ANNA UNIVERSITY : CHENNAI 600 025
UNIVERSITY DEPARTMENTS

CURRICULUM – R 2008

CURRICULUM FROM III TO VIII SEMESTERS FOR B.E. AUTOMOBILE ENGINEERING

SEMESTER III

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA9211	Mathematics III	3	1	0	4
AE9201	Engineering Fluid Mechanics	3	1	0	4
AU9201	Thermodynamics and Thermal Engineering	3	1	0	4
AU9202	Solid Mechanics	3	1	0	4
EI9211	Electronics and Instrumentation	3	0	0	3
AU9203	Automotive Petrol Engines	3	0	0	3
PRACTICAL					
PR9202	Computer Aided Part & Assembly Drawing	0	0	4	2
PR9203	Mechanical Sciences Laboratory	0	0	3	2
	TOTAL	**18**	**4**	**7**	**26**

SEMESTER IV

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA9262	Numerical Methods	3	1	0	4
PR9251	Theory of Machines	3	1	0	4
AU9251	Automotive Diesel Engines	3	0	0	3
AU9252	Automotive Chassis	3	1	0	4
AU9253	Automotive Electrical Systems	3	0	0	3
AU9254	Measurements and Metrology	3	0	0	3
PRACTICAL					
AU9255	Automotive Engine Components Lab	0	0	3	2
AU9256	Automotive Chassis Components Lab	0	0	3	2
EI9261	Electrical and Electronic Engineering Lab	0	0	3	2
	TOTAL	**18**	**3**	**9**	**27**

SEMESTER V

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AU9301	Machine Components Design	3	0	0	3
AU9302	Automotive Transmission	3	1	0	4
AU9303	Two and Three Wheeler Technology	3	0	0	3
AU9304	Automotive Materials and Production Techniques	3	0	0	3
AU9305	Automotive Pollution and Control	3	0	0	3
AU9306	Microprocessor application in automobiles	3	0	0	3
PRACTICAL					
AU9307	Vehicle Design Data Characteristics	1	0	3	3
AU9308	Engine Testing and Emission Measurement Lab	0	0	3	2
AU9309	Computer Aided Drafting	0	0	3	2
AU9310	Technical Seminar	0	0	2	1
	TOTAL	**19**	**1**	**11**	**27**

SEMESTER VI

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AU9351	Vehicle Design	3	1	0	4
AU9352	Electronic Engine Management Systems	3	0	0	3
AU9353	Vehicle Body Engineering	3	0	0	3
AU9354	Computer control of vehicle systems	3	0	0	3
	Elective I	3	0	0	3
PRACTICAL					
AU9355	Computer Application in Engine Design	1	0	3	3
AU9356	Computer Application in Chassis Design	0	0	3	2
AU9357	Automotive Electronics Lab	0	0	3	2
GE9371	Communication skills and Soft Skills Lab	0	0	2	1
	TOTAL	**16**	**1**	**11**	**24**

SEMESTER VII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
PR9402	Engineering Management	3	0	0	3
AU9401	Vehicle Dynamics	3	0	0	3
AU9402	Vehicle Maintenance	3	0	0	3
AU9403	Computer Simulation of IC Engine Processes	3	0	0	3
	Elective II	3	0	0	3
	Elective III	3	0	0	3
PRACTICAL					
AU9404	Vehicle Maintenance and Re-Conditioning Lab	0	0	3	2
AU9405	Industrial Training	-	-	-	1*
AU9406	Comprehension and Technical Seminar	0	0	2	1
	TOTAL	**18**	**0**	**5**	**22**

SEMESTER VIII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
	Elective – IV	3	0	0	3
	Elective – V	3	0	0	3
PRACTICAL					
AU9451	Project Work	0	0	12	6
	TOTAL	**6**	**0**	**12**	**12**

TOTAL CREDIT: 192

LIST OF ELECTIVES FOR B.E. AUTOMOBILE ENGINEERING

ELECTIVES – I

CODE NO.	COURSE TITLE	L	T	P	C
AE9354	Finite Element Method	3	0	0	3
AU9021	Automotive Aerodynamics	3	0	0	3
AU9026	Automotive Safety	3	0	0	3
AU9031	Combustion Thermodynamics and Heat Transfer	3	0	0	3
AU9032	Advanced Theory of IC Engines	3	0	0	3
AU9027	Rubber Technology for Automobiles	3	0	0	3
GE9021	Professional Ethics and Human Values	3	0	0	3
GE9022	Total Quality Management	3	0	0	3
GE9023	Fundamentals of Nanoscience	3	0	0	3
AU9025	Vehicle Air-Conditioning	3	0	0	3
PR9404	Manufacturing Process Planning and Cost Estimation	3	0	0	3
AU9030	Advanced Production Processes for Automotive Components	3	0	0	3
AU9033	Computer Integrated Manufacturing Systems	3	0	0	3
AU9034	Theory and Design of Jigs and Fixtures	3	0	0	3
AU9035	Hydraulic and Pneumatic systems	3	0	0	3
AU9022	Alternate Fuels and energy systems	3	0	0	3
AU9023	Special Types of Vehicles	3	0	0	3
AU9024	Tractor and Farm Equipments	3	0	0	3
AU9028	Fleet Management	3	0	0	3

MA9211 **MATHEMATICS III** **L T P C**
(Common to all branches of BE / B.Tech) **3 1 0 4**

AIM:
To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES:
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems

UNIT I FOURIER SERIES 9+3
Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 9+3
Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9+3
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3
Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9+3
Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

L: 45, T: 15, TOTAL= 60 PERIODS

TEXT BOOKS:
1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES:
1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. Ramana, B.V. "Higher Engineering Mathematics" Tata McGraw Hill (2007).
3. Bali, N.P. and Manish Goyal, "A Text Book of Engineering 7th Edition (2007)

AE9201 ENGINEERING FLUID MECHANICS L T P C
3 1 0 4

AIM: To introduce the concepts of Fluid Mechanics.
PRE-REQUISITE: Basics of Physics

OBJECTIVE:
To introduce the concepts of fluid statics viscosity and buoyancy. To make the student understand the basic laws namely, mass momentum and energy. To give an introduction on fluid machinery.

UNIT I BASIC CONCEPTS 15
Introduction – Fluid properties – Newton's viscosity law – Classification of fluids and fluid motion – Fluid statics – Hydrostatic force on submerged surfaces – stability of floating bodies – Dimensional analysis – The Buckingham-Pi theorem – Significant dimensionless groups – Flow similarity and model studies

UNIT II BASIC EQUATIONS OF FLUID FLOW ANALYSIS 15
Basic laws for a system in integral form – Conservation of mass – Newton's 2^{nd} law – Laws of thermodynamics – Application of the basic laws for a control volume – Kinematics – Motion of a fluid particle – Fluid deformation – Differential analysis of fluid motion – Continuity equation – Differential momentum equation – The Navier Stokes equations

UNIT III INCOMPRESSIBLE INVISCID FLOW 8
Euler's equations of motion – Bernoulli's equations – Applications – Methods of pressure measurement – Flow measurement – Orifice plate – Venturi meter – Irrotational flow – Stream function and velocity potential – Laplace equation – Elementary plane flows

UNIT IV INCOMPRESSIBLE VISCOUS FLOW 8
Fully developed laminar flow between infinite parallel plates – Laminar and turbulent flow through pipes – Velocity profiles – Energy considerations in pipe flow – Calculation of head loss Pipe flow problems – Hydraulic and energy grade lines – Moody's diagram

UNIT V FLUID MACHINERY 14
Introduction and classification of fluid machines – Turbo machinery analysis – The angular momentum principle – Euler turbo machine equation – Velocity triangles – Application to fluid systems – Working principle of turbines, fans, blowers, pumps and compressors.

L = 45, T = 15, TOTAL : 60 PERIODS

TEXT BOOKS

1. Shames I H, 'Mechanics of Fluids', Kogakusha, Tokyo, 1998
2. Robert W Fox & Alan T Mc.Donald, 'Introduction to fluid Mechanics', John Wiley and Sons, 1995

REFERENCE BOOKS

1. Yuan S W, 'Foundations of fluid Mechanics', Prentice-Hall, 1987
2. Milne Thompson L M, 'Theoretical Hydrodynamics', MacMillan, 1985
3. Rathakrishnan, E, 'Fundamentals of Fluid Mechanics', Prentice-Hall, 2007

AU9201 THERMODYNAMICS AND THERMAL ENGINEERING L T P C
3 1 0 4

OBJECTIVE:
To introduce fundamental concepts in thermodynamics, heat tramsfer, propulsion and refrigeration and air conditioning.

UNIT I BASIC THERMODYNAMICS 16
Systems, Zeroth low, First law. Steady flow energy equation. Heat and work transfer in flow and non-flow processes. Second law, Kelvin-Planck statement - Clausius statement - Concept of Entropy, Clausius inequality, Entropy change in non-flow processes. Properties of gases and vapours.

UNIT II AIR CYCLE AND COMPRESSORS 12
Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency . Mean effective pressure, Reciprocating compressors. Intercooling – Minimum work requirement

UNIT III STEAM AND JET PROPULSION 12
Properties of steam – Rankine cycle – Steam Nozzles – Simple jet propulsion system – Thrust rocket motor – Specific impulse.

UNIT IV REFRIGERATION AND AIR-CONDITIONING 10
Principles of Psychrometry and refrigeration - Vapour compression - Vapour absorption types - Co-efficient of performance, Properties of refrigerants – Basic Principle and types Air conditioning.

UNIT V HEAT TRANSFER 10
Conduction in parallel, radial and composite wall – Basics of Convective heat transfer - Fundamentals of Radiative heat transfer – Flow through heat exchangers.

L = 45, T = 15, TOTAL : 60 PERIODS

(Use of standard thermodynamic tables, Mollier diagram and Refrigerant property tables are permitted)

TEXT BOOKS

1. Nag.P.K., “Engineering Thermodynamics”, Tata McGraw-Hill, New Delhi, 2007.
2. Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, Prentice-Hall India, 2005.

REFERENCES

1. Ramalingam K.K. “Thermodynamics”, Sci-Tech Publications, 2006
2. Holman.J.P., “Thermodynamics”, 3rd Ed. McGraw-Hill, 2007.
3. Venwylen and Sontag, “Classical Thermodynamics”, Wiley Eastern, 1987
4. Arora C.P, “ Thermodynamics”, Tata McGraw-Hill, New Delhi, 2003.
5. Merala C, Pother, Craig W, Somerton, “ Thermodynamics for Engineers”, Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.

AU9202 **SOLID MECHANICS** **L T P C**
3 1 0 4

OBJECTIVE:

- To gain knowledge of simple stresses, strains and deformation in components due to external loads.
- To assess stresses and deformations through mathematical models of beams, twisting bars or combinations of both.
- Effect of component dimensions and shape on stresses and deformations are to be understood.
- The study would provide knowledge for use in the design courses

To provide knowledge on analysis of various structural elements for different loading condition

UNIT I AXIAL LOADING 12

Stresses and strains – Hooke's law – stress and strain diagrams - elastic constants – statically determinate and indeterminate problems in tension & compression – thermal stresses – impact loading.

UNIT II STRESSES IN BEAMS 10

Shear force & bending moment diagrams – bending stresses – shear stress variation in beams of symmetric sections – beams of uniform strength.

UNIT III DEFLECTION OF BEAMS 12

Double integration method – Macaulay's method – moment area method – conjugate beam method – principle of superposition – Strain Energy in axial, bending, torsion and shear loadings. Castigliano's theorems and their applications.

UNIT IV TORSION – SPRINGS – COLUMNS 14

Torsion of solid and hollow circular shafts – shear stress variation – power transmission in shafts – open and closed-coiled helical springs – stresses in helical springs – classification of columns – Euler buckling – columns with different end conditions.

UNIT V BIAXIAL STRESSES 12

Stresses in thin-walled pressure vessels – combined bending, torsion and axial loading of circular shafts – Mohr's circle and its construction – determination of principal stresses.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Gere & Timoshenko, 'Mechanics of Materials', McGraw Hill, 1993
2. William Nash, Strength of Materials, Tata McGraw Hill, 2004

REFERENCES:

1. Dym,C.L., and Shames,I.H., 'Solid Mechanics', McGraw Hill, Kogakusha, Tokyo, 1973.
2. Stephen Timoshenko, 'Strength of Materials', Vol I & II, CBS Publishers and Distributors, Third Edition.
3. R.K.Rajput, 'Strength of Materials', S. Chand and Co., 1999.
4. Timoshenko,S. and Young,D.H., Elements of Strength of Materials, T.Van Nostrand Co. Inc., Princeton, N.J., 1977.

EI9211 ELECTRONICS AND INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVE:

- To impart the knowledge on basic concepts of electronic components, devices and circuits
- To impart the knowledge on measurements and instruments

UNIT I ELECTRONIC COMPONENTS AND DEVICES 10

Resistors, Capacitors, Inductors and Transformers - properties, types. Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor and Field Effect Transistors – operating principles and characteristics. Other Devices – UJT, SCR, LED, Photodetectors.

UNIT II ANALOG CIRCUITS 10

Rectifier and Power Supply Circuits, clipper, clamper using diodes, Operational Amplifiers (Ideal) – properties and typical circuits like differentiator, integrator, summer, comparator, single-stage BJT's and FET's amplifiers – Multistage Amplifier Principles(Qualitative Treatment only).

UNIT III DIGITAL CIRCUITS 10

Basics of Boolean Logic – Logic Gates, Flip-Flops, Shift-Registers, Counters, Decoders/Drivers, Timer, Display Devices, A/D and D/A Converters.

UNIT IV MEASUREMENTS AND INSTRUMENTS 7

Definitions of Accuracy, Precision, Sensitivity, Resolution, Linearity, Range, Measurement of Electrical Quantities – Voltmeter, Ammeter, Watt-Meter, DMM, CRO, DSO, Transducers and signal conditioning systems for pressure, temperature, acceleration measurements (Qualitative Treatment only).

UNIT V MICROPROCESSORS AND APPLICATIONS 8

Architecture of 8085 processors, Address Modes, Instruction set, simple programming like addition, subtraction, multiplication, logical operation, Peripherals and Interfacing – 8255, 8251. Applications like motor control, keyboard and PC interface, Introduction to Microcontrollers.

TOTAL : 45PERIODS

TEXT BOOKS

1. Millman.J. and Halkias.C., "Integrated Electronics", Tata McGraw Hill, 2004.
2. Paul Horowitz and Wilfred Hill "The Art of Electronics", Cambridge University press,1989.

REFERENCES

1. Donald P Leach, Albert Paul Malvino and Goutam Saha," Digital Principles & Applications",6E, Tata McGraw Hill, 2006.
2. A.K.Sawhney, A course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Raj. and Sons, New Delhi, 1999
3. Helfrick.A.D., and Cooper.W.D., '"Electronic Instrumentation and Measurement techniques", Prentice Hall of India, 1998.
4. Gaonkar. Ramesh S, " Microprocessor Architecture Programming and Applications with 8085", 5th Ed. Penram International Publishing (India). 2003 .
5. Kenneth J.Ayala., "The 8051 Microcontroller Architecture Programming and Applications", 2ed, Penram International Publishing (India).2004.

AU9203 AUTOMOTIVE PETROL ENGINE L T P C
3 0 0 3

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

UNIT I ENGINE CONSTRUCTION AND OPERATION 10
4 stroke engine - Constructional details, working principle. Otto cycle, Actual indicator diagram. Fuel air cycle. Cylinder layout and configurations. Firing order and its significance. Engine balancing. Materials of engine components.

UNIT II SI ENGINE FUEL SYSTEM 10
Carburettor working principle. Requirements of an automotive carburetor – starting, idling, acceleration and normal circuits of a carburetor – Compensation – Maximum power devices – Constant choke and constant vacuum carburetor, multi barrel and multiple venturi systems – Fuel feed system – Mechanical and electrical pumps – Petrol injection.

UNIT III COOLING AND LUBRICATION SYSTEM 8
Need for cooling. Types of cooling system – air cooling and Liquid cooled systems. Forced circulation system, pressure cooling system – Need for Lubrication system. Mist lubrication system, wet sump lubrication – Properties of lubricants, properties of coolant.

UNIT IV COMBUSTION AND COMBUSTION CHAMBERS 9
Combustion in SI engine – Stages of combustion – Flame propagation – Rate of pressure rise – Abnormal combustion – pre ignition and knock – effect of engine variables on knock – Combustion chambers – Different types – Factors controlling combustion chamber design.

UNIT V TWO STROKE ENGINES 8
Two stroke engine – types, terminologies, definitions, construction and operation. Comparison of four stroke and two stroke engine operation. Theoretical scavenging methods. Scavenging pumps – Types of scavenging.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Ramalingam. K. K., Internal Combustion Engines, Scitech publications, Chennai, 2003
2. Ganesan.V., Internal Combustion Engines, Tata McGraw Hill Publishing Co., New York, 1994.

REFERENCES

1. Heldt.P.M. High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1975.
2. Obert E.F., Internal Combustion Engines Analysis and Practice, International Text Books: Co., Scranton, Pennsylvania, 1988.
3. William.H.Crouse, Automotive Engines, McGraw Hill Publishers, 1985.
4. Ellinger, H.E., Automotive Engines, Prentice Hall Publishers, 1992.

PR9202 COMPUTER AIDED PART & ASSEMBLY DRAWING L T P C
0 0 4 2

OBJECTIVES:

- To train the students in construction of machine elements and assembly drawing
- To train the students to allocate geometrical tolerance and to develop part drawing

Instruction to machine drawing & production drawing classification of drawing – BIS conventions – Orthogrphic and sectional views. Reviews of the concepts of limits, tolerance, fits, surface roughness, and symbols terminology used in Production drawing.

Machine element joints – Types of joints – Screw fasteners – Pin joints, couplings welded joints.

Computer Aided Production Drafting

Detailed part drawing and assembly drawings (with suitable tolerances, machine sumbols, specification of fit).

1) Screw jack
2) Shaper tool head
3) Non return valve
4) Plummer block
5) Foot step drawing
6) Machine vice
7) Four jaw chuck of lathe
8) Lathe tail stock
9) Square tool post
10) Universal coupling
11) Hydraulic & Pneumatic Assembly

TOTAL : 60 PERIODS

TEXT BOOK:

1. Narayana K.L., Kannaiah P and Venkata Reddy – “Production Drawing” New age International Limited, Delhi 2004.

REFERENCE

1. Bhat N.D., “Machine Drawing”, Charotar Publishing House, Anand 2000
2. Nagtal G.R., “Machine Drawing”, Khanna Publishers, New Delhi 1994.
3. Sache Singh & P.L. Shah – Fundamentals of Machine Drawing, Prentice Hall India, 2003.

PR9203 **MECHANICAL SCIENCES LAB** **L T P C**
0 0 3 2

OBJECTIVE :
To train the students in testing and quantifying the mechanical properties of Engineering Materials, Engines.

LIST OF EXPERIMENTS

- Tension Test
- Torsion Test
- Testing of springs
- Impact test i) Izod, ii) Charpy
- Hardness test i) Vickers, ii) Brinell, iii) Rockwell, iv) Shore
- Deflection of Beams
- Dye Penetrant Test
- Tensile testing of polymers.
- Flex Fatigue test for Elastomers.
- Injection moulding machine operation.
- Performance test on a 4 storke engine
- Viscosity determination of the given fluid
- Moment of inertial of connecting rod
- Determination of Effectiveness of a parallel and counter flow heat exchangers
- Valve timing of a 4 stroke engine and port timing of a 2 stroke engine
- Determination of Flash point and Fire point of the given oil.

TOTAL : 45 PERIODS

MA9262 **NUMERICAL METHODS** **L T P C**
3 1 0 4

AIM:
This course gives a complete procedure for solving numerically different kinds of problems occurring in engineering and technology.

OBJECTIVES:
The students would be acquainted with the basic concepts of numerical methods and their applications.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS (10 +3)
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss Elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigenvalues of a matrix by Power method and by Jacobi's method.

UNIT II INTERPOLATION AND APPROXIMATION (8 + 3)
Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION (9 + 3)

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS (9 + 3)

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (9 + 3)

Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank Nicholson) methods - One dimensional wave equation by explicit method.

L = 45 T = 15 TOTAL = 60 PERIODS

TEXT BOOKS

1. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004.
2. Sankara Rao, K. "Numerical methods for Scientists and Engineers', 3rd Edition Prentice Hall of India Private Ltd., New Delhi, 2007.

REFERENCE BOOKS

1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, 2006.
3. Brian Bradie, "A friendly introduction to Numerical analysis", Pearson Education Asia, New Delhi, 2007.

PR9251 THEORY OF MACHINES L T P C
3 1 0 4

OBJECTIVES:

- To understand the basic concepts of mechanisms and machinery
- To expose the students the different mechanisms, their method of working, Forces involved and consequent vibration during working

UNIT I MECHANISMS 14

Definition – Machine and Structure – Kinematic link, pair and chain – classification of Kinematic pairs – Constraint & motion – Degrees of freedom slider crank – Single and double – Crank rocker mechanisms – Inversions – applications, Kinematic analysis and synthesis of simple mechanisms – Determination of velocity and acceleration of simple mechanisms.

UNIT II FRICTION 12

Types of friction – friction in screw and nut – pivot and collar – thrust bearings – collar bearing – plate and disc clutches – belt (flat & vee) and rope drives – creep in belts – Jockey pulley – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions– condition for maximum power transmission.

UNIT III GEARING AND CAMS 12

Gear profile and geometry – nomenclature of spur & helical gears – laws of gearing – interference – requirement of minimum number of teeth in gears – gear trains – simple and compound gear trains – determination of speed and torque in epicyclic gear trains – cams different types of followers – cam design for different follower motions.

UNIT IV BALANCING 11

Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – balancing single and multi cylinder Engines – Governors and Gyroscopic effects.

UNIT V VIBRATION 11

Free, forced and damped vibrations of single degree of freedom systems – force transmitted to supports – vibration Isolation – vibration absorption – torsional vibration of shafts – single and multirotor systems – geared shafts – critical speed of shafts.

L = 45 T = 15 TOTAL = 60 PERIODS

TEXT BOOK

1. Bansal Dr.R.K. " Theory of Machines" Laxmi Publications (P) Ltd., New Delhi 2001
2. Rattan S.S."Theory of machines" Tata McGraw Hill publishing Co., New Delhi, 2002.

REFERENCES:

1. Rao J.S.and Dukkipati R.V. "Mechanism and Machine Theory" Second Edition, Wiley Eastern Limited, 1992.
2. Malhotra D.R. and Gupta H.C "The Theory of machines" Satya Prakasam, Tech. India Publications, 1989
3. Gosh A and Mallick A.K. "Theory of Machines and Mechanisms" affiliated east west press, 1989
4. Shingley J.E. and Vicker J.J. Theory of Machines and Mechanisms" McGraw Hill, 1986.
5. Burton Paul "Kinematics and Dynamics of Machinery", Prentice Hall, 1979.

AU9251 AUTOMOTIVE DIESEL ENGINES L T P C
3 0 0 3

OBJECTIVE :

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

UNIT I DIESEL ENGINE BASIC THEORY 9

Diesel engine construction and operation. Two stroke and four stroke diesel engines. Diesel cycle – Fuel-air and actual cycle analysis. Diesel fuel. Ignition quality. Cetane number. Laboratory tests for diesel fuel. Standards and specifications.

UNIT II FUEL INJECTION SYSTEM 9

Requirements – solid injection. Function of components –common rail direct injection - Jerk and distributor type pumps. Pressure waves, Injection lag. Unit injector. Mechanical and pneumatic governors. Fuel injector, Types of injection nozzle, Nozzle tests. Spray characteristics. Injection timing. Pump calibration. Pilot injection.

UNIT III AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS 10

Importance of air motion – Swirl, squish and turbulence, Swirl ratio. Fuel air mixing. Stages of combustion. Delay period – factors affecting delay period. Knock in CI engines. Comparison of knock in CI & SI engines. Direct and indirect injection combustion chambers. Air cell chamber. Combustion chamber design – objectives – Different types of combustion chamber. M.Combustion chamber. Combustion chambers for Homogeneous charge compression ignition systems – Dual and alternate fueled engine systems.

UNIT IV SUPERCHARGING AND TURBOCHARGING 8

Necessity and limitation – Charge cooling. Types of supercharging and turbocharging – Relative merits. Matching of turbocharger.

UNIT V DIESEL ENGINE TESTING AND PERFORMANCE 9

Automotive and stationary diesel engine testing and related standards – Engine power and efficiencies – performance characteristics. Variables affecting engine performance – Methods to improve engine performance – Heat balance – Performance maps.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. K. K. Ramalingm, internal Combustion Engines, Scitech publications, Chennai, 2003.
2. Ganesan,V., Internal Combustion Engines, Tata-McGraw Hill Publishing Co., New Delhi, 1994.

REFERENCES:

1. Heldt,P.M., High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1985.
2. Obert,E.F., Internal Combustion Engine analysis and Practice, International Text Book Co., Scranton, Pennsylvania, 1988.
3. Maleev,V.M., Diesel Engine Operation and Maintenance, McGraw Hill, 1974. Dicksee,C.B., Diesel Engines, Blackie & Son Ltd., London, 1964.

AU9252 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 INTRODUCTION, FRAME, STEERING SYSTEM 9+3

Types of Chassis layout, with reference to Power Plant location and drive, various types of frames, Loads acting on vehicle frame, Constructional details and materials for frames, Testing of frames, Types of Front Axles and Stub Axles, Front Wheel Geometry, namely, Castor, Camber, King Pin Inclination and Toe–in, Condition for True Rolling Motion of Wheels during Steering, Ackerman's and Davis Steering Mechanisms, Steering Error Curve, Steering Linkages, Different Types of Steering Gears, Slip Angle, Over–Steer and Under–Steer, Reversible and Irreversible Steering, Power–Assisted Steering.

UNIT II PROPELLER SHAFT AND FINAL DRIVE 9+2

Effect of Driving Thrust, torque reactions and side thrust, Hotchkiss drive, torque tube drive, radius rods and stabilizers, Propeller Shaft, Universal Joints, Constant Velocity Universal Joints, Front Wheel drive, Final drive, different types, Double reduction and twin speed final drives, Multi–axled vehicles, Differential principle and types, Differential housings, Non–Slip differential, Differential locks, Final drive of Crawler Tractors.

UNIT III AXLES AND TYRES 9+2

Construction and Design of Drive Axles, Types of Loads acting on drive axles, Full – Floating, Three–Quarter Floating and Semi–Floating Axles, Axle Housings and Types, Types and Constructional Details of Different Types of Wheels and Rims, Different Types of Tyres and their constructional details.

UNIT IV SUSPENSION SYSTEM 9+4

Need for Suspension System, Types of Suspension Springs, Constructional details and characteristics of Single Leaf, Multi–Leaf, Coil, Torsion bar, Rubber, Pneumatic and Hydro – elastic Suspension Spring Systems, Independent Suspension System, Shock Absorbers, Types and Constructional details, Design of Leaf and Coil Springs.

UNIT V BRAKING SYSTEM 9+4

Theory of Automobile Braking, Stopping Distance Time and Braking Efficiency, Effect of Weight Transfer during Braking, Theory of Drum Brakes, Loading and Trailing Shoes, Braking Torque, Constructional Details of Drum Brake and its Activators, Disc Brake Theory, Types and Construction, Hydraulic Braking System, Mechanical Braking System, Pneumatic Braking System, Power–Assisted Braking System, Servo Brakes, Retarders, Types and Construction, Anti–Lock Braking System, Constructional Details.

TOTAL 45 + 15 = 60 PERIODS

TEXT BOOKS :

1. Kripal Singh, Automobile Engineering, Standard Publisher, New Delhi , 2006
2. R.K. Rajput, A Text–Book of Automobile Engineering, Laxmi Publications Private Limited, 2007
3. N.K. Giri, Automotive Mechanics, Kanna Publishers, 2007

REFERENCES :-

1. Heldt P.M., Automotive Chassis, Chilton Co., New York, 1990
2. Newton Steeds and Garret, Motor Vehicles, 13th Edition, Butterworth, London, 2005.
3. Heinz Hazler, Modern Vehicle Technology, Butterworth, London, 2005.

AU9253 AUTOMOTIVE ELECTRICAL SYSTEMS L T P C
3 0 0 3

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.

UNIT I BATTERIES 8
Principle and construction of lead-acid battery. Characteristics of battery, rating, capacity and efficiency of batteries. Various tests on battery condition, charging methods. Details of modern storage batteries.

UNIT II STARTING SYSTEM 9
Condition of starting Behavior of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units. Care & maintenance of starter motor, Starter switches.

UNIT III CHARGING SYSTEM 9
Function, Components of DC and AC Charging System for Automobile, construction, operating principle, characteristics, charging circuit controls – cut out, relays, voltage and current regulators, troubleshooting

UNIT IV IGNITION SYSTEM 10
Types, construction & working of battery coil and magneto ignition systems. Relative merits, centrifugal and vacuum advance mechanisms. Types and construction of spark plugs, Electronic Ignition system. Digital ignition system.

UNIT V LIGHTING SYSTEM & ACCESSORIES 9
Insulated & earth return systems. Positive & negative earth systems. Details of head light & side light. Head light dazzling & preventive methods. Electrical fuel-pump, Speedometer, Fuel, oil & temperature gauges, Horn, Wiper system, Trafficator, wiring system.

TOTAL 45 PERIODS

TEXT BOOK:

1. Judge,A.W., Modern Electrical Equipment of Automobiles, Chapman & Hall, London, 1992.

REFERENCES:

1. Young,A.P. & Griffiths,L., Automobile Electrical Equipment, English Language Book Society & New Press, 1990.
2. Vinal,G.W., Storage Batteries, John Wiley & Sons Inc., New York, 1985.
   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. Kholi,P.L., Automotive Electrical Equipment, Tata McGraw-Hill Co. Ltd., New Delhi, 1975.
5. Automotive Hand Book, fifth edition, Robert Bosch, Bently Publishers, 2003.

AU9254 MEASUREMENTS AND METROLOGY 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

UNIT I LINEAR MEASUREMENT 9
Units and standards, terminology and measurement errors. Linear measuring instruments, dial gauges, comparators and linear measuring machines. Angular measuring instruments- measurement of straightness flatness and surface finish. Profilographs..

UNIT II PRESSURE MEASUREMENT 9
Bourden tube, diaphragm, bellows and pressure capsules: Transducers used in pressure measurement- potentiometer, strain gauges, LVDT, capacitive and variable reluctance type transducers. Dynamic pressure measurement piezo electric and piezo resistive transducers. Farnboro engine indicator. Low pressure measurement Mc leod gauge, Pirani gauge,, thermal conductivity type pressure measurement.

UNIT III FLOW MEASUREMENT: 9
Obstruction type flow meter- orifice plate, venturimeter, flow nozzles, pitot tube, rotometer. Positive displacement flow meters – turbine flow meter, flouted tube flowmeter, anemometer, ultrasonic flow meter, magnetic flow meters. Alcock viscous air flow meter.

UNIT IV TEMPERATURE MEASUREMENT: 9
Temperature scales – mechanical temperature sensors, liquid in glass, vapour pressure, bimetal temperature gauges. Resistance type temperature sensors. Thermistors, thermocouples, Laws of thermocouple, types of thermocouples. Construction and circuits for thermocouples. High temperature measurement pyrometers.

UNIT V FORCE AND TORQUE MEASUREMENT: 9
Force measuring devices- Balances, platform scales, weigh bridges, load cells, proving ring. Torque measurement – prony brake, rope brake and fan type brakes. Dynamometers – hydraulic, electric cardle and eddy current dynamometers. Transmission dynamometers. Chassis dynamometers.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Jain R.K., “Engineering Metrology”, Khanna publishers, New Delhi, 2005.
2. Rangan C.S., Sarma G.E and Mani V.S “Instrumentation devices and systems”. TMH Publishing Co. New Delhi, 2001.
3. Beckwith T.G & Buck N.L “Mechanical Measurements”, Oxford and IBH publishing house New Delhi, 2004.

REFERENCES:

1. Patranabis D, “Principles of industrial instrumentation”, TMH Publishing Co. New Delhi, 2000.
2. Jain R.K., “Mechanical & Industrial Measurements” , Khanna publishers, New Delhi, 2005.
3. Doeblin,”Measurement System Application &Design” McGraw Hill ,New Delhi, 2004.
4. Gaylor F.W and Shotbolt C.R “Metrology for Engineers”, ELBS, 2006.

AU9255 AUTOMOTIVE ENGINE COMPONENTS LAB L T P C
0 0 3 2

OBJECTIVE:
To familiarize and train the students on the constructional arrangements of different engine system.

Study of the following engines and its components by dismantling, comparing with recent engine components and assembling various parts:

- Tata engine
- Leyland engine
- Ambassador engine
- Fiat engine
- Maruthi 800 CC engine
- Maruthi 1000 CC engine
- Ford Car engine
- Two stroke engines (TVS Suzuki, Hero Honda, Scooters, Mopeds etc.)
- MPFI Engine

TOTAL : 45 PERIODS

AU9256 AUTOMOTIVE CHASSIS COMPONENTS LAB L T P C
0 0 3 2

OBJECTIVE:
To familiarize and train the students on the constructional arrangements of different chassis system.

Study and measurement of the following chassis

- Tata
- Leyland
- Ambassador
- Premier Padmini
- Maruthi car (Front engine, front wheel drive & constant velocity joint)
- Mahindra & Mahindra Jeep
- Tata Mini Lorry

Study, dismantling & assembling

- Front axle – Rzeppa joint assembly
- Rear axle
- Clutch 2 types – Coil spring& Diaphragm spring clutches
- Gear box – Sliding mesh, Constant mesh & Synchromesh Gear Box
- Transfer case
- Steering system
- Braking system
- Differential mechanism
- Power steering mechanism

TOTAL: 30 PERIODS

EI9261 ELECTRICAL AND ELECTRONICS ENGINEERING LAB L T P C
0 0 3 2

OBJECTIVE:
To train the students performing various tests on electrical drives, sensors and circuits

- Load test on separately excited DC shunt generator
- Load test on DC shunt moor
- Load test on Sϕ Transformer
- Load test on Induction motor
- Regulation of 3ϕ Alternator
- Study of CRO
- Logic gates
- Operational amplifiers
- Time constant of RC circuit
- Characteristics of LVDT
- Calibration of Rotometer
- RTD and thermistor
- Flapper Nozzle system

AU 9301 MACHINE COMPONENTS DESIGN L T P C
3 0 0 3

AIM:

This course gives a complete procedure for designing different kinds of problems occurring in design engineering field especially in automobile engineering.

OBJECTIVES:

- To familiarize the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components

UNIT I INTRODUCTION 12

Classification of design - Engineering materials and their physical properties as applied to design - Selection of materials - Factors of safety in design - Endurance limit of materials - Determination of endurance limit for ductile materials - Notch sensitivity Principle of design optimization - Future trends - CAD Euler's formula - - Rankine's formula - Tetmajer's formula - Johnson formula - Design of push rods and eccentricity loaded columns - Reduction of stress concentration.

UNIT II DESIGN OF SHAFTS AND SPRINGS 9

Introduction - Material and design stresses - Design of axles - Design of shafts on the basis of strength - Design of shaft on the basis of rigidity - Design of hollow shafts - Design of close coiled helical spring subjected to axial loading - Torsion of helical springs.

UNIT II GEAR DESIGN 8

Design considerations - strength of gear teeth - Lewis equation - Terminology of gearsDynamic tooth load - Design of spur gears - helical gears - herringbone gears - bevel gears and worm gears. .

UNIT IV FLYWHEELS 7

Determination of the mass of a flywheel for a given co-efficient of speed fluctuation. Engine flywheels stresses of rim of flywheels. Design of hubs and arms of flywheel - Turning moment diagram.

UNIT V DESIGN OF BEARINGS 9

Design of journal bearings - Ball and Roller bearings - Types of Roller bearings - Bearing life - Static load capacity - Dynamic load capacity - Bearing material - Boundary lubrication - Oil flow and temperature rise.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Jain,R.K., "Machine Design", Khanna Publishers, 1992.
2. Sundararaja Murthy, T.V., "Machine Design", Khanna Publishers, New Delhi, 1991.
3. Bhandari,v.B., "Design of Machine Elements", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1990.

REFERENCES:

1. Hall Allen,S. & other, “Machine Design” , Schaum publisher Co., 1982.
2. Sigley, “Machine Design”, McGraw Hill,1981.
3. “Design Data Book “, PSG College of Technology, Coimbatore,1992

AU9302 AUTOMOTIVE TRANSMISSION L T P C
3 1 0 4

OBJECTIVE:

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 devices and automatic transmission system will be taught to the students. The design of clutch and gearbox will all so 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 AND GEAR BOX 14

Problems on performance of automobile - such as resistance to motion, tractive effort, engine speed, engine power and acceleration. Requirement of transmission system. Different types of clutches, principle, Construction and torque capacity. Determination of gear ratios for vehicles. Different types of gearboxes such as Sliding mesh gearbox, Constant mesh gearbox and Synchromesh gearbox.

UNIT II HYDRODYNAMIC DRIVE 12

Fluid coupling - Principle of operation, Constructional details, Torque capacity, Performance characteristics and Reduction of drag torque. Hydrodynamic Torque converter - Principle of operation, Constructional details and Performance characteristics. Multistage torque converters. Polyphase torque converters. Converter coupling

UNIT III PLANETARY GEAR BOXES 10

Construction and operation of Ford – T-model gearbox, Wilson Gear box and Cotal electromagnetic transmission.

UNIT IV AUTOMATIC TRANSMISSION APPLICATIONS 12

Need for automatic transmission, Principle of operation. Hydraulic control system for automatic transmission. Chevrolet “Turboglide” Transmission, Continuously Variable Transmission (CVT) – Types – Operations.

UNIT V HYDROSTATIC AND ELECTRIC DRIVE 12

Hydrostatic drive - Various types of hydrostatic systems, Principles of Hydrostatic drive system. Advantages and limitations. Comparison of hydrostatic drive with hydrodynamic drive, Construction and Working of typical Janny hydrostatic drive. Electric drive - Principle of operation of Early and Modified Ward Leonard Control system, Advantages & limitations.

TOTAL:60 PERIODS

TEXT BOOKS

1. Heldt P.M – “Torque Converters”- Chilton Book Co.-1992
2. Judge, A.W., Modern Transmission systems, Chapman and Hall Ltd., 1990.
3. Newton and Steeds – “Motor Vehicle”- Illiffee Publisher- 2000.

REFERENCES

1. Design Practices, passenger Car Automotive Transmissions- SAE Hand book-1994.
2. Crouse, W.H., Anglin, D.L., Automotive Transmission and Power Trains construction, McGraw Hill, 1992.
3. Heldt, P.M., Torque converters, Chilton Book Co., 1992.

AU9303 TWO AND THREE WHEELER TECHNOLOGY L T P C
3 0 0 3

OBJECTIVE:

The aim of this course is to make the students to know and understand the constructional details operating characteristics and vehicle design aspects

UNIT I THE POWER UNIT 9

Two stroke and four stroke SI engine, merits and demerits, Symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes, merits and demerits, scavenging efficiency. Scavenging pumps. Rotary valve engine. Fuel system. Lubrication system. Magneto coil and battery coil spark ignition system. Electronic ignition System. Starting system. Kick starter system.

UNIT II CHASSIS AND SUB-SYSTEMS 8

Main frame, its types. Chassis and shaft drive. Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar.

UNIT III BRAKES AND WHEELS 8

Drum brakes, Disc brakes, Front and rear brake links lay-outs. Spoked wheel, cast wheel. Disc wheel. Disc types. Tyres and tubes.

UNIT IV TWO WHEELERS 10

Case study of motor cycles, scooters and mopeds. Servicing and maintenance.

UNIT V THREE WHEELERS 10

Case study of Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Irving,P.E., Motor cycle Engineering, Temple Press Book, London, 1992.

REFERENCES:

1. The Cycle Motor Manual, Temple Press Ltd., London, 1990.
2. Encyclopedia of Motor cycling, 20 volumes, Marshall Cavensih, New York and London, 1989.
3. Bryaut,R.V., Vespa Maintenance and Repair series.
4. Raymond Broad, Lambretta – A practical guide to maintenance and repair, 1987.

AU9304 AUTOMOTIVE MATERIALS AND PRODUCTION TECHNIQUES L T P C
3 0 0 3

UNIT I ELASTIC AND PLASTIC BEHAVIOUR OF MATERIALS 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 HEAT TREATMENT AND SURFACE TREATMENT 10

Heat treatment of steel - Annealing - Types, normalising, Types, hardening and tempering with specific relevance to automotive components, surface hardening techniques, Induction, flame and chemical hardening, coating of wear and corrosion resistance, Electroplating. Phosphating, Anodizing, hot dipping, thermal spraying, hard facing and thin film coatings.

UNIT III SELECTION OF MATERIALS 9

Criteria of selecting materials for automotive components viz cylinder block, Cylinder head, piston, piston ring, Gudgeon pin, connecting rod, crank shaft, crank case, cam, cam shaft, engine valve, gear wheel, clutch plate, axle, bearings, chassis, spring, body panel - radiator, brake lining etc. Application of non-metallic materials such as composite, ceramic and polymers in automobile.

UNIT IV CASTING FOR AUTOMOTIVE ENGINE COMPONENTS 8

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.

UNIT V MACHINING OF AUTOMOTIVE ENGINE COMPONENTS 9

Machining of connecting rods – crank shafts – cam shafts – pistons – piston pins – piston rings- valves – front and rear axle housings – fly wheel – Honing of cylinder bores – Copy turning and profile grinding machines – Materials and properties.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Khanna.O.P., " Material Science and Metallurgy ", Dhanapal Rai & Sons, 1992.
2. Heldt,P.M., High Speed Combustion Engines, Oxford Publishing Co., New York, 1990.

REFERENCES

1. Kapoor, " Material Science and Processes ", New India Publishing House, 1987.
2. Dieter.G.E., Mechanical Metallurgy, McGraw Hill, New York, 1972.
3. Avner.S.H., Introduction to physical metallurgy, MaGraw Hill, New York., 1982.
4. Raghavan.V., Physical Metallurgy, Principle and Practice, Prentice Hall, 1995.
5. Avner S.H". Introduction to Physical Metallurgy" McGraw-Hill, New York, 1982.
6. Haslehurst,S.E., Manufacturing Technology, ELBS, London, 1990.
7. Upton, Pressure Die Casting, Pergamon Press, 1985.

AU9305 AUTOMOTIVE POLLUTION AND CONTROL L T P C
3 0 0 3

OBJECTIVES

To make the students to realize the impact of automobile emissions on the environment and expose student to factors affecting the formation and control of automobile pollutants.

UNIT I INTRODUCTION 9

Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, types of emission, transient operational effects on pollution.

UNIT II POLLUTANT FORMATION IN SI ENGINES 9

Pollutant formation in SI Engines, mechanism of HC and CO formation in four stroke and two stroke SI engines, NOx formation in SI engines, effects of design and operating variables on emission formation, control of evaporative emission. Two stroke engine pollution.

UNIT III POLLUTANT FORMATION IN CI ENGINES 9

Pollutant formation in CI engines, smoke and particulate emissions in CI engines, effects of design and operating variables on CI engine emissions. Nox formation and control. Color and Aldehyde emissions Noise pollution from automobiles, measurement and standards.

UNIT IV CONTROL OF EMISSIONS FROM SI AND CI ENGINES 9

Design of engine, optimum selection of operating variables for control of emissions, EGR, Air injector PCV system, Thermal reactors, secondary air injection, catalytic converters, catalysts, fuel modifications, fuel cells, Two stroke engine pollution control.

UNIT V MEASUREMENT TECHNIQUES EMISSION STANDARDS AND TEST PROCEDURE 9

NDIR, FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards, driving cycles – USA, Japan, Euro and India. Test procedures – ECE, FTP Tests. SHED Test – chassis dynamometers, dilution tunnels.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Paul Degobert – Automobiles and Pollution – SAE International ISBN-156091-563-3, 1991.
2. Ganesan, V- “Internal Combustion Engines”- Tata McGraw-Hill Co.- 2003.
3. Springer and Patterson, Engine Emission, Plenum Press, 1990.

REFERENCES

1. SAE Transactions- “Vehicle Emission”- 1982 (3 volumes).
2. Obert.E.F.- “Internal Combustion Engines”- 1988
3. Marco Nute- “ Emissions from two stroke engines, SAE Publication – 1998

AU9306 MICROPROCESSOR APPLICATION IN AUTOMOBILES L T P C
3 0 0 3

OBJECTIVE

The main objective of this course is to impart knowledge in 8085 microprocessor along with its interface circuits. At the end of the course the students will have command over writing assembly level programs for automotive application.

UNIT I ARCHITECTURE OF 8085 MICROPROCESSOR 9

8085 architecture - Functional block diagram - pin function - Registers, ALU, Bussystems - Timing and control signals, stack.

UNIT II ASSEMBLY LANGUAGE PROGRAMMING 9

Instruction format - addressing modes - instruction set - Construct of the language programming - Assembly directive - programs like addition, subtraction, multiplication, division, code conversion, lookup tables etc.

UNIT III I/O INTERFACING INTERRUPTS 9

Simple I/O ports - Programmable peripheral interface (8255) - Interfacing of switch, LED's, ROM and RAM, keyboard - display. Interrupt feature - Need for interrupts - Characteristics and Types of interrupts - Interrupt structure - Methods of servicing interrupts - Development of interrupt service subroutines - DMA.

UNIT IV SIGNAL CONDITIONING 9

Need - Analog to Digital and Digital to Analog converter - selection criteria for ADC/DAC -Interfacing ADC0801- DAC0800.

UNIT V APPLICATIONS 9

Data acquisitions - temperature control - stepper motor control - engine control – Casestudies

TOTAL : 45 PERIODS

TEXT BOOKS

1. Ramesh S. Goankar, "Microprocessor Architecture: Programming and Applications with the 8085", Fourth edition, penram international, 2000.

REFERENCES:

1. Douglas, V. Hall, "Microprocessors and Interfacing Programming and Hardware", Second edition, McGraw Hill Inc., 1992.

2. Kenneth, L.Short, "Microprocessors and Programmed Logic", Second edition, Prentice Hall of India, New Delhi, 1987.

AU9307 VEHICLE DESIGN DATA CHARACTERISTICS L T P C
1 0 3 3

OBJECTIVE:

Students have to collect important technical specification of an automobile from automobile journals and keeping this, as a guide, they have to calculate and tabulate various vehicle performance parameters and design parameters and to draw curves using these data.

UNIT I PERFORMANCE CURVE 15

Resistance. Power and torque curves. Driving force against vehicle speed. Acceleration and gradability in different gears for a typical car or truck plotted from specifications available in Automobile Journals.

UNIT II` EXPECTANCY CURVES 45

Calculation and plotting the curves of Air and Rolling resistances. Driving force. Horse poweer, Rear axle ratio. Engine speed. Torque and mechanical efficiency for different vehicle speeds. Pressure volume diagram. Frictional mean effective pressure. Engine capacity. Bore and stroke length. Connecting rod length to crank radius ratio. Piston velocity and acceleration against crank angle. Gas force, inertia force and resultant force against crank angle. Turning moment, side thrust against crank angle on cylinder wall. Determination of gear ratios. Acceleration and gradability. Typical problems on vehicle performance.

TOTAL : 60 PERIODS

TEXT :

1. Heldt,P.M., High Speed Combustion Engine, Oxford & IBH Publishing Co., Calcutta, 1989.

REFERENCES:

1. Lichty, IC Engines, Kogakusha Co. Ltd., Tokyo, 1991.
2. Automotive Engineering Journals Auto Car, Automotive Industries, Automobile Engineer.
3. Giri,K., Automobile Mechanics, Khanna Publishers, New Delhi, 1986.

AU9308 ENGINE TESTING AND EMISSION MEASUREMENT LAB L T P C
0 0 3 2

1. Study and use of IC engine testing Dynamometers.
2. Study of 2 and 4 wheeler chassis Dynamometers.
3. Study and use of Pressure pickups, charge amplifier, storage oscilloscope and signal analysers used for IC engine testing.
4. Performance study of petrol engine at full throttle and part throttle conditions.
5. Performance study of diesel engine both at full load and part load conditions.
6. Morse test on petrol and diesel engines.
7. Determination of compression ratio, volumetric efficiency and optimum cooling water flow rate in IC engines.
8. Head balance test on a Automotive diesel engine.
9. Engine tuning for performance improvement.
10. Testing of 2 and 4 wheelers using chassis dynamometers.
11. Study of NDIR Gas Analyser and FID.
12. Study of Chemiluminescent NOx analyzer.
13. Measurement of HC, CO, CO2, O2 using exhaust gas analyzer.
14. Diesel smoke measurement.

TOTAL : 45 PERIODS

TEXT BOOK

1. Giles,J.G., Vehicle Operation and performance, Illiffe Books Ltd., London, 1989.

REFERENCES

1. Crouse,W.H. and Anglin,D.L., Motor Vehicle Inspection, McGraw Hill Book Co., 1978.
2. Ganesan,V., Internal Combustion engines, Tata McGraw Hill Co., 1994.
3. BIS Code Books, IS-10000 series, 1988.

AU9309 COMPUTER AIDED DRAFTING L T P C
0 0 3 2

UNIT I INTRODUCTION TO AUTO CAD

Getting into Auto CAD. Drawing Editor, Menus, Co-ordinator systems, Creating a drawing. Line input methods, Angle measures, Circle-5 methods, Unity commands. Organising a Drawing Area: Limits, Zoom all, Drawing Aids, Grid, Shape, Ortho, Function keys, Entity creation, Arc, Point, Polygon, Donut, Trace, Ellipse. Editing Commands: Erase, Object selection methods, U, Oops, Redo, Move, Copy, Mirror, Rotate, Scale, Array.

Two-Dimensional geometrical construction curves – Projection of points – Projection of solids – Three dimensional views of simple solids.

UNIT II MODELING SOFTWARE APPLICATION

Introduction of Modelling Software, Formatting of 2D and 3D objects.
3D Part Modeling – Protrusion, cut, sweep, draft, loft, blend, rib, round, chamfer Editing- Move, Pattern, Mirror
Assembly- Creating assembly from parts-assembly constrains
Conversions of 3D solid model to 2D drawing – different views, sections, isometric view and dimensioning
Introduction to Surface Modeling
Introduction to File import, Export – DXF, IGES, STL, STEP
3D Modeling of machine elements like Flanged coupling, screw, jack etc.,

NOTE: Any one of the 3D MODELING softwares like Pro/E, IDEAS, CATIA UNIGRAPHICS, AutoCAD to be used

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Mastering Auto CAD, Version 12, IDG Publication, 1995.

REFERENCE:

1. Auto Desk Training Centre Reference Manuals.
2. Engineering Drawing and Design: Autocad workbook Introductor's Guide, Delmar Publishers, 1991.

AU9310	TECHNICAL SEMINAR (Common to all Branches)	LT P C 0 0 2 1

OBJECTIVE

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

TOTAL : 30 PERIODS

AU 9351	VEHICLE DESIGN	L T PC 3 1 0 4

AIM

This course gives a complete procedure for designing different kinds of chassis components in automobile engineering.

OBJECTIVES:

At the end of the course the student will be able to understand the fundamental principles involved in design of components of automotive chassis, the complete design exercise and arrive at important dimensions of chassis components.

UNIT I VEHICLE FRAME AND SUSPENSION 12

Study of loads - moments and stresses on frame members. Design of frame for passenger and commercial vehicle - design of leaf springs - Coil springs and torsion bar springs.

UNIT II FRONT AXLE AND STEERING SYSTEMS 12

Analysis of loads - moments and stresses at different sections of front axle. Determination of bearing loads at Kingpin bearings. Wheel spindle bearings. Choice of bearings. Determination of optimum dimensions and proportions for steering linkages ensuring minimum error in steering. Design of Front Axle Beam.

UNIT III CLUTCH 12

Torque capacity of single plate, multi plate and cone clutch. Design of clutch components, Design details of roller and sprag type of clutches ..

UNIT IV GEAR BOX 12

Gear train calculations, layout of gear box constant mesh and synchrono mesh gear box. Design of three speeds and four speed gear boxes.

UNIT V DRIVE LINE AND REAR AXLE 12

Design of propeller shaft and types of propeller shaft. Design details of final drive gearing. Design details of full floating. Semi-floating and three quarter floating rear shafts and rear axle housings. Design aspects of final drive.

TOTAL : 60 PERIODS

TEXT BOOKS :

1. Heldt,P.M., "Automotive Chassis", Chilton Book Co., 1992.
2. Heldt,P.M., "Torque Converters", Chilton Book Co., 1992.

REFERENCES:

1. Dean Averns., " Automobile Chasis Design", Illife Book Co., 1982.
2. Giri, N.K., Automobile Mechanics", khanna Publishers, New Delhi,1998
3. The Automotive Chassis: Engineering Principles", SAE – Sep.,1995

AU9352 ELECTRONIC ENGINE MANAGEMENT SYSTEMS L T P C
3 0 0 3

OBJECTIVE:

To explain the principle of engines electronic management systems 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. Parameters to be controlled in SI and CI engines.

UNIT II SENSORS AND ACTUATORS 9

Inductive, Hall Effect, hot wire, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, mass air flow, crank shaft position, cam position, engine and wheel speed, steering position, tire pressure, brake pressure, steering torque, fuel level, crash, exhaust oxygen level (two step and linear lambda), knock, engine temperature, manifold temperature and pressure sensors.

UNIT III SI ENGINE MANAGEMENT 9

Three way catalytic converter, conversion efficiency versus lambda. Layout and working of SI engine management systems like Bosch Monojetronic, L-Jetronic and LH-Jetronic. Group and sequential injection techniques. Working of the fuel system components. Advantages of electronic ignition systems. Types of solid state ignition systems and their principle of operation, Contactless 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. Pilot, main, advanced post injection and retarded post injection. Electronically controlled Unit Injection system. Layout of the 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 control of fuel injection and closed loop lambda control – Integrated engine control system, Exhaust emission control engineering, Electromagnetic compatibility – EMI Suppression techniques – Electronic dash board instruments – Onboard diagnosis system.

TOTAL: 45 PERIODS

TEXT BOOKS

1. William B.Ribbens, Understanding Automotive Electronics, 5th Edition, Butterworth, Heinemann, 1998.
2. Tom Weather Jr and Cland C.Hunter, Automotive Computers and Control System, Prentice Hall Inc., New Jersey, 1984

REFERENCES

1. Diesel Engine Management by Robert Bosch, SAE Publications
2. Gasoline Engine Management by Robert Bosch, SAE Publications
3. Robert N Brady, “Automotive Computers and Digital Instrumentation”, A reston Book, Prentice Hall, Eagle Wood Cliffs, New Jersey, 1988.
4. Bechtold, “Understanding Automotive Electronics”, SAE, 1998.
5. T. Mellard, “Automotive Electronics System”, William Hienemann, London, 1987

AU9353 VEHICLE BODY ENGINEERING L T P C

3 0 0 3

OBJECTIVE

At the end of the course, the students will be able to have a sound knowledge for the design of the vehicles body to give maximum comfort for the passengers and exposed to the methods of stream lining the vehicles body to minimize drag.

UNIT I CAR BODY DETAILS 8

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

UNIT II VEHICLE AERODYNAMICS 10

Objectives. Vehicle drag and types; various types of forces and moments, effects of forces and moments, side wind effects on forces and moments, Various body optimization techniques for minimum drag, wind tunnel testing: flow visualization techniques, scale model testing, component balance to measure forces and moments.

UNIT III BUS BODY DETAILS 8

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

UNIT IV COMMERCIAL VEHICLE DETAILS 9

Types of body; flat platform, drop side, fixed side, tipper body, tanker body, Light commercial vehicle body types. Dimensions of driver's seat relation to controls. Drivers cab design.

UNIT V BODY MATERIALS, TRIM AND MECHANISMS 10

Steel sheet, timber, plastic, GRP, properties of materials; Corrosion, anticorrosion methods. Selection of paint and painting process. Body trim items. Body mechanisms.

TOTAL : 45 PERIODS

TEXT BOOK

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

REFERENCES

1. Giles.J.C. - "Body construction and design" - Liiffe Books Butterworth & Co. - 1971.
2. John Fenton - "Vehicle Body layout and analysis" - Mechanical Engg. Publication Ltd., London – 1982.
3. Braithwaite.J.B. - "Vehicle Body building and drawing" - Heinemann Educational Books Ltd., London – 1977.

AU9354 COMPUTER CONTROL OF VEHICLE 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 pertain to chassis system – construction – working principle.

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.

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 - In-Vehicle Computing – Vehicle Diagnostics system – Hybrid / Electric and Future Cars – Case studies.

TOTAL: 45 PERIODS

TEXT BOOK

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, TMH, New Delhi 1986.
2. William B.Ribbens -Understanding Automotive Electronics, 5th edition, Butter worth Heinemann Woburn,1998.
3. Robert Bosch -Automotive Hand Book- SAE , 5th Edition, 2000
4. Internet References

AU9355 COMPUTER APPLICATION IN ENGINE DESIGN L T P C
1 0 3 3

AIM

To impart exposure to CAD tools. Design procedure will be introduced for piston, connecting rod, crankshaft, camshaft and combustion chamber.

OBEJECTIVES :

To make the students understand the design concept and principles of various engine components, their materials and manufacturing techniques. These concepts and principles are familiarized for design of components.

- Design of piston, piston pin and piston rings and drawing of these components.
- Designing of connecting rod small end and big end, shank design, design of big and cap bolts and drawing of the connecting rod assembly.
- Design of crankshaft, balancing weight calculations, development of short long crankarms, front end and rear end details, drawing of the crankshaft assembly.
- Design and drawing of flywheel, ring gear design, drawing of the flywheel including the development of ring gear teeth.
- Design and drawing of the inlet and exhaust valves.
- Design of Cam and Camshaft, Cam profile generation. Drawing of cam and camshaft.
- Design of combustion chamber.
- Design and drawing of engine complete assembly involved with cylinder block, cylinder head, crankcase, valve ports, water jackets.
- Computer aided design of the above components.

TOTAL: 60 PERIODS

TEXT BOOK:

1. Heldt,P.M., “High Speed Combustion Engine”, Chilton Books Co., 1952.

REFERENCES:

1. Giles,J.G., “Engine Design”, Illiffe Books Ltd., London, 1962.
2. Newton,K. and Steeds,W., “The Motor Vehicle”, The English Language Book Society and Newnes Butterworth, London, 1972.
3. Khovak,” Motor Vehicle Engines”, MIR Publishers.
4. Kolchin,A. and Demidov,V., “Design of Automotive Engines”.

AU 9356 COMPUTER APPLICATION IN CHASSIS DESIGN L T P C
0 0 3 2

AIM

This course gives a complete procedure for designing different kinds of chassis components by using designing software like CAD, Pro E and solid works in automobile engineering.

OBJECTIVES:

Designing of the clutch, gear box and drive line systems of Automobiles.

Drafting and Modeling of

- CLUTCH
  1. Complete design of clutch components.
  2. Assembly drawing of clutch using drafting software.

- GEAR BOX
  1. Gear train calculations.
  2. Layout of gear box.
  3. Calculation of bearing loads
  4. Selection of bearings.
  5. Assembly drawing of gear box using drafting software.

- DRIVE LINE AND REAR AXLE
  1. Design of propeller shaft.
  2. Design details of final drive gearing.
  3. Design details' of full floating, semi-floating and three quarter floating rear shafts and rear axle housings

TOTAL : 45 PERIODS

AU9357 AUTOMOTIVE ELECTRONICS LAB **L T P C**
0 0 3 2

Study of the following devices for Automotive Application

1. Logic gates, Adders, Flip flops
2. SCR and IC Timers
3. Interfacing seven segment displays
4. Study of Microprocessor and Microcontrollers
5. Interfacing Sensors like RTD, LVDT, Load Cell etc.
6. Interfacing ADC for Data Acquistion
7. Interfacing DAC for Control Application
8. Interfacing Actuators
9. EPROM Programming
10. Mini Project

TOTAL: 45 PERIODS

GE9371 COMMUNICATION SKILLS AND SOFT SKILLS LAB **L T P C**
0 0 2 1

AIM:

To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

1. PC based session

A. Career Lab (15 periods) Viewing and discussing audio-visual materials

1. **Resume / Report Preparation / Letter Writing:** (3)
   Letter writing – Job application with Resume - Project report - Email etiquette.
2. **Presentation skills:** (3)
   Elements of effective presentation – Structure of presentation - Presentation tools – Body language.
3. **Soft Skills:** (3)
   Time management – Stress management – Assertiveness – Negotiation strategies, Psychometrics - Analytical and logical reasoning.
4. **Group Discussion:** (3)
   Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.
5. **Interview Skills:** (3)
   Kinds of interviews – Interview techniques – Corporate culture – Mock interviews.

II. Class Room Session **45 periods**

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. (9)
2. **Presentation Skills:** Students make presentations on given topics. (12)
3. **Group Discussion**: Students participate in group discussions. (12)
4. **Interview Skills**: Students participate in Mock Interviews (12)

Note: Classroom sessions are practice sessions.

REFERENCES:

1. Prakash P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., 2nd Edition, New Delhi, 2004.
2. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi 2004.
3. Paul V Anderson, **Technical Communication**, Thomson Wadsworth , 6th Edition, New Delhi, 2007.
4. Edgar Thorpe and Showick Thorpe, **Objective English**, Pearson Education, 2nd Edition, New Delhi 2007.
5. David Evans, **Decision maker**, CUP, 1997

LAB REQUIREMENT:

1. Teacher console and systems for students.
2. English Language Lab Software
3. Tape recorders

PR 9402 ENGINEERING MANAGEMENT **L T P C**
3 0 0 3

OBJECTIVES:

- To train Engineer to manage industrial scenario

UNIT I PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT **7**

General principles of management - management functions - organization - types - comparison functions of personnel management - recruitment training leadership/motivation - communication - Conflict - Industrial relations - trade union.

UNIT II INVENTORY MANAGEMENT **7**

Purpose of Inventory - Cost related to inventory - Basic EOQ model - variations in EOQ model- Finite Production, quantity discounts - ABC Analysis - MRP

UNIT III OPERATIONS MANAGEMENT **11**

Plant Location - Layout - Materials Handling - Method Study - Time Study Ergonomics - Aggregate Planning - Value Analysis

UNIT IV FINANCIAL MANAGEMENT **10**

Capital - Types - sources - break even analysis - financial statements - income statement - balance sheet - capital budgeting - working capital management inventory pricing.

UNIT V MARKETING MANAGEMENT 7

Functions of marketing - Sales promotion methods - advertising - product packaging - marketing variables - distribution channels - organization - market research - market research techniques.

TOTAL :45 PERIODS

TEXT BOOKS

1. R. Kesavan, C.Elanchezhian and T.Sundar Selwyn - "Engineering Management" Eswar Press, 2005
2. R. Panneerselvam - "Production and Operations Management" - Prentice Hall of India, 2003.

REFERENCES:

1. Koontz and Odonnel-"Essentials of Management", McGraw Hill 1992.
2. Philips Kotler - "Principles of Marketing", Prentice Hall of India, 1995
   a. .M. Pandey - "Financial Management", Vikas PUblishing house, 1995
3. K.K.Ahuja - "Personnel Management", Kalyane Publication 1992
4. K. Panneerselvam - "Production and Operations Management" - Prentice Hall of India, 2003
5. Martand T. Telesand - "Industrial and Business Management" - S.Chand & Co., 2001
6. R. Kesavan, C.Elanchezian and B.vijayaramnath - "Production Planning and Control", Anuratha Publishing Co. Ltd., Chennai - 2008

AU9401 VEHICLE DYNAMICS L T P C
3 0 0 3

OBJECTIVE

When the vehicle is at dynamic condition more vibration will be produced. It is essential to study about vibrations and how to reduce the vibration under different loads, speed and road conditions in order to improve the comfort for the passengers and life of the various components of the vehicle. In this subject these aspects have been given.

UNIT I INTRODUCTION 9

Fundamentals of vibration, single degree of freedom, two degree of freedom, multidegree freedom, free, forced and damped vibrations, modeling and simulation studies, model of an automobile, magnification factor, transmissibility, vibration absorber.

UNIT II MULTI DEGREE FREEDOM SYSTEMS 8

Closed and far coupled system, eigen value problems, orthogonality of mode shapes, modal analysis, forced vibration by matrix inversion.

UNIT III NUMERICAL METHODS 9

Approximate methods for determining fundamental frequency, Dunkerleys lower bound, Rayleighs upper bound, Holzer method for closed coupled system and branched systems.

UNIT IV VEHICLE HANDLING AND STABILITY OF VEHICLES 9

Load distribution, calculation of acceleration, tractive effort and reactions for different drives, stability of a vehicle on a curved track, slope and a banked road. Oversteer, under steer, steady state cornering, effect of braking, driving torques on steering, effect of camber, transient effects in cornering.

UNIT V SUSPENSION, TYRES 9

Requirements, sprung mass frequency, wheel hop, wheel wobble, wheel shimmy, choice of damper characteristics and suspension spring rate, calculation of effective spring rate, vehicle suspension in fore and aft direction, roll axis and vehicle under the action of side forces. Tyre – Requirements, types, testing, dynamics, ride characteristics, power consumed by a tyre.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Giri N.K – Automotive Mechanics, Khanna Publishers, 2002.
2. Rao J.S and Gupta. K "Theory and Practice of Mechanical Vibrations", Wiley Eastern Ltd., New Delhi -2, 2002.

REFERENCES

1. Heldt.P.M -"Automotive Chassis"- Chilton Co., New York- 1992
2. Ellis.J.R - "Vehicle Dynamics"- Business Books Ltd., London- 1991
3. Giles.J.G.Steering - "Suspension and Tyres", Illiffe Books Ltd., London- 1998
4. Ham B, Pacejka - Tyre and Vehicle Dynamics - SAE Publication - 2002.
5. Gillespie T.D, "Fundamentals of Vehicle Dynamics", SAE USA 1992.

AU9402 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 OF RECORDS AND SCHEDULES 9

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists. Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE – REPAIR AND OVERHAULING 9

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE - REPAIR AND OVERHAULING 9

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system. Maintenance servicing of suspension systems. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE - SERVICING AND REPAIRS 9

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VECHICLE BODY 9

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts. Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TOTAL : 45 PERIODS

TEXT BOOK

1. John Doke “Fleet Management”, McGraw-Hill Co. 1984.

REFERENCES

1. James D Halderman - Advanced Engine Performance Diagnosis – PHI - 1998.
2. Service Manuals from Different Vehicle Manufacturers.

AU9403 COMPUTER SIMULATION OF IC ENGINE PROCESSES L T P C 3 0 0 3

UNIT I INTRODUCTION 10

Introduction – Heat of reaction – Measurement of URP – Measurement of HRP – Adiabatic flame temperature: Complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion. Calculation of adiabatic flame temperature – Isentropic changes of state.

UNIT II SI ENGINE SIMULATION WITH AIR AS WORKING MEDIUM 10

Deviation between actual and ideal cycle – Problems, SI engine simulation with adiabatic combustion, temperature drop due to fuel vaporization, full throttle operation – efficiency calculation, part-throttle operation, super charged operation.

UNIT III PROGRESSIVE COMBUSTION 9

SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process, friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance.

UNIT IV SIMULATION OF 2-STROKE SI ENGINE 7

Intake, Exhaust, Charging and Combustion Simulation

UNIT V DIESEL ENGINE SIMULATION 9

Zero, one and multi zone model for combustion, different heat release and heat transfer models, equilibrium calculations, simulation of engine performance.

TOTAL : 45 PERIODS

TEXTBOOK

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

REFERENCES

1. Ramoss,A.L., Modelling of Internal Combustion Engines Processes, McGraw Hill Publishing Co., 1992.
2. Ashley Campbel, Thermodynamics analysis of combustion engines, John Wiley & Sons, New York, 1986.
3. Benson,R.S., Whitehouse,N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979.

AU 9404 VEHICLE MAINTENANCE AND RECONDITIONING LABORATORY

L T P C
0 0 3 2

1. Study and layout of an automobile repair, service and maintenance shop.
2. Study and preparation of different statements/records required for the repair and maintenance works.
3. Cylinder reboring - checking the cylinder bore, Setting the tool and reboring.
4. Valve grinding, valve lapping - Setting the valve angle, grinding and lapping and checking for valve leakage
5. Calibration of fuel injection pump
6. Minor and major tune up of gasoline and diesel engines
7. Study and checking of wheel alignment - testing of camber, caster.
8. Testing kingpin inclination, toe-in and toe-out.
9. Brake adjustment and Brake bleeding.
10. Simple tinkering, soldeting works of body panels, study of door lock and window glass rising mechanisms.
11. Battery testing and maintenance.
12. Practice the following:
    i) Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play
    ii) Air bleeding from hydraulic brakes, air bleeding of diesel fuel system
    iii) Wheel bearings tightening and adjustment
    iv) Adjustment of head lights beam
    v) Removal and fitting of tyre and tube

TOTAL : 45 PERIODS

AU9405 INDUSTRIAL TRAINING

L T P C
0 0 0 1

1. The students have to undergo practical industrial training for six weeks in recognized industrial establishments.
2. At the end of the training they have to submit a report with following informations:
   Profile of the industry
   Product range
   Organization structure
   Plant layout
   Processes/Machines/Equipments/Devices
   Personnel welfare schemes
   Details of the training undergone
   Projects undertaken during the training, if any
   Learning points
3. The assessments will be based equally on the report in the prescribed format and viva-voce examination by a committee nominated by the Head of the Department

TOTAL : 30 PERIODS

AU9406 COMPREHENSION AND TECHNICAL SEMINAR L T P C

0 0 2 1

Comprehension will be conducted with a written test during the semester and one viva-voce examination at the end of the semester in all the subjects during their course of study. The written test will consist of questions of multiple choices, objective type; fill in the blanks, true or false and short answer type questions. Also the students have to give a seminar on a topic relevance to the study.

TOTAL : 30 PERIODS

AU9451 PROJECT WORK L T P C

0 0 12 6

A Project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

AE9354 FINITE ELEMENT METHODS L T P C
3 0 0 3

UNIT I INTRODUCTION 8

Review of various approximate methods – Raleigh Ritz's, Galerkin and finite doifference methods- Governing equation and convergence criteria of finite element method.

UNIT II DISCRETE ELEMENTS 10

Bar elements, uniform section, mechanical and thermal loading, varying section, truss analysis. Beam element - problems for various loadings and boundary conditions - longitudinal and lateral vibration. Use of local and natural coordinates.

UNIT III CONTINUUM ELEMENTS 8

Plane stress, Plane strain and axisymmetric problems, constant and linear strain, triangular elements, stiffness matrix, axisymmetric load vector

UNIT IV ISOPARAMETRIC ELEMENTS 10

Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, Stiffness matrix and consistent load vector, Gaussian integration

UNIT V FIELD PROBLEM 9

Heat transfer problems, Steady state fin problems, Derivation of element matrices for two dimensional problems, Torsion problems

TOTAL: 45 PERIODS

TEXT BOOK

1. Tirupathi.R. Chandrapatha and Ashok D. Belegundu – Introduction to Finite Elements in Engineering – Printice Hall India, Third Edition, 2003.
2. Larry J Segerlind, 'Applied Finite Element Analysis', Second Edition, John Wiley and Sons, Inc. 1984.

REFERENCES

1. Reddy J.N. – An Introduction to Finite Element Method – McGraw Hill – 2000.
2. Krishnamurthy, C.S., Finite Element Analysis, Tata McGraw Hill, 2000.
3. Bathe, K.J. and Wilson, E.L., Numerical Methods in Finite Elements Analysis, Prentice Hall of India, 1985.
4. Robeert D Cook, David S malkus, Michael E Plesha, 'Concepts and Applications of Finite Element Analysis', 4th edition, John Wiley and Sons, Inc., 2003.

AU9021 AUTOMOTIVE AERODYANAMICS 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 9
Scope, historical developments, fundamental of fluid mechanics, flow phenomenon related to vehicles, external and Internal flow problem, resistance to vehicle motion, performance, fuel consumption and performance potential of vehicle aerodynamics,

UNIT II AERODYNAMIC DRAG OF CARS 9
Cars as a bluff body, flow field around car, drag force, types of drag force, analysis of aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development, low drag profiles.

UNIT III SHAPE OPTIMIZATION OF CARS 9
Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners.

UNIT IV VEHICLE HANDLING 9
The origin of forces and moments on a vehicle, lateral stability problems, methods to calculate forces and moments – vehicle dynamics under side winds, the effects of forces and moments, characteristics of forces and moments, dirt accumulation on the vehicle, wind noise, drag reduction in commercial vehicles.

UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS 9
Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale models, full scale wind tunnels, measurement techniques, equipment and transducers, road testing methods, numerical methods.

TOTAL : 45 PERIODS

TEXT BOOK
1. Hucho.W.H. - “Aerodynamic of Road Vehicles” - Butterworths Co., Ltd., - 1997.

REFERENCES
1. A. Pope - “Wind Tunnel Testing “ - John Wiley & Sons - 2nd Edition, New York - 1974.
2. Automotive Aerodynamic: Update SP-706 - SAE - 1987
3. Vehicle Aerodynamics - SP-1145 - SAE – 1996.

AU9026 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

Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.

UNIT II SAFETY CONCEPTS 9

Active safety: driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT III SAFETY EQUIPMENTS 9

Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT IV COLLISION WARNING AND AVOIDANCE 9

Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT V COMFORT AND CONVENIENCE SYSTEM 9

Steering and mirror adjustment, central locking system , Garage door opening system, tyre pressure control system, rain sensor system, environment information system

TOTAL : 45 PERIODS

TEXT BOOK

1. Bosch - “Automotive Handbook” - 5th edition - SAE publication - 2000.

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.

AU9031 COMBUSTION THERMODYNAMICS AND HEAT TRANSFER L T P C
3 0 0 3

UNIT I INTRODUCTION TO COMBUSTION PROCESSES 10

Definition for Fuel and Oxidizer – types – Various combustion modes- Combustion in premixed laminar and premixed turbulent combustion - Flame Speed – Burning Velocity - diffusion flames – Combustion process in IC engines.

UNIT II THERMODYNAMICS OF COMBUSTION 11

Thermodynamics of combustion – Thermodynamic Properties – Ideal gas law – Gas mixture combustion – Stoichiometric combustion – Thermochemistry – Hess’s law- Adiabatic flame temperature – Physics of combustion – Fick’s law of species diffusion – Conservation equations – Boundary layer concept

UNIT III NORMAL, ABNORMAL COMBUSTION IN SI ENGINES 7

Stages of combustion – Flame propagation –– Flame Limits –Flame Extinction -Rate of pressure rise – Cycle to cycle variation – Abnormal combustion – Theories of detonation – Effect of engine operating variables on combustion –Example problems.

UNIT IV COMBUSTION AND HEAT TRANSFER IN IC ENGINES 11

Droplet and spray combustion theory – delay period – Peak pressure – Heat release – Gas temperature – Diesel knock. Basic definitions – Convective heat transfer – Radiative heat transfer – Heat transfer, temperature distribution and thermal stresses in piston – Cylinder liner – Cylinder head – fins and valves.

UNIT V EXPERIMENTAL INVESTIGATION OF COMBUSTION AND HEAT TRANSFER IN IC ENGINES 6

Photographic studies of combustion processes – P-θ diagrams in SI and CI engines, Assembly – Temperature measurement in piston – cylinder liner – Cylinder head and engine valves.

TOTAL:45 PERIODS

TEXT BOOK

1. SPALDING.D.B., Some fundamentals of Combustion, Butterworth Science Publications, London, 1985.

REFERENCES

1. Lewis,B., Pease,R.N. and Taylor,H.S., Combustion Process, High Speed Gas dynamics and Jet Propulsion Series, Princeton University Press, Princeton, New Jersey, 1976.
2. Taylor,E.F., The Internal Combustion Engines, International Text Book Co., Pennsylvania, 1982.
3. Ganesan,V., Internal Combustion Engines, Tata McGraw Hill Co., 1994.
4. D.P.Mishra.,Fundamentals of Combustion, PHI .,2008

AU9032 ADVANCED THEORY OF I.C. ENGINES L T P C
3 0 0 3

OBJECTIVES

At the end of the course, the students will be able to understand the significance of various processes in I.C Engines.

UNIT I INTRODUCTION 7

Fuel air cycle and Actual cycle analysis, Properties of IC engine fuels, Refining process, chemical composition and molecular structure of fuels, octane number, cetane number. Knock rating of SI engine fuels.

UNIT II COMBUSTION OF FUELS 12

Combustion Stoichiometry of petrol, diesel, alcohol and hydrogen fuels – Chemical energy and heating values – Chemical equilibrium and maximum temperature – SI engine combustion – Flame velocity and area of flame front –performance number – CI engine combustion. Fuel spray characteristics – droplet size, penetration and atomization.

UNIT III COMBUSTION MODELLING 10

Basic concepts of engine simulation, governing equations, simulation of various engine processes for SI and CI engines. Adiabatic flame temperature, Heat release calculations. Thermodynamic and Fluid mechanic based models.

UNIT IV NON-CONVENTIONAL IC ENGINES 8

Adiabatic and L.H.R. engines – Variable compression ratio engine – Wankel rotary combustion engine – Free piston engine - MAN combustion chamber and multi fuel engines – Stratified charge and lean burn engines – Locomotive and marine engines.

UNIT V COMBUSTION ANALYSIS IN IC ENGINES 8

Photographic studies of combustion processes – P-θ diagrams in SI and CI engines, Rate of heat release – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines

TOTAL:45 PERIODS

TEXT BOOKS

1. Ganesan .V - "IC Engines" - Tata McGraw-Hill, 2003.
2. John B. Haywodd, "Internal Combustion Engine Fundamentals", McGraw-Hill Automotive Technology Series ISBN 0-07-1000499-8, 1988.

REFERENCES

1. Ganesan .V – 'Computer Simulation of Spark Ignition Processes' - Universities Process Ltd, Hyderabad - 1993.
2. Ganesan.V. – Computer Simulation of compression ignition engines – Orcent Longman – 2000.
3. Richard Stone – "Introduction to IC Engines" – 2nd edition – Macmilan – 1992.

AU9027 RUBBER TECHNOLOGY FOR AUTOMOBILES L T P C
3 0 0 3

UNIT I INTRODUCTION 6

Identification of plastics / rubber components in automobiles – function – selection criteria.

UNIT II STRUCTURE-PROPERTY RELATIONSHIP OF RUBBER 10

Resilience, creep, hysteresis and damping, stability, set and stress relaxation, behaviour in dynamic applications.

UNIT III VIBRATION AND RUBBER SPRING 10

Principle of vibration isolation – rubber mounts – spring design – comparison with metallic springs – shape factor and its effect – forced and free vibrations with damping – typical mounts, compounding and manufacture.

UNIT IV FLUID SEALINGS AND FLEXIBLE COUPLINGS AND HOSES 10

Seals for static and dynamic applications – effect of heat / oil ageing – frictional behaviour – fundamental of sealability.

UNIT V COMPOUNDING AND MANUFACTURE 9

Types of couplings – specification and selection – torque vs deflection relationships – brake fluid / hydraulic hoses, materials and manufacture.

TOTAL: 45 PERIODS

TEXTBOOK

1. Freakley,P.K., and Payne,A.R., Theory and Practice of Engineering with Rubber, Applied Science Publishers Ltd.

REFERENCES

1. Hobel,E.F., Rubber Springs Design.
2. Blow,C.M. and Hepburn,C., Rubber Technology and Manufacture.

GE9021 PROFESSIONAL ETHICS IN ENGINEERING L T P C
3 0 0 3

AIM:

To sensitize the engineering students on blending both technical and ethical responsibilities.

OBJECTIVES:

- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one's own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as Responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and Risk – Assessment of Safety and Risk – Risk Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL : 45 PERIODS

TEXT BOOKS :

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, “Engineering Ethics Concepts and Cases”, Thompson Learning, (2000).

REFERENCES :

1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, (1999).
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University Press, (2003)

GE9022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

AIM

To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES

- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.

To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL : 45 PERIODS

TEXT BOOK

1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCE BOOKS

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

GE9023 FUNDAMENTALS OF NANOSCIENCE L T P C
3 0 0 3

AIM:

To make the students understand the importance ,relevance and potentialities of this emerging field of study.

OBJECTIVES:

- Study the basic nano technology and nano science.
- Understand interdisciplinary nature of this field.
- Understand the important role of physics, chemistry ,biology.
- Recognize that the rules of nano science are fundamentally different than those we experience.
- Study the basic fabrication strategies of nano science.

UNIT I INTRODUCTION 10

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS 10

Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES 5

Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS 10

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V CHARECTERISATION TECHNIQUES 10

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL: 45 PERIODS

TEXT BOOKS

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale charecterisation of surfaces & Interfaces", 2nd Edition, Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES

1. G Timp (Editor), "Nanotechnology", AIP press/Springer, 1999
2. Akhlesh Lakhtakia (Editor), "The Hand Book of Nano Technology,Nanometer Structure", Theory, Modeling and Simulations", Prentice-Hall of India (P) Ltd, New Delhi, 2007.

AU9025 VEHICLE AIR-CONDITIONING 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 AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS 10

Basic air conditioning system – Components – types of Compressor, Condenser, Expansion devices and Evaporators. Location of air conditioning components in a car – Schematic layout of a air conditioning system. Compressor components – Thermostatic expansion valve & orifice tube – Expansion valve calibration – Evaporator temperature controls for TXV & CCOT systems.

UNIT II REFRIGERANT 9

Requirements for refrigerants – Classification of refrigerants- Refrigerant selection- Storage of refrigerants – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT III AIR CONDITIONER – HEATING SYSTEM 10

Manually controlled air conditioner – Heater system – Ford automatically controlled air conditioner – heater systems – Chrysler automatically controlled air conditioner – Heater system, General Motors automatically controlled air conditioner – Heater system – Flushing & Evacuating.

UNIT IV AIR ROUTING & TEMPERATURE CONTROL 10

Objectives – Evaporator case air flow through the Dash recirculating unit – Automatic temperature control – Ducting system in Passenger car and Bus– Controlling flow – Vacuum reserve – Testing the air control and handling systems- Load calculations - Psychrometry

UNIT V HEATER – AIR CONDITIONER TROUBLE SHOOTING & SERVICE 6

Air conditioner maintenance and service – Servicing heater system. Removing and replacing components. Trouble shooting of air conditioner – heating system – Compressor service.

TOTAL:45 PERIODS

TEXT BOOK

1. William H Crouse and Donald L Anglin, “Automotive Air

REFERENCES

1. Mitchell Information Services, Inc., Mitchell Automatic Heating and Air Conditioning Systems, Prentice Hall Inc., 1989.
2. Paul Weisler, Automotive Air Conditioing, Reston Publishing Co. Inc., 1990.
3. McDonald,K.L., Automotive Air Conditioning, Theodore Audel series, 1978.
4. Goings,L.F., Automotive Air Conditioning, American Technical services, 1974.

PR 9404 MANUFACTURING PROCESS PLANNING AND COST ESTIMATION L T P C 3 0 0 3

AIM

To evaluate a product in monetary units

OBJECTIVES

- **To** develop a good process planner
- To impart the knowledge on good estimation of engineering product

PRE-REQUISITES: Students must have sound knowledge on various manufacturing processes

UNIT I PROCESS PLANNING 9

Definition - Information required and advantages - process planning activities and chart - logical design of a process plan (for machining process), covering preliminary analysis, selection of machining process, machine tools, grouping of jobs, Anteriorities table and anteriority matrix for sequencing.

Primary process selection - Rough and Refined rules - Selection of casting process - Selection of forming process - Selection of machining process - examples - Manual process planning - case studies - short comings of Manual process planning - Computer aided process planning - variant, generative and semi generative.

UNIT II ESTIMATING, COSTING AND ELEMENTS OF COST 9

Importance and aims of cost estimation - Functions of estimation - costing - importance and aims of costing - Difference between costing and estimation - Importance of realistic estimates - Estimation procedure - Elements of cost - Material cost - Determination of Material cost - labour cost - determination of direct labour cost - Expenses - Cost of product (Ladder of cost) - Illustrative examples.

UNIT III ANALYSIS OF OVERHEAD EXPENSES & METHODS OF DEPRECIATION 9

Overhead expenses - Factory expenses - Administrative expenses - Selling and Distributing expenses - Allocation of overhead expenses - Depreciation - Causes of depreciation - Methods of depreciation.

UNIT IV ESTIMATION OF COSTS FOR FORGOING, CASTING AND WELDING 9

Estimation of forging cost - Forging process - Forging operations - Losses in forging operations - Calculating forging cost - Illustrative examples - Estimation in Foundry shop - Introduction - Steps involved in making a casting - Patterns - Pattern allowances Estimation of pattern cost - Foundry losses - Steps for calculating casting costs Illustrative examples. Estimating welding costs - Introduction -Arc welding costs - Basic costing procedure (Arc welding) - Gas Welding - Basic costing procedure (Gas welding) - Factors affecting welding cost - Thermal cutting of Metals - Illustrative examples.

UNIT V ESTIMATION OF MACHINING TIME AND ESTIMATION IN SHEET METAL SHOP 9

Estimation in Machine-shop - Introduction - Machining times and allowances - General term related to machining - calculation of machining time - Estimation of time for lathe operations - estimation of machining time for drilling, shaping, slotting, planing, grinding, and milling operations - Illustrative examples.

Estimation in sheet metal shop - Introduction - Development of product - sheet metal operations - sheet metal joints - Press working operations - Layout of blank - Press capacities - Estimation of time - Illustrative examples.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. *OP.* Khanna, "Mechanical Estimating and Costing", Dhanpat Rai pUblishers, 1999
2. R. Kesavan, C.Elenchezian, and B.vijaya Ramnath, "Process Planning and cost estimation", New age International publishers, 2005

REFERENCES:

1. G.B.S. Narang and V.Kumar, "Production and costing", Khanna publishers, 2000
2. Mikell P. Groover, "Automation, production systems and computer - Integrated Manufacturing", Prentice-Hall of India Private Limited, 2003
3. P. Radhakrishnan, S. Subramanyan and V. Raju, "CAD/CAM/CIM", New Age International Publishers, 2000
4. Gideon Halevi & Roland D. Weill, "Principles of process planning", Chapman & Hall, 1995.
5. M. Adithan & B.S. Pabla, "Production Engineering Estimating and costing", Konark publishers Pvt. Ltd., 1990.

AU9030 ADVANCED PRODUCTION PROCESSES FOR AUTOMOTIVE COMPONENTS **L T P C 3 0 0 3**

UNIT I POWDER METALLURGY 8

Process flow chart – Production of metal powders and their raw materials – Manufacture of friction lining materials for clutches and brakes – Testing and inspection of PM parts.

UNITII FORMING PROCESS 15

Forging – process flow chart, forging of valves – connecting rod, crank shaft, cam shaft, propeller shaft, transmission gear blanks, foot brake linkage, steering knuckles. Extrusions: Basic process steps, extrusion of transmission shaft, steering worm blanks, brake anchor pins, rear axle drive shaft, axle housing spindles, piston pin and valve tappets. Hydroforming: Process, hydroforming of manifold and comparison with conventional methods – Hydro forming of tail lamp housing. Stretch forming – Process, stretch forming of auto body panels – Super plastic alloys for auto body panels.

UNIT III GEAR MANUFACTURING 8

Different methods of Gear manufacture – Gear hobbing and gear shaping machines specifications – gear generation – different methods – gear finishing and shaving – Grinding and lapping of hobs and shaping cutters – gear honing – gear broaching.

UNIT IV CONCEPT & PROGRAMMING OF CNC MACHINES 8

NC, CNC & DNC – types of CNC – constructional features – drives and control systems – feed back devices – manual part programming – steps involved – sample program in Lathe & milling.

UNIT V RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS 6

Powder injection moulding – Shotpeen hardening of gears – Production of aluminium MMC liners for engine blocks – Plasma spray coated engine blocks and valves – Recent developments in auto body panel forming – Squeeze casting of pistons – aluminium composite brake rotors.

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. Subroff,A.M. & Others, Forging Materials & Processes, Reinhold Book Corporation, New York, 1988.
4. High Velocity Forming of Metals, ASTME, Prentice Hall of India (P) Ltd., New Delhi, 1990.
5. Groover.M.P.,Automatic production systems and computer integrated manufacturing, Prentice-Hall, 1990.
6. GE Thyer, Computer Numerical Control of Machine Tools, BH.Newners, 1991.

AU9033 COMPUTER INTEGRATED MANUFACTURING SYSTEMS **L T P C 3 0 0 3**

UNIT I INTRODUCTION TO CAD **8**

Fundamental concepts in manufacturing and automation – Need for automation – Automation stages – Economic analysis and production – Fundamentals of CIMS. Elements of CAD system – Graphics hardware – ALU – CPU – Input/Output devices – Geometric modeling – Automated drafting

UNIT II MANUFACTURING SYSTEMS **10**

Basics of numerical control – Types of NC systems – CNC and DNC machines – Machining centre – Tool magazine – NC tape format – Programming – Manual part programme – Simple programmes – Computer assisted part programming – APT language – Simple examples

UNIT III FLEXIBLE MANUFACTURING SYSTEMS **9**

Group technology – Part families – Part classification and coding – Production flow analysis – Machine cell design – Description of FMS – Equipment, Tooling and fixture. Design for Manufacturing and Assembly - Process Planning Techniques - Total approach to product development - Concurrent Engineering – Rapid prototyping

UNIT IV COMPUTER AIDED MANUFACTURING **9**

Computers in manufacturing – Automated manufacturing systems – Work piece handling – Types of transfer – Continuous, Intermittent and Non-synchronous walking beam – Computer aided process planning – Computer aided inspection – Computer aided quality control – Basic model of CIMS – Interfacing methods of CAD and CAM – Computer Process Monitoring.

UNITV PRODUCTION PLANNING AND CONTROL **9**

Introduction to production planning and control - Shop Floor Control Systems - Just in time approach - Emerging Challenges in CAD / CAM, Product Data Management - Product Modeling - Assembly and Tolerance Modeling.

TOTAL: 45 PERIODS

TEXT BOOK

1. Groover,M.P., Automation Production Systems and CAM, Prentice Hall, 1990.

REFERENCES

1. Groover,M.P., CAD/CAM Computer Aided Design and Manufacturing, Prentice Hall, 1990.
2. Barry Hawker, CAD/CAM Processes, Pitman, 1988.
3. Niebel, Modern Manufacturing Process Engineering, McGraw Hill, 1989.
4. Martin,S.J., Numerical control of Machine Tools, ELBS, London, 1980.
5. Weatherhall,A., Computer Integrated Manufacturing, Affiliated East-West, 1988.

AU9034 THEORY AND DESIGN OF JIGS AND FIXTURES L T P C
3 0 0 3

UNIT I INTRODUCTION 4

Definitions of Jigs and Fixtures – Principles of Jigs and Fixtures design – Preliminary analysis and planning of jigs and fixture parts and their materials – Basic steps in the design of jigs and fixtures – Different types of locating devices – different types of clamps – Drill bushes – types – Elements of fixtures – Advantages of Jigs & Fixtures.

UNIT II LOCATION AND CLAMPING 16

Degrees of freedom – 3-2-1 location principle – Radial location and diamond pin location – Principle of pin location – location from plane surfaces – location from a profile – location from a cylinder – Circular location – Jamming and remedies – V location – Adjustable locators – Redundant locators – Fool proofing – Adjustable supporters and centralizers Strap clamp – cam clamps – screw clamping – latch clamps – wedge clamps – pivoted clamps – eccentric operator clamp – power clamps – quick acting clamps – equalizers.

UNIT III LOADING AND UNLOADING PROBLEMS 5

Loading - Entering, locating and clamping, symmetric consideration. Unloading – Bur clearance, ejectors, receivers, chip problems, relief and projection, shields and seals.

UNIT IV CUTTER GUIDANCE 5

Various types of setting blocks – Press fit bushes – Renewable bushes – Slip bushes – Threaded bushes – Special bushes – Drills with attached bushing for small holes.

UNIT V DESIGN OF JIGS AND FIXTURE 15

Three construction principles – Built up type, casting and weldment. Practising the various types of jigs – Practising the various types of milling fixtures – broaching fixtures – function of broaching fixtures – Internal and external broaching fixtures.

TOTAL: 45 PERIODS

TEXTBOOK

1. Kempster, M.H.A., Introduction to Jig and tool design, ELBS Edition, 1990.

REFERENCES

1. Henriksen, Erik,K., Jigs and Fixtures, Design Manual Industrial Press Inc., Madison Avenue
2. Donaldson,G.H., Lecain, Gould,V.V., Tool design, TMH Edition, 1990.
3. ASTME, Fundamentals of Tool design, Prentice Hall, 1989.
4. Joshi,P.H., Jigs and Fixtures, Tata McGraw-Hill, 1988.

AU9035 HYDRAULICS AND PNEUMATICS SYSTEMS L T P C
3 0 0 3

OBJECTIVE

This course will give an appreciation of the fundamental principles, design and operation of hydraulic and pneumatic machines, components and systems and their application in recent automation revolution.

UNIT I INTRODUCTION 6

Introduction to fluid power, properties - hydraulic fluids, air. Selection of hydraulic fluids, comparison between hydraulics and pneumatics. Symbols of pneumatic elements and hydraulic elements.

UNIT II PNEUMATIC SYSTEMS 12

Basic requirement of pneumatic system. Elements of pneumatics, constructional details of air compressors, 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

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

UNIT IV ADVANCED TOPICS IN HYDRAULICS AND PNEUMATICS 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 and maintenance and trouble shooting of pneumatic circuits.

TOTAL:45 PERIODS

TEXT BOOK

1. Anthony Esposito," Fluid Power with Applications", PHI / Pearson Education, 2005.

REFRENCES

1. Shanmugasundaram.K, "Hydraulic and Pneumatic controls", Chand & Co, 2006.
2. Majumdar, S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw Hill, 2001
3. Majumdar, S.R., "Pneumatic Systems – Principles and Maintenance", Tata McGraw Hill, 2007.
4. Micheal J, Pinches and Ashby, J.G., "Power Hydraulics", Prentice Hall, 1989.
5. Dudelyt, A Pease and John J Pippenger, "Basic Fluid Power", Prentice Hall, 1987.

TOTAL: 45 PERIODS

AU9022 ALTERNATE FUELS AND ENERGY 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 energy systems for use in the automobiles.

UNIT I INTRODUCTION 6

Estimation of petroleum reserve "World Energy Scenerio, Energy Survey of India" – Need for alternate fuel – Availability of alternate fuels.

UNIT II ALCOHOLS 9

Properties as engine fuels, alcohols and gasoline blends, performance in SI engine. Methanol and gasoline blends – Combustion characteristics in engines – emission characteristics.

UNIT III NATURAL GAS, LPG, HYDROGEN AND BIOGAS 9

Availability of CNG, properties, modification required to use in engines – performance and emission characteristics of CNG and LPG in SI & CI engines. Performance and emission for LPG – Hydrogen – Storage and handling, performance and safety aspects.

UNIT IV VEGETABLE OILS 10

Various vegetable oils for engines – Esterification – Performance in engines – Performance and emission characteristics.

UNIT V ELECTRIC AND SOLAR POWERED VEHICLES 11

Layout of an electric vehicle – advantage and limitations – Specifications – System component, Electronic control system – High energy and power density batteies – Hybrid vehicle – Solar powered vehicles. Fuel cell vehicles.

TOTAL: 45 PERIODS

TEXTBOOK

1. Ramalingam. K.K., Internal combustion engine, scitech publications, Chennai, 2003.
2. Maheswar Dayal, Energy today & tomorrow, I & B Horishr India, 1982.
3. Bechtold,R.L., Alternative Fuels Guide Book, SAE, 1997.

REFERENCES

1. Nagpal, Power Plant Engineering, Khanna Publishers, 1991.
2. Alcohols and motor fuels progress in technology, Series No.19, SAE Publication USA 1980.
3. SAE Paper Nos.840367, 841156, 841333, 841334.
4. The properties and performance of modern alternate fuels – SAE Paper No.841210.

AU9023	SPECIAL TYPES OF VEHICLES	L T P C 3 0 0 3

UNIT I. EARTH MOVING AND CONSTRUCTIONAL EQUIPMENTS 11

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

UNIT II POWER TRAIN CONCEPTS 7

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

UNIT III VEHICLE SYSTEMS, FEATURES 11

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 on dumper body, loader bucket and water tank of sprinkler.

UNIT IV SPECIAL PURPOSE VEHICLES FOR INDUSTRIAL APPLICATIONS 8

Constructional features, capacity and stability of jib cranes. Vibratory compactors.

UNIT V FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES 8

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

TOTAL: 45PERIODS

TEXTBOOK

1. Abrosimov. K. Bran berg.A. and Katayer.K., " Road making Machinery ", MIR Publishers, Moscow, 1971.
2. SAE Handbook Volume III
3. Wong.J.T., " Theory of Ground vehicles ", John Wiley & Sons, New York, 1987.

REFERENCES

1. B. Geleman and M. Moskovin, Farm tractors, MIR publishers, Moscow.
2. Off the road wheeled and combined traction devices - Ashgate Publishing Co. Ltd. 1998.
3. Bart H Vanderveen, Tanks and Transport vehicles, Frederic Warne and Co ltd., London.
4. Astokhov, Truck Cranes, MIR Publishers, Moscow.

AU9024 TRACTOR AND FARM EQUIPMENTS L T P C
3 0 0 3

UNIT I GENERAL DESIGN OF TRACTORS 10

Classification of tractors – Main components of tractor – Safety rules.

UNIT II CONTROL OF THE TRACTOR AND FUNDAMENTALS OF ENGINE OPERATION 10

Tractor controls and the starting of the tractor engines – Basic notions and definition – Engine cycles – Operation of multicylinder engines – General engine design – Basic engine performance characteristics.

UNIT III ENGINE FRAME WORK AND VALVE MECHANISM OF TRACTOR 10

Cylinder and pistons – Connecting rods and crankshafts – Engine balancing – Construction and operation of the valve mechanism – Valve mechanism troubles.

UNIT IV COOLING SYSTEM, LUBRICATION SYSTEM AND FUEL SYSTEM OF A TRACTOR 10

Cooling system – Classification – Liquid cooling system – Components, Lubricating system servicing and troubles – Air cleaner and turbo charger – Fuel tanks and filters – Fuel pumps.

UNIT V FARM EQUIPMENTS 5

Working attachment of tractors – Farm equipment – Classification – Auxiliary equipment – Trailers and body tipping mechanism.

TOTAL :45 PERIODS

TEXTBOOK

1. Rodichev and G.Rodicheva, Tractor and Automobiles, MIR Publishers, 1987.

REFERENCES

1. Kolchin,A., and V.Demidov, Design of Automotive Engines for Tractor
2. MIR Publishers, 1972.

AU9028 FLEET MANAGEMENT L T P C
3 0 0 3

UNIT I MANAGEMENT TRAINING AND OPERATIONS 10

Basic principles of supervising. Organising time and people. Job instruction training – Training devices and techniques – Drive and mechanic hiring – Driver checklist – Lists for driver and mechanic – Trip leasing – Vehicle operation and types of operation.

UNIT II VEHICLE MAINTENANCE 8

Scheduled and unscheduled maintenance – Planning and scope – Evaluation of PMI programme – Work scheduling – Overtime – Breakdown analysis – Control of repair backlogs – Cost of options.

UNIT III VEHICLE PARTS, SUPPLY MANAGEMENT AND BUDGET 10

Cost of inventory – Balancing inventory cost against downtime – Parts control – Bin tag systems – Time management – Time record keeping – Budget activity – Capital expenditures – Classification of vehicle expenses – Fleet management and data processing – Data processing systems – Software. Models – Computer controlling of fleet activity – Energy management.

UNIT IV SCHEDULING AND FARE STRUCTURE 10

Route planning – Scheduling of transport vehicles – Preparation of timetable, Costs, fare structure – Methods of fare collection – Preparation of fare table.

UNIT V MOTOR VEHICLE ACT 7

Schedules and sections – Registration of motor vehicles – Licensing of drivers – Control of permits – Limits of speed – traffic signs – Constructional regulations – Description of goods carrier, delivery man, tanker, tipper, Municipal, fire fighting and break down service vehicle.

TOTAL: 45 PERIODS

TEXT BOOK

1. John Dolu, Fleet management, McGraw Hill Co., 1984.

REFERENCES

1. Government Publication, The Motor vehicle Act, 1989.
2. Kitchin,L.D., Bus operation, Illiffe and Sons Ltd., London, III Edition, 1992.
3. Kadiyali,L.R., Traffic engineering and Transport Planning.

AU9029 AUTOMATIVE TEST INSTRUMENTATION L T P C
3 0 0 3

UNIT I MEASUREMENT SYSTEMS 6

Static and Dynamic Measurement systems- Requirements and characteristics – Analysis of experimental detail.

UNIT II TRANSDUCERS, MODIFIERS AND TERMINATING DEVICES 8

Transducers for Automotive Applications – Amplifiers- filters –data Acquisition-Indicators, Printers and displays –Signal Analyzing.

UNIT III MECHANICAL MEASUREMENT 10

Instrumentation for Measuring Weight, Force, torque, pressure power, temperature, fluid flow, vibration, rotational speed, velocity, acceleration and angular motion.

UNIT IV ENGINE EXPERIMENTAL TECHNIQUES 12

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 – Brake tests.

TOTAL : 45 PERIODS

REFERENCES:

1. A.W. JUDGE, Engineering Precision Measurement, Chapman and Hall Ltd, Essex Street W.C.,1951,
2. T.G. Beckwith and Buck, Mechanical Measurements, Oxford and IBH Publishing House, New Delhi, 1995
3. D.Patambis, Principle of Industrial Instrumentation, Tata McGraw Hill Publishing Co, New Delhi, 1990.
4. Rangan, Sharma and Mani, Instrumentation Devices and systems, Tata McGraw Hill Publishing Co., Ltd., 1990
5. J.G. Giles, Engine and Vehicle Testing, Illiffe books Ltd., London,1968.

GE9024 EFFECTIVE COMMUNICATION AND SOFT SKILLS L T P C
2 1 0 3

AIM:
To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel in their profession.

OBJECTIVES:
- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

1. **PC BASED SESSION**

A. Career Lab (15 periods) Viewing and discussing audio-visual materials

1. Resume / Report Preparation / Letter writing (3)
Letter writing – Job application with Resume – Project report – Email etiquette.

2. Presentation skills: (3)
Elements of effective presentation – Structure of presentation – Presentation tools – Body language.

3. Soft skills: (3)
Time management – Stress management – Assertiveness – Negotiation strategies – Psychometrics – Analytical and logical reasoning.

4. Group Discussion: (3)
Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.

TOTAL : 45 PERIODS