 9

Mechanics, Manufacturing and Design. Types of composites. Fiber reinforced plastics (FRP), engineering ceramics, metal matrix composites, silicon carbide, graphite, fibres of zirconia, alumina and boron nitride - metal filaments - boron filaments - glass fibres applications, nano-composites. Piezoelectriccomposites. Applications in Automobiles

UNIT IV ELECTRICAL AND MAGNETIC MATERIALS 9

Semiconductors materials, single crystals, soft and hard magnets, superconductors, MEMS materials, nano materials, smart materials, shape memory alloys. Piezoelectric Materials., piezoceramic materials, polyvinyldenefluoride, Magnetostrictive Materials. Metglasmaterials.

UNIT V RUBBER AND PLASTICS MATERIALS 9

Plastics / rubber components in automobiles – function – selection criteria. Structure - property relationship of rubber. Rubber mounts – spring design – comparison with metallic springs – shape factor and its effect. Typical mounts, compounding and manufacture. Seals for static and dynamic applications. Brake fluid / hydraulic hoses, materials and manufacture.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Michael F. Ashby, “Materials Selection in Mechanical Design”, Butterworth Heinemann, 2005.
2. Daniel Yesudian C., “Materials Science and Metallurgy”, Scitech Publications (India), 2004.

REFERENCES

1. Polmear I.J., “Light Alloys”, Arnold Publishers, 1995.
2. Swarup D. and Saxena M.N., "Elements of Metallurgy", Rastogi Publishers, Meerut, 1994.
3. Srinivasan N.K. and Ramakrishnan S.S., "The Science of Engineering Materials", Oxford and IBH Pub. Co., New Delhi, 1993.
4. Van Vlack L.H., "Elements of Materials Science and Engineering", Addison Wesley, New York, 1991.
5. Guy A.G," Elements of Physical Metallurgy", Oxford & IBH Pub. Co., 1990.

AM8013 PRODUCTION OF AUTOMOTIVE COMPONENTS L T P C
3 0 0 3

OBJECTIVE:

The objective of this course is to make the students to know and understand the production methods of various engine components like piston, connecting rod, crankshaft etc and various chassis components like friction lining materials, propeller shaft, steering column, gears etc.

UNIT I CASTING 9

Sand casting of cylinder block and liners - Centrifugal casting of flywheel, piston rings, bearing bushes, and liners, permanent mould casting of piston, pressure die casting of carburetor and other small auto parts. Melting practice of alloys

UNIT II MACHINING 9

Special consideration of machining of various components such as flywheel, piston rings, bearing bushes, and liners. Machining of connecting rods - crank shaft - cam shaft - piston - piston pin - valve - front and rear axle housing - fly wheel - Honing of cylinder bores - Copy turning and profile grinding machines.

UNIT III FORMING PROCESS 10

Forging materials - process flow chart, forging of valves, connecting rod, crank shaft, cam shaft, propeller shaft, transmission gear blanks, steering column. Extrusions: Basic process steps, extrusion of transmission shaft, housing spindle, steering worm blanks, piston pin and valve tappets. Hydro forming - Process, hydro forming of manifold and comparison with conventional methods- Hydro forming of tail lamp housing – forming of wheel disc and rims. Stretch forming - Process, stretch forming of auto body panels –Super plastic alloys for auto body panels.

UNIT IV POWDER METALLURGY AND PROCESSING OF PLASTICS 8

Powder metallurgy process, process variables, Manufacture of friction lining materials for clutches and brakes – plastics-raw material –automobile components – molding – injection, compression and blow – PU foam molding - Machining of plastics.

UNIT V RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS 9

Powder injection molding - Production of aluminum MMC liners for engine blocks - Plasma spray coated engine blocks and valves - Recent developments in auto body panel forming –Squeeze Casting of pistons - aluminum composite brake rotors. Sinter diffusion bonded idler sprocket – gas injection molding of window channel – cast con process for auto parts.

TOTAL : 45 PERIODS

TEXT BOOK

1. Heldt.P.M., " High Speed Combustion Engines ", Oxford Publishing Co., New York, 1990.

REFERENCES

1. Haslehurst.S.E., " Manufacturing Technology ", ELBS, London, 1990.
2. Rusinoff, " Forging and Forming of metals ", D.B. Taraporevala Son & Co. Pvt Ltd., Mumbai, 1995.
3. Sabroff.A.M. & Others, "Forging Materials & Processes ", Reinhold Book Corporation, New York, 1988.
4. Upton, "Pressure Die Casting ", Pergamon Press, 1985.
5. High Velocity "Forming of Metals ", ASTME, prentice Hall of India (P) Ltd., New Delhi, 1990
6. HMT handbook

AM8010 IC ENGINE PROCESS MODELING L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in computer simulation of IC engine process. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. The simulation of two stroke SI engine will also be introduced to the students. At the end of the course the students will have command over simulation of IC engine process.

UNIT I INTRODUCTION 9

Advantages of computer simulation, Classification of engine models. Intake and exhaust flow models – Quasi steady flow - Filling and emptying - Gas dynamic Models. Thermodynamic based in cylinder models. Step by step approach in SI engine simulation.

UNIT II COMBUSTION AND STOICHIOMETERY 9

Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction - combustion equation for hydrocarbon fuels. Calculation of minimum air, excess air and stoichiometric air required for combustion. Conversion of volumetric analysis to mass analysis. Introduction, complete combustion in C-H-N-O systems, constant volume adiabatic combustion, constant pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state.

UNIT III COMPUTER SIMULATION OF SI ENGINE WITH FUEL AIR CYCLE 9

SI Engine simulation with air as working medium, deviation between actual and ideal cycle. Fuel air cycle analysis - Temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation. SI Engines simulation with progressive combustion. Wiebe's law combustion analysis.

UNIT IV COMPUTER SIMULATION OF SI ENGINE WITH GAS EXCHANGE PROCESS 9

Introduction, gas exchange process, Heat transfer process, friction calculations, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram, brake power, brake thermal efficiency, effect of speed on performance.

UNIT V COMPUTER SIMULATION OF CI ENGINE 9

Zero, one and multizone models for diesel engine combustion. Double Wiebe's Law analysis for diesel combustion. Heat release model and different heat transfer models. Equilibrium calculations. Parametric studies on simulated engine performance.

TOTAL: 45 PERIODS

TEXTBOOK:

1. **Ganesan.V**. "Computer Simulation of spark ignition engine process", Universities Press (I) Ltd, Hyderbad, 1996.

REFERENCES

1. John. B. Heywood, 'Internal Combustion Engines'", Tata McGraw Hill Co., Newyork, 1988.
2. Benson.R.S., Whitehouse.N.D., "Internal Combustion Engines", Pergamon Press, oxford, 1979
3. Ramoss.A.L., "Modelling of Internal Combustion Engines Processes", McGraw Hill Publishing Co., 1992.P
4. Ashley Campbel, "Thermodynamic analysis of combustion engines", John Wiley & Sons, New York, 1986.

AM8014 SIMULATION OF VEHICLE SYSTEMS L T P C
3 0 0 3

OBJECTIVE:

The objective of this course is to introduce the essential principles of simulation of various vehicle systems like longitudinal, lateral dynamics, modeling of suspension and tyre system etc.

UNIT I LONGITUDINAL DYNAMICS AND CONTROL 9

Aerodynamic drag force - Longitudinal tyre force - Rolling resistance - Calculation of normal tyre forces - Calculation of effective tyre radius - Driveline Dynamics - Torque converter - Transmission dynamics - Engine dynamics - Wheel dynamics - Cruise Control - Anti-Lock Brake Systems - Automated Highway Systems - Longitudinal Control Architecture.

UNIT II LATERAL DYNAMICS AND ELECTRONIC STABILITY CONTROL 9

Lateral Systems - Kinematic Model - Bicycle Model. Motion of Particle Relative to a rotating Frame. Dynamic Model in Terms of Error with Respect to Road, Yaw Rate and Slip Angle. Road Model.

Differential Braking Systems - Steer-By-Wire Systems - Independent All Wheel Drive Torque Distribution

UNIT III MODELING OF PASSIVE AUTOMOTIVE SUSPENSIONS 9

Introduction - Modal Decoupling - Performance Variables - Natural Frequencies and Mode Shapes - Approximate Transfer Functions - Analysis of Vibrations in the Sprung Mass Mode and Unsprung Mass Mode - Verification Using Quarter Model. Half-Car and Full-Car Suspension Models.

UNIT IV MODELING OF SEMIACTIVE AND ACTIVE AUTOMOTIVE SUSPENSIONS 9

Semi-Active Suspension Model - Optimal Semi-Active Control Law - Calculation of Transfer Function Plots - Performance of Semi-Active Suspension Systems. Active Automotive Suspensions - Trade-offs and Limitations - Invariant Points and Their Influence - Hydraulic Actuators for Active Suspensions

UNIT V LATERAL AND LONGITUDINAL TYRE FORCES 9

Tyre Forces - Tyre Structure - Longitudinal Tyre Force at Small Slip Ratios - Lateral Tyre Force at Small Slip Angles - Magic Formula Tyre Model - Dugoff's Tyre Model - Dynamic Tyre Model - Development of Lateral Tyre Model for Uniform Normal Force Distribution and Parabolic Normal Pressure Distribution - Combined Lateral and Longitudinal Tyre Force Generation.

TOTAL : 45 PERIODS

TEXT BOOK

1. Rajesh Rajamani, “Vehicle Dynamics and Control”, Springer, 2006.

AM8015 SPECIAL TYPE OF VEHICLES L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to introduce the concept and principle of operation of special vehicles such as Bulldozers, Ditchers, Bucket excavators, farm equipments, military vehicles etc. At the end of the course, the students can have a better understanding of the application of the special types of vehicles in the excavation of earth.

UNIT I EARTH MOVING AND CONSTRUCTIONAL EQUIPMENTS 10

Construction details, capacity and applications of earthmovers for dumpers, front-end loaders, bulldozers, excavators, backhoe loaders, scrappers, motor graders etc. criteria for selection of prime mover for dumpers and front end loaders based on vehicle performance characteristics.

UNIT II POWER TRAIN CONCEPTS 7

Engine – converter match curves. Epicyclic type transmissions. Selection criteria for universal joints. Constructional details of steerable and drive axles of dumper.

UNIT III VEHICLE SYSTEMS AND FEATURES 14

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader and bulldozer operational linkages. Safety features, safe warning system for dumper. Design aspects oF dumper body, loader bucket and water tank of sprinkler. Articulated vehicles, double decker. Fire fighting equipment.

UNIT IV SPECIAL PURPOSE VEHICLES FOR INDUSTRIAL APPLICATIONS 5

Constructional features, capacity and stability of jib cranes. Vibratory compactors. Stackers, borewell machines, concrete mixtures.

UNIT V FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES 9

Ride and stability characteristics, power take off, special implementations. Special features and constructional details of tankers, gun carriers and transport vehicles. Harvesting vehicles.

TOTAL : 45 PERIODS

REFERENCES

1. Pipenger, 'Industrial Hydralics', Mcgraw Hill, Tokoyo, 1979.
2. A. Astakhov, 'Truck cranes', MIR Publishers, Moscow, 1971.
3. Bart H Vanderveen, 'Tanks and Transport Vehicles', Frederic Warne and co. Ltd., London, 1974.
4. K. Abrosimov, A. Bromberg and F. Katayer, 'Road making machineries', MIR Publisher, Moscow,1975.
5. SAE Handbook – Vol III, 1995.

AM8016 THEORY OF FUELS AND LUBRICANTS L T P C
3 0 0 3

OBJECTIVES

To understand the properties of fuels and lubricants for the design and operation of the I.C engines.

UNIT I MANUFACTURE OF FUELS AND LUBRICANTS 9

Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II THEORY OF LUBRICATION 9

Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT III PROPERTIES AND TESTING OF LUBRICANTS 9

Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.

UNIT IV PROPERTIES AND TESTING OF FUELS 9

Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion etc.

UNIT V ADDITIVES FOR LUBRICANTS AND FUELS 9

Additive - mechanism, requirements of additive, petrol fuel additives, diesel fuel additives – Additives and additive mechanism, for lubricants. Introduction to Nano fluids

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Ganesan.V., "Internal Combustion Engineering", Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2. M.L. Mathur, R.P.Sharma "A course in internal combustion engines", Dhanpatrai publication, 2003.
3. Obert.E.F "Internal Combustion Engineering and Air Pollution", International book Co., 1988.

REFERENCES

1. Brame, J.S.S. and King, J.G. – Fuels – Solids, Liquids, Gaseous.
2. Francis, W – Fuels and Fuel Technology, Vol. I & II
3. Hobson, G.D. & Pohl.W- Modern Petroleum Technology
4. A.R.Lansdown – Lubrication – A practical guide to lubricant selection – Pergamon press – 1982.
5. Raymond.C.Gunther – Lubrication – Chilton Book Co., - 1971.

AM8017 TWO AND THREE WHEELERS L T P C
3 0 0 3

OBJECTIVE:

The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.

UNIT I INTRODUCTION 7

Classifications- design considerations –weight and dimension limitations –requirements, stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS 12

2 stoke and 4 stoke engines. Design criteria for engines – design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical systems.

UNIT III CLUTCHES AND TRANSMISSION 10

Types of clutches. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Free wheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES 8

Types of frames. Wheel frames- construction design of frames for fatigue strength, torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS 8

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission, wheel types, wheel mountings attachment, tyre types. Brake systems.

TOTAL: 45 PERIODS

TEXTBOOK:

1. Irving P.E., “Motor Cycle Engineering”, Temple Press Book, London, 1964.
2. Marshal Cavandedish, ‘Encyclopedia of Motor cycling’, New York, 1989
3. Srinivasan.S., ‘Motor cycle, Scooter, Mopeds’, New century book house, 1988.

REFERENCES:

1. M.M.Griffin., ‘Motor cycles from inside and outside’, Prentice Hall Inc, New Jersey, 1978.
2. Johns.B.A., ‘Motorcycles’, Good Heartwill, 1984.
3. ‘Cycle Motor Manual’, Templeton Press Ltd., London, 1992.
4. Servicing Manuals- various motor cycles, Scooters, Mopeds and three wheelers.

AM8018 VEHICLE CONTROL SYSTEMS L T P C
3 0 0 3

OBJECTIVE:
To explain the principle of chassis management system and different sensors used in the systems.

UNIT I INTRODUCTION 9
Components of chassis management system – role of various sensors and actuators pertaining to chassis system – construction – working principle of wheel speed sensor, steering position, tyre pressure, brake pressure, steering torque, fuel level, Engine and vehicle design data.

UNIT II DRIVELINE CONTROL SYSTEM 9
Speed control – cylinder cut - off technology, Gear shifting control – Traction / braking control, brake by wire – Adaptive cruise control, throttle by wire. Steering - power steering, collapsible and tiltable steering column – steer by wire.

UNIT III SAFETY AND SECURITY SYSTEM 9
Airbags, seat belt tightening system, collision warning systems, child Lock, anti lock braking systems, Vision enhancement, road recognition system, Anti theft technologies, smart card system, number plate coding, central locking system.

UNIT IV COMFORT SYSTEM 9
Active suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, power windows, thermal management system, adaptive noise control.

UNIT V INTELLIGENT TRANSPORTATION SYSTEM 9
Traffic routing system - Automated highway systems - Lane warning system – Driver Information System, driver assistance systems - Data communication within the car, Driver conditioning warning - Route Guidance and Navigation Systems – vision enhancement system - In-Vehicle Computing – Vehicle Diagnostics system – Hybrid / Electric and Future Cars – Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. U. Kiencke, and L. Nielsen,Automotive Control Systems,SAE and Springer-Verlag, 2000.
2. Ljubo Vlacic, Michel Parent, Fumio Harashima, “Intelligent Vehicle Technologies”, Butterworth-Heinemann publications, Oxford, 2001.

REFERENCES:
1. Crouse, W.H. & Anglin, D.L., “Automotive Mechanics”, Intl. Student edition, 9th edition, TMH, New Delhi, 2002.
2. William B.Ribbens -Understanding Automotive Electronics, 5th edition, Butter worth Heinemann Woburn,1998.
3. Bosch, “Automotive HandBook”, 6th edition, SAE, 2004.
4. Internet References

AM8019 VEHICLE MAINTENANCE L T P C
3 0 0 3

OBJECTIVE
At the end of the course, the students will be able to have a complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.

UNIT I MAINTENANCE TOOL, SHOP, SCHEDULE, RECORDS 8

Standard tool set, torque wrenches, compression and vacuum gauges, engine analyzer and scanner, computerized wheel alignment and balancing, gauges for engine tune up and pollution measurement, spark plug cleaner, cylinder re boring machine, fuel injection calibration machine. Importance of maintenance. Schedule and unscheduled maintenance. Scope of maintenance. Equipment downtime. Vehicle inspection. Reports. Log books. Trip sheet. Lay out and requirements of maintenance shop.

UNIT II POWER PLANT REPAIR AND OVERHAULING 12

Dismantling of power plant and its components. Cleaning methods. Inspection and checking. Repair and reconditioning methods for all engine components. Maintenance of ignition system, fuel injection system, cooling system,- lubrication system. Power plant trouble shooting chart.

UNIT III MAINTENANCE, REPAIR AND OVERHAULING OF THE CHASSIS 10

Maintenance, servicing and repair of clutch, fluid coupling, gearbox, torque converter, propeller shaft. Maintenance of front axle, rear axle, brakes, steering systems.

UNIT IV MAINTENANCE AND REPAIR OF VEHICLE BODY 8

Body panel tools for repairing. Tinkering and painting. Use of soldering, metalloid paste. Tyre maintenance, metallic, plastics

UNIT V MAINTENANCE AND REPAIR OF ELECTRICAL SYSTEMS 7

Care, maintenance, testing and trouble shooting of battery, starter motor, dynamo, alternator and regulator. Transistorized regulator problems.

TOTAL : 45 PERIODS

TEXTBOOK:

1. A.W.Judge, Motor Vehicle Servicing, 3rd Edition, Pitman Paperpack, London , 1969.
2. W.Crouse, Everyday Automobile repair, Intl.student edition, TMH, New Delhi, 1986.
3. Ernest Venk., Edward spicer, Automotive maintenance and trouble shooting, D.B. Taraporevala Sons, Bombay, 1963

REFERENCES:

1. Stator Abbey, Automotive steering, braking and suspension overhaul, pitman publishing, London, 1971.
2. Frazee, fledell, Spicer,-Automobile collision Work, American technical publications, Chicago, 1953.
3. John Dolce, Fleet maintenance, Mcgraw Hill, Newyork, 1984
4. A,W.Judge, Maintenance of high speed diesel engines, Chapman Hall Ltd., London, 1956.
5. V.L.Maleev, Diesel Engine operation and maintenance, McGraw Hill Book CO., Newyork, 1995.
6. Vehicle servicing manuals.
7. Ernest Venk., Edward spicer, Automotive maintenance and trouble shooting, D.B. Taraporevala Sons, Bombay, 1963
8. S. Abbey, Automotive Transmission servicing and overhaul, Sir Issac Pitman, London, 1971.