ANNA UNIVERSITY:: CHENNAI 600 025

UNIVERSITY DEPARTMENTS

CURRICULUM – R 2013

B.E. (PART – TIME) – AUTOMOBILE ENGINEERING

I – VII SEMESTERS CURRICULA & SYLLABI

SEMESTER I

Sl. No.	Code No.	Course Title	L	T	P	C
Theory						
1.	PTMA8151	Applied Mathematics	3	0	0	3
2.	PTPH8151	Engineering Physics	3	0	0	3
3.	PTCY8152	Engineering Chemistry	3	0	0	3
4.	PTGE8153	Engineering Mechanics	3	0	0	3
5.	PTGE8151	Computing Techniques	3	0	0	3
		TOTAL	**15**	**0**	**0**	**15**

SEMESTER II

Sl. No.	Code No.	Course Title	L	T	P	C
Theory						
1	PTAU8201	Electrical and Electronics Engineering	3	0	0	3
2	PTAU8202	Manufacturing Processes	3	0	0	3
3	PTAU8203	Measurement System for Automobiles	3	0	0	3
4	PTAU8204	Thermodynamics and Thermal Engineering	3	0	0	3
5	PTMA8251	Numerical Methods	3	0	0	3
		TOTAL	**15**	**0**	**0**	**15**

SEMESTER III

Sl. No.	Code No.	Course Title	L	T	P	C
THEORY						
1	PTAU8301	Automotive Chassis	3	0	0	3
2	PTAU8302	Automotive Electrical and Electronics	3	0	0	3
3	PTAU8303	Automotive Petrol Engines	3	0	0	3
4	PTAU8304	Mechanics of Solids	3	0	0	3
5	PTAU8305	Theory of fuels and Lubricants	3	0	0	3
		TOTAL	**15**	**0**	**0**	**15**

SEMESTER IV

Sl. No.	Code No.	Course Title	L	T	P	C
THEORY						
1	PTAU8401	Automotive Diesel Engines	3	0	0	3
2	PTAU8402	Automotive Transmission	3	0	0	3
3	PTAU8403	Two and Three Wheeler Technology	3	0	0	3
4	PTPR8351	Kinematics and Dynamics of Machines	3	0	0	3
PRACTICAL						
5	PTAU8411	Automotive Engine and Chassis Components Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER V

Sl. No.	Code No.	Course Title	L	T	P	C
THEORY						
1	PTAU8501	Automotive Components Design	3	0	0	3
2	PTAU8502	Special types of vehicle	3	0	0	3
3	PTAU8503	Vehicle Body Engineering	3	0	0	3
4	PTAU8504	Vehicle Control System	3	0	0	3
PRACTICAL						
5	PTAU8511	Engine Testing and Emission Measurement Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER VI

Sl. No.	Code No.	Course Title	L	T	P	C
Theory						
1	PTAU8601	Vehicle Dynamics	3	0	0	3
2	PTAU8602	Vehicle Maintenance	3	0	0	3
3		Elective – I	3	0	0	3
4		Elective – II	3	0	0	3
Practical						
5	PTAU8611	Vehicle Maintenance and Re Conditioning Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER VII

Sl. No.	Code No.	Course Title	L	T	P	C
Theory						
1	PTAU8701	Automotive Pollution and Control	3	0	0	3
2	PTAU8702	Manufacturing of Automotive Components	3	0	0	3
3		Elective – III	3	0	0	3
Practical						
4	PTAU8711	Project Work	0	0	9	6
		TOTAL	**9**	**0**	**9**	**15**

* - Four weeks Industrial Training during Vacation

TOTAL CREDITS: 15 +15 + 15 + 14 + 14 + 14 + 15 = 102

LIST OF ELECTIVES FOR B. E. (PART – TIME) -AUTOMOBILE ENGINEERING

S.No	Code No.	Course Title	L	T	P	C
1.	PTAU8001	Advance Theory of IC Engines	3	0	0	3
2.	PTAU8002	Advance Vehicle Technology	3	0	0	3
3.	PTAU8003	Alternative Fuels and Energy System	3	0	0	3
4.	PTAU8004	Automotive Aerodynamics	3	0	0	3
5.	PTAU8005	Automotive Materials	3	0	0	3
6.	PTAU8006	Automotive Test Instrumentation	3	0	0	3
7.	PTAU8007	Combustion Thermodynamics and Heat Transfer	3	0	0	3
8.	PTAU8008	Computational Fluid Mechanics	3	0	0	3
9.	PTAU8009	Finite Element Techniques	3	0	0	3
10.	PTAU8010	Fleet Management	3	0	0	3
11.	PTAU8011	Hybrid and Electric Vehicles	3	0	0	3
12.	PTAU8012	Simulation of IC Engines	3	0	0	3
13.	PTAU8013	Vehicle Air Conditioning	3	0	0	3
14.	PTGE8551	Engineering Ethics and Human Values	3	0	0	3
15.	PTMG8651	Total Quality Management	3	0	0	3
16.	PTGE8071	Disaster Management	3	0	0	3
17.	PTGE8072	Human Rights	3	0	0	3

PTMA8151 APPLIED MATHEMATICS L T P C
(Common to all branches of B.E / B.Tech (PT) Programmes) 3 0 0 3

OBJECTIVES

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

UNIT I MATRICES 9

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 9

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables - Maxima and minima of functions of two variables.

UNIT III ANALYTIC FUNCTION 9

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions w = a + z , az, 1/z, **-** Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9

Line Integral – Cauchy's theorem and integral formula – Taylor's and Laurent's Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 9

Existence conditions – Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals –Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 45 PERIODS

OUTCOMES

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

BOOKS FOR STUDY

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, Forty Second Edition, Delhi, 2012.
2. Ramana, B.V. Higher Engineering Mathematics" Tata McGraw Hill Publishing Company, 2008.

REFERENCES

1. Glyn James, Advanced Modern Engineering Mathematics, Prentice Hall of India, Fouth Edition, 2011.
2. Veerarajan, T., Engineering Mathematics (For First Year), Tata McGraw-Hill Pub. Pvt. Ltd., New Delhi, 2007.

PTPH8151 ENGINEERING PHYSICS L T P C
3 0 0 3

OBJECTIVE:

To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity - Poisson's ratio and relationship between moduli (qualitative) - Stress-strain diagram - factors affecting elasticity - bending of beams - cantilever - bending moment - theory and experiment of Young's modulus determination - Uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - rate of growth and decay of sound intensity - derivation of Sabine's formula - absorption coefficient and its determination - factors affecting acoustics of buildings : focussing, interference, echo, Echelon effect, resonance - noise and their remedies. Ultrasonics - production – magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating - industrial applications - NDT - Ultrasonic method: scan modes and practice.

UNIT III THERMAL PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity - conductions in solids - Forbe's and Lees' disc methods - Rectilinear flow of heat through a rod - flow of heat through a compound materials - radical flow of heat through a spherical shell - thermal insulation of buildings – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law and Planks law (derivation). Laws of thermodynamics - Otto and diesel engines and their efficiency - entropy - entropy of Carnot's cycle - reverse Carnot's cycle - refrigerator.

UNIT IV APPLIED OPTICS 9

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein's coefficients - CO2, Nd:YAG and semiconductor lasers - homo junction and hetro junction - construction and working - applications - Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V SOLID STATE PHYSICS **9**

Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL : 45 PERIODS

OUTCOMES:

- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:

1. Gaur R.K., and Gupta, S.L., Engineering Physics, Dhanpat Raj Publications,2003.
2. Palanisamy, P.K., Engineering Physics, Scitech Publications (P) Ltd, 2006.
3. Arumugam, M., Engineering Physics, Anuradha Publications, 2000.

REFERENCES:

1. Sankar, B.N., Pillai.S.O., Engineering Physics, New Age International (P) Ltd., 2007.
2. Rajendran.V Engineering Physics, Tata McGraw-Hill, 2009.

PT CY8152 **ENGINEERING CHEMISTRY** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand about the chemical thermodynamics.
- To impart knowledge in the basics of polymer chemistry.
- To develop sound knowledge on kinetics and catalysis.
- To impart basic knowledge on photochemistry and spectroscopy

UNIT I CHEMICAL THERMODYNAMICS **9**

Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Criteria of spontaneity; Helmholtz and Gibbs free energy functions; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY **9**

Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS **9**

Introduction-reaction velocity, factors affecting reaction velocity, rate constant, order of reaction, molecularity, pseudo molecular reactions, zero, first, second, and third order reactions, reactions of fractional orders, determination of order of reactions. Catalysis: Auto catalysis - Enzyme Catalysis: Michaelis-Menton equation; factors affecting enzyme catalysis. Heterogeneous Catalysis: Types of adsorption isotherms: Langmuir–Hinselwood and Rideal–Eley Mechanism.

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY **9**

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Photoprocesses - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitisation. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

UNIT V NANOCHEMISTRY **9**

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis: Precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and Applications. Risk discussion and Future perspectives.

TOTAL 45 PERIODS

OUTCOMES:

- The knowledge gained on polymer chemistry, thermodynamics. spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning

TEXT BOOKS

1 P. Kannan and A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009.

2 S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India, 2011

REREFERENCE BOOKS

1 P.W. Atkins and de Paula Julio, "Physical Chemistry", Oxford University Press, 8th Ed., (Indian Student Edition) (2009).

2 K. K. Rohatgi-Mukherjee, "Fundamental of Photochemistry" New Age International (P) Ltd., New Delhi, 1986.

3 G.A. Ozin and A.C. Arsenault, "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.

4 V.R.Gowariker, N.V.Viswanathan and JayadevSreedhar, "Polymer Science", New Age International P (Ltd.,), Chennai, 2006.

.

PTGE8153	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVE

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I BASICS AND STATICS OF PARTICLES 9

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces –– Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES 9

Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9

Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass

moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 9

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion -Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 9

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 45 PERIODS

OUTCOMES:

- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R. "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004)
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:

1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education (2010).
2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education (2006)
3. J.L.Meriam and L.G.Kraige, " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2,Third Edition, John Wiley & Sons,(1993)
4. Rajasekaran, S and Sankarasubramanian, G., "Engineering Mechanics Statics and Dynamics",3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
5. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, (1998).
6. Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw-Hill Publishing company, New Delhi (2008)

PTGE8151 COMPUTING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

The students should be made to:

- Learn the organization of a digital computer.
- Be exposed to the number systems.

- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION 8

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II C PROGRAMMING BASICS 10

Problem formulation – Problem Solving - Introduction to ' C' programming –fundamentals – structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV FUNCTIONS AND POINTERS 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V STRUCTURES AND UNIONS 9

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design C Programs for problems.
- Write and execute C programs for simple applications.

TEXTBOOKS

1. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.

REFERENCES

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Byron S Gottfried, " Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

PTAU8201 ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- To impart the knowledge on basic concepts of electrical circuits and electrical machines.
- To impart the knowledge on basic concepts of electronic components, devices and circuits

UNIT I BASIC CONCEPTS AND DC CIRCUITS 9

Ohm's law - Electrical resistance - Series /Parallel resistive circuits - Star/Delta transformations - Kirchoff's law - Node and Mesh analysis - Thevenin's and Norton's theorem.

UNIT II A.C.CIRCUITS 9

RMS and average value of periodic waves - Form factor - Phase and Phase difference - Simple RC.RL and RLC circuits - series and parallel resonance - power and power factor - introduction to three phase systems – power measurement in 3 phase system.

UNIT III D.C. MACHINES 10

Construction details of DC machines - principle of operation of DC generator - EMF equation - principle of DC motor - Back EMF - Voltage and torque equation - Principle of transformer - construction and type - EMF equation - Tests on transformer - Equivalent circuit - Induction motor - Construction and basic principle of operation - Starting and Running torques.

UNIT IV ELECTRONIC COMPONENTS AND DEVICES 9

Operating principle and characteristics of Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor - Field Effect Transistors – UJT – SCR.

UNIT V ANALOG CIRCUITS 8

Rectifier and Power Supply Circuits, clipper, clamper using diodes, Operational Amplifiers (Ideal) - properties and typical circuits like differentiator, integrator, summer, comparator.

TOTAL : 45 PERIODS

OUTCOMES:

- The students will be able to construct analog and digital circuits with electrical and electronics component. They will be familier with the use of electrical and electronic measuring systems

REFERENCES:

1. Theraja, B.L., " A Text Books of Electrical Technology ", S.S.Chand and Co., New Delhi, 1998.
2. Edminister J.A., " Theory and Problems on Electric circuits ", McGraw Hill International Edition, 1994.
3. Kosow, I.L., " Electrical Machinery and Transformers ", 4th Edition, Prentice Hall of India, 1991.
4. Nagrath I.J. and Kothari D.P., "Theory and Problems of Basic Electrical Engineering", Prentice Hall of India, 1998.
5. Millman.J. and Grabel.S., Integrated Electronics, Tata McGraw Hill, 1995.
6. Horowits.P. and Hill.W., The Art of Electronics, McGraw Hill, 1995.

PTAU8202 MANUFACTURING PROCESSES L T P C
3 0 0 3

OBJECTIVE:

To learn the basic processes available to make a part/product. Will help the students to select the best manufacturing process based on quality/time/cost/mechanical properties.

UNIT I CASTING PROCESSES 9

Comparison of Manufacturing Processes - Pattern – mould, die – Pattern allowances – materials – types – sand – sand moulding – single box – 2 and 3 box moulding – die casting – investment casting – shell moulding – centrifugal casting – continuous casting – core – runner – riser – gate – chaplet – squeeze casting.

UNIT II WELDING PROCESSES 9

Soldering, brazing and welding – fusion welding gas welding – flame types – process – arc welding – electrode – filler material – flux – edge preparation – joints – position – welding symbol – GMAW – GTAW – resistance welding – spot, seam, butt and projection – stud welding – friction welding – submerged arc welding – electrosleg welding.

UNIT III METEL FORMING PROCESSES 9

Hot and cold forming – forging – rolling – extrusion – spinning – sheet metal operations – Powder metallurgy – steps – sintering – merits – demerits and applications. Types of dies – Progressive and combination dies – tube bending.

UNIT IV MACHINING PROCESSES 9

Machine and Machine tool – Lathe types – various operations – Shaper – Planer - Quick return mechanism – drilling – types and operations – milling – types – cutters – operations – gear cutting in milling – grinding – types – grinding wheel – loading – turning & balancing of wheels - CNC machines.

UNIT V PLASTIC MATERIAL PROCESSES 9

Injection – Blow and rotational moulding – Thermoforming Process - Reinforced plastics and composite materials – Manufacturing of honey comb structure – shaping of ceramics – Transfer moulding – MMC – CMC.

TOTAL : 45 PERIODS

OUTCOMES:

- The students will be in a position to select and employ a particular non traditional machining process as well as a rapid prototyping technique based upon the application in industries.

TEXT BOOKS:

1. Serope Kalpakjian, Steven R. Schmid “Manufacturing Engineering and Technology”, Addison Wesley, 2001
2. P.C. Sharma, “A Text Book of Production Technology”, S.Chand and Co. Ltd., New Delhi, 1996.

REFERENCE BOOKS:

1. B.H.Amstead, “Manufacturing Processes”, Phillip F.Ostwald, L.Begemon, John Wiley and Sons, 8th Edition, 1998.
2. De Garmo, “Materials and Processes in Manufacturing”, Prentice Hall of India, 8th Edition, 1998.
3. T.R. Banga, R.L. Agarwal and T.Manghrani, “Foundry Engineering”, Khanna Publishers, New Delhi – 1995.
4. P.N.Rao, “Manufacturing Technology – foundry Forging and Welding”, Tata McGraw Hill Publishing Co., New Delhi – 1988.

PTAU8203 MEASUREMENT SYSTEM FOR AUTOMOBILES L T P C
3 0 0 3

OBJECTIVES:

- To impart the knowledge on basics of measurements and sensors
- To impart the knowledge on automotive measurements and instruments

UNIT I INTRODUCTION TO MEASUREMENTS AND SENSORS 9

Sensors: Functions- Classifications- Main technical requirement and trends
Units and standards- Calibration methods- Classification of errors- Error analysis- Limiting error- Probable error- Propagation of error- Odds and uncertainty- principle of transduction- Classification.
Static characteristics- mathematical model of transducers- Zero, First and Second order transducers- Dynamic characteristics of first and second order transducers for standard test inputs.

UNIT II VARIABLE RESISTANCE AND INDUCTANCE SENSORS 9

Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers:- EI pick up and LVDT

UNIT III VARIABLE AND OTHER SPECIAL SENSORS 9

Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor- digital transducers-Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.

UNIT IV AUTOMOTIVE PRESSURE AND FORCE/TORQUE SENSOR 9

Pressure Sensor:

Typical automotive applications- Thick film pressure sensor- Semiconductor pressure sensor- Integrated silicon intake-manifold pressure sensor-Integrated silicon combustion-pressure sensor- Piezo electric sensor-High pressure sensor with metal diaphragm.

Force/Torque Sensor:

Typical automotive applications- Magneto elastic bearing-pin sensor- Magneto elastic tension/compressive-force sensor according to the cross-ductor principle – Basic principle of torque measurement –Stress and Angle measuring torque sensor

UNIT V AUTOMOTIVE POSITION AND RPM/VELOCITY SENSORS 9

Position Sensors:- Typical automotive applications- Wiper potentiometers- Short-circuiting ring sensor- Half-differential sensor- Eddy-current pedal-travel sensor- Integrated Hall IC's - Hall acceleration sensor- Knock sensors-RPM and Velocity Sensors: - Inductive rotational speed sensor- Hall effect sensor

Temperature Sensors:- Typical automotive applications -Sintered-Ceramic resistors-Thin film resistors-Thick film resistors- Monocrystalline silicon semiconductor resistor- Thermopile sensors

Flow Sensors:- Ultrasonic flow sensors-Pitot tube air-flow sensor- Hot wire air-mass flow meter- Micro mechanical hot-film air-mass flow meter- Lambda sensor -Imaging sensor-Rain Sensor Introduction to MEMs

TOTAL: 45 PERIODS

OUTCOME:

- Students gained the basic knowledge on measurements and sensor.
- Familiarized in application of automotive sensors.

TEXT BOOKS:

1. Doeblin E.O, “Measurement Systems : Applications and Design”, 5th Edition, Tat McGraw-Hill Publishing Co,2007
2. Robert Brandy, “ Automotive Electronics and Computer System”, Prentice Hall,2001
3. William Kimberley,” Bosch Automotive Handbook”, 6th Edition, Robert Bosch GmbH,2004.

REFERENCES:

1. Bentley J.P ,” Principles of Measurement Systems”, 4th Edition, Addision Wesley Longman Ltd., U.K, 2004
2. Patranabis.D, “ Sensors and Transducers”, 2nd Edition, Prentice Hall India Ltd,2003
3. Murthy D.V.S, “Transducers and Instrumentation”, Prentice Hall of India, 2007
4. Neubert H.K.P.,” Instrument Transducers- An Introduction to their Performance and Design” , Oxford University Press, Cambridge,2003

PTAU8204 THERMODYNAMICS AND THERMAL ENGINEERING L T P C
3 1 0 4

OBJECTIVE:

- To introduce fundamental concepts in thermodynamics, heat transfer, propulsion and refrigeration and air conditioning.

UNIT I BASIC THERMODYNAMICS 14

Systems, closed, open and isolated. Property, state, path and process, quasi-static process, 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. Availability and Un Availability. Properties of gases and vapours.

UNIT II AIR STANDARD CYCLES AND COMPRESSORS 12

Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Compressors, Classifications of compressors, Single stage and multi stage, Effect of intercooler in multi stage compressor, Perfect and imperfect intercooler, work done by the compressor, Reciprocating, Rotary, Axial, Vane compressors.

UNIT III STEAM AND JET PROPULSION 12

Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart – Rankine cycle, Work done, Steam rate – Steam Nozzles, Types of nozzles, Friction in nozzles - Simple jet propulsion system – Thrust rocket motor – Specific impulse.

UNIT IV REFRIGERATION AND AIR-CONDITIONING 10

Principles of refrigeration, Vapour compression – Vapour absorption types, comparison - Co-efficient of performance (COP), Properties of refrigerants – Basic Principle, Summer, winter and Year round Air conditioning.

UNIT V HEAT AND MASS TRANSFER 12

Modes of heat transfer, Heat conduction in parallel, radial and composite wall – Basics of Convective heat transfer. Fundamentals of Radiative heat transfer – Flow through heat exchangers, Logarithmic Mean Temperature Difference (LMTD) for parallel flow and Arithmetic Mean Temperature Difference (AMTD) counter flow heat exchangers.

TOTAL : 60 PERIODS

(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)

OUTCOMES:

- It helps the students to have a clear idea of application of thermodynamics and heat transfer. The student would be able to identify the applications of these techniques in their engineering fields.

TEXT BOOKS:

1 Chattopadhyay. P Engineering Thermodynamics", oxford University Press, New Delhi, 2010.
2 .Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 2007.
3. 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.
6. Mathur& Sharma Steam Tables, Jain Publishers, NewDelhi.

PTMA8251 NUMERICAL METHODS L T P C
(EEE, IT, Printing, Automobile, Industrial, Manufacturing) 3 0 0 3

OBJECTIVES:

- To provide the mathematical foundations of numerical techniques for solving linear system, eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

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 9

Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 9

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

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

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.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

1. Grewal, B.S. and Grewal,J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao, K. "Numerical methods for Scientists and Engineers', Prentice Hall of India Private Ltd., New Delhi, 3rd Edition,2007.

REFERENCES:

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, "Applied Numerical Analysis using MATLAB", Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.

PTAU8301 AUTOMOTIVE CHASSIS L T P C
3 0 0 3

OBJECTIVE:

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

UNIT I LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM 9

Basic construction of chassis, Types of Chassis layout, with reference to Power Plant location and drive, various, types of frames, Loads acting on vehicle frame, Types of Front Axles and Stub Axles, Front Wheel Geometry. Condition for True Rolling Motion. Ackerman's and Davi's Steering Mechanisms, Steering Linkages, Different Types of Steering Gear boxes, Slip Angle, Over–Steer and Under–Steer, Reversible and Irreversible Steering, Electrical Power–Assisted Steering. Problems in steering system.

UNIT II DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL 9

Driving Thrust and its effects, torque reactions and side thrust, Hotchkiss drive, torque tube drive, radius rods and stabilizers, Propeller Shaft, Universal Joints, Constant Velocity Universal Joints, Final drive, different types of final drive, Worm and Worm wheel, straight bevel gear,spiral bevel gear and hypoid gear final drive. Differential principle. Constructional details of differential unit, Differential housings, Non–Slip differential, Differential locks.

UNIT III REAR AXLES, WHEELS, RIMS AND TYRES 9

Construction of rear axles, Types of Loads acting on rear axles, Full –Floating, Three–Quarter Floating and Semi–Floating Axles, Twist beam rear axle, Types, Multi axles vehicles. Wheels and Rims, Types of Tyres and their constructional details. Measurement of wheel and axle load.

UNIT IV SUSPENSION SYSTEM 9

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

UNIT V BRAKING SYSTEM 9

Need for Braking system, Stopping Distance, Time and Braking Efficiency, Effect of Weight Transfer during Braking, Classification of brakes , Braking Torque, drum brake and disc Brake Theory, Types and Construction of Hydraulic Braking System, Mechanical Braking System, Pneumatic Braking System, Power–Assisted Braking System, Servo Brakes, Retarders. Problems in braking system.

TOTAL : 45 PERIODS

OUTCOMES:

- The students will understand the constructional, working principle of various sub system of an automobile.

TEXT BOOKS

1. Newton Steeds and Garret, “Motor Vehicles” 13th Edition,Butterworth, London, 2005.
2. Heinz Hazler, “Modern Vehicle Technology”, Butterworth, London, 2005.

REFERENCES

1. Heldt P.M., “Automotive Chassis” Chilton Co., New York.
2. N.K. Giri, “Automotive Mechanics” Khanna Publishers, New Delhi, 2005.
3. Milliken & Milliken, “Race Car Vehicle Dynamics”, SAE

PTAU8302 AUTOMOTIVE ELECTRICAL AND ELECTRONICS L T P C
3 0 0 3

OBJECTIVES

- Knowledge in vehicle electrical and electronics components for engine operation.
- Enhancing the knowledge of revsor and microprocessor applications in vehicle control systems.
- Gaining information's on modern safety system in vehicle braking.

UNIT I BATTERIES AND STARTING SYSTEM 10

Different types of Batteries – principle, rating, testing and charging. Starter motors characteristics, capacity requirements. Drive mechanisms. Starter switches.

UNIT I CHARGING SYSTEM LIGHTING AND ACCESSORIES 9

DC Generators and Alternators their characteristics. Control unit – cut out, electronic regulators. Vehicle interior lighting system. Vehicle exterior lighting system. Wiring requirements. Lighting design. Dashboard instruments. Horn, trafficator.

UNIT III ELECTRONIC IGNITION AND INJECTION SYSTEM 9

Spark plugs. Advance mechanisms. Different types of ignition systems. Electronic fuel injection systems.

UNIT IV SENSORS AND MICROPROCESSORS IN AUTOMOBILES 9

Basic sensor arrangements. Types of sensors – oxygen sensor, hot wire anaemometer sensor, vehicle speed sensor, detonation sensor, accelerometer sensor, crank position sensor. Microprocessor and microcomputer controlled devices in automobiles such voice warning system, travel information system, keyless entry system, automatic transmission system, electronic steering system.

UNIT V SAFETY SYSTEMS 8

Antilock braking system, air bag restraint system, voice warning system, seat belt system, road navigation system, anti theft system.

TOTAL : 45 PERIODS

OUTCOMES:

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

REFERENCES:

1. Judge. A.W., modern Electrical Equipment of Automobiles, Chapman & Hall, London, 1992
2. Young.A.P., & Griffiths.L., Automobile Electrical Equipment, English Language Book Society & New Press, 1990
3. Spreadbury. F.G., Electrical Ignition Equipment, Constable & Co Ltd., London, 1962
4. Robert N Brady Automotive computers and Digital Instrumentation. A Reston Book, Prentice Hill, Eagle Wood Cliffs, New Jersey, 1988.

PTAU8303 AUTOMOTIVE PETROL ENGINES 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 for engine components.

UNIT II FUEL AND IGNITION SYSTEM 10

Carburetor – requirements, working principle, types, different circuits – Compensation – Maximum power devices – Petrol injection in SI engines, Magneto coil and battery coil spark ignition system. Advance mechanism. Electronic ignition System – CDI.

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, Evaporative cooling system – Need for Lubrication system. Mist lubrication system, wet & dry sump lubrication, Properties of lubricants, properties of coolant – Recent Technologies.

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 in SI engines – effect of engine variables on knock – Combustion chambers for SI engine – 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 processes. Merits and demerits, scavenging efficiency, Scavenging pumps, Rotary valve engine.

TOTAL : 45 PERIODS

OUTCOMES:

- Understand the working principles and constructional details of automotive SI Engines
- Understand the different sub systems of S.I Engine like,Fuel and ignition system, lubricating system, cooling system etc.

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.

PTAU8304 MECHANICS OF SOLIDS L T P C
3 0 0 3

OBJECTIVE:

- To introduce various behavior of structural components under various loading conditions.

UNIT I INTRODUCTION 8

Definition of stress, strain and their relations – Relations between material constants – Axial loading - Statically determinate and indeterminate problems in tension & compression – Plane truss analysis – method of joints – method of sections – 3-D trusses – Thermal stresses – Impact loading.

UNIT II STRESSES IN BEAMS 10

Shear force & bending moment diagrams: Bending and shear stress variation in beams of symmetric sections, a typical spar section: Beams of uniform strength - beams of two materials.

UNIT III DEFLECTION OF BEAMS 10

Double integration method – Macaulay's method – moment area method – conjugate beam method – principle of superposition – Maxwell's reciprocal theorem.

UNIT IV TORSION – SPRINGS – COLUMNS 10

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

UNIT V BIAXIAL STRESSES 7

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

TOTAL: 45 PERIODS

OUTCOMES:

- Solve the problems related to the structural components under various loading conditions

TEXT BOOKS:

1. William Nash, 'Strength of Materials', Tata McGraw Hill, 2004
2. Timoshenko and Young "Strength of Materials" Vol. I & II

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. Timoshenko,S. and Young,D.H., 'Elements of Strength of Materials', T.Van Nostrand Co. Inc., Princeton, N.J., 1977.

PTAU8305 THEORY OF FUELS AND LUBRICANTS L T P C
3 0 0 3

OBJECTIVES

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

UNIT I MANUFACTURE OF FUELS AND LUBRICANTS 9

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

UNIT II THEORY OF LUBRICATION 9

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

UNIT III LUBRICANTS 9

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

UNIT IV PROPERTIES AND TESTING OF FUELS 9

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

UNIT V COMBUSTION & FUEL RATING 9

SI Engines – flame propagation and mechanism of combustion, normal combustion, knocking, octane rating, fuel requirements. CI Engine, mechanism of combustion, diesel knock, cetane rating, fuel requirements. Additive - mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives – specifications of fuels.

TOTAL : 45 PERIODS

OUTCOMES:

- At the end of the course, the student can understand the importance, manufacturing methods, testing methods, combustion methodology of automotive fuels and lubricants.

TEXT BOOKS:

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

REFERENCES

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

PTAU8401 AUTOMOTIVE DIESEL ENGINES L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge on basic concepts of automotive diesel engines, combustion process involved in diesel engines and the various subsystems used along with their functions in detail.

UNIT I DIESEL ENGINE BASIC THEORY 9

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

UNIT II FUEL INJECTION SYSTEM 9

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

UNIT III AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS 10

Air intake systems – Importance of air motion – Swirl, Squish and Tumble. Swirl ratio. Fuel air mixing. Stages of combustion. Delay period – factors affecting combustion. Knock in CI engines. Comparison of knock in CI & SI engines. Direct and indirect injection combustion chambers. Air cell chamber. Combustion chamber design – M-Combustion chamber. Combustion chambers for HCCI engines.

UNIT IV SUPERCHARGING AND TURBOCHARGING 8

Necessity and limitation of supercharging. Thermodynamic cycle with super charging. Types of supercharging and turbocharging – Relative merits. Intercooler. Matching of turbocharger. Modification of an engine for supercharging. Effect of supercharging on engine performance. Variable geometry and variable nozzle turbocharger. E-Turbocharger. Problems.

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 – Heat balance – Methods to improve engine performance - Introduction to Stratified charge engine, LHR engines, HCCI Engine. Problems.

TOTAL: 45 PERIODS

OUTCOMES:

- The students can understand the construction and basic principle of operation of various types of engines and its various fuel induction systems. Also the students can have the basic knowledge on theory of combustion and its types, different types of combustion chamber, air motion etc. Also the students will get the knowledge on the design advances in IC engines; Electronic fuel injection system will also be introduced to the students. At the end of the course the students will have command over automotive engine operation and its fuel injection system.

TEXT BOOKS:

1. V. Ganesan, Internal Combustion Engines, Tata-McGraw Hill Publishing Co., New Delhi, 1994.
2. M.L. Mathur and R.P.Sharma, Internal Combustion Engine, Dhanpat Rai Publications (P) Ltd, New Delhi 110002

REFERENCES:

1. K. K. Ramalingm, internal Combustion Engines, Scitech publications, Chennai, 2003.
2. Heldt, P.M., High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1985.
3. Obert, E.F., Internal Combustion Engine analysis and Practice, International Text Book Co., Scranton, Pennsylvania, 1988.

4. Maleev, V.M., Diesel Engine Operation and Maintenance, McGraw Hill, 1974.
5. Heinz advanced engine tech

PTAU8402 AUTOMOTIVE TRANSMISSION L T P C
3 0 0 3

OBJECTIVES:

- To know about the various transmission and drive line units of automobiles.

UNIT I CLUTCH AND GEAR BOX 9

Requirement of transmission system, Different types of clutches, principle & Construction of Single plate coil spring and Diaphragm spring clutches., Need and Objectives of Gear box. Construction and operation of Sliding mesh, Constant mesh and Synchromesh gearboxes. – Determination of gear ratios for vehicles. Performance characteristics in different speeds. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & Power and acceleration.

UNIT II HYDRODYNAMIC TRANSMISSION 9

Fluid coupling-Principle-Constructional details. Torque capacity. Performance characteristics. Reduction of drag torque in fluid coupling. Torque converter-Principle-constructional details, performance characteristics. Multistage torque converters and Polyphase torque converters.

UNIT III EPICYCLIC GEARBOXES USED IN AUTOMATIC TRANSMISSION 9

Principle of Planetary gear trains - Wilson Gear box, Cotal electromagnetic transmission-Hydraulic control system for Automatic Transmission.

UNIT IV AUTOMATIC TRANSMISSION APPLICATIONS 9

Need for automatic transmission, Four speed longitudinally mounted automatic transmission - Chevrolet “Turboglide” Transmission, Continuously Variable Transmission (CVT) – Types – Operations of a typical CVT.

UNIT V HYDROSTATIC AND ELECTRIC DRIVE 9

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-types- Principle of early and modified Ward Leonard Control system-Advantages & limitations.

TOTAL : 45 PERIODS

OUTCOMES

- The students will understand the constructional, working principle of various types of manual and automotive transmission of an automobile.

TEXT BOOKS:

1. Heldt,P.M., Torque converters, Chilton Book Co., 1962.
2. Newton and Steeds, Motor vehicles, Illiffe Publishers, 1985.

REFERENCES:

1. SAE Transactions 900550 & 930910.
2. Hydrostatic transmissions for vehicle applications, I Mech E Conference, 1981-88.
3. Crouse,W.H., Anglin,D.L., Automotive Transmission and Power Trains construction, McGraw Hill, 1976.
4. Heinz Heisler, Advance vehicle Technology, Butterworth-Heinemann.

PTAU8403 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 & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams. Scavenging process.

UNIT II FUEL AND IGNITION SYSTEMS 9

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, Starting system - Kick starter system – Self starter system. Recent technologies.

UNIT III CHASSIS AND SUB-SYSTEMS 9

Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar, Freewheeling devices

UNIT IV BRAKES AND WHEELS 8

Drum brakes & Disc brakes Construction and Working and its Types, Front and Rear brake links lay-outs. Brake actuation mechanism. Spoked wheel, cast wheel, Disc wheel & its merits and demerits. Tyres and tubes Construction & its Types. Steering geometry.

UNIT V TWO & THREE WHEELERS – CASE STUDY 10

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance. Recent developments.

TOTAL : 45 PERIODS

OUTCOMES:

- The students can able to understand the various subsystem of two and three wheeler and also know how it is different from light motors and heavy motor vehicles.

TEXT BOOK:

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

REFERENCES:

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

PTPR8351 KINEMATICS AND DYNAMICS OF MACHINES L T P C
3 1 0 4

OBJECTIVES:

- To understand the basic concepts of mechanisms and machinery

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 – Introduction to 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 – screw jack – pivot, collar and thrust bearings – plate and cone clutch – belt (flat & vee) and rope drives – creep in belts – 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 – Types and profile – nomenclature of spur & helical gears – laws of gearing – interference – requirement of minimum number of teeth in gears – gear trains – simple, compound and reverted gear trains – determination of speed and torque in epicyclic gear trains – cams different types of followers – Cam – Types of cams and 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 of 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.

TOTAL : 60 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

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. Shigley J.E. and Uicker J.J. Theory of Machines and Mechanisms" McGraw Hill, 1986.

PTAU8411 AUTOMOTIVE ENGINE AND CHASIS COMPONENT LABORATORY **L T P C 0 0 3 2**

OBJECTIVE:

- To familiarize and train the students on the constructional arrangements of different automotive chassis components.

1. Study of the following engines and its components by dismantling, comparing with recent engine components and assembling various parts.
   i. Multi cylinder (4/6) inline diesel engine.
   ii Multi cylinder (4/6) inline petrol engine.
2. Study and measurements of a chassis.
3. Study, dismantling and assembling of the following components and systems
   i. Front axle (Rzeppa joint)
   ii. Real axle
   iii. Differential and Transfer Case.
   iv. Clutch (Single plate and Multi plate clutch)
   v. Gear box (Sliding, constant and mesh and synchromesh)
   vi. Steering System.
   vii. Braking system (Mechanical and Hydraulic)

Equipments Required:

1. Multi cylinder (4/6) inline diesel engine.
2. Multi cylinder (4/6) inline petrol engine.
3. Chassis.
4. Front axle with Rzeppa joint.
5. Rear axle with differential.
6. Single plate and Multi plate Clutch.
7. Sliding, constant mesh and synchromesh gear box.
8. Steering gear box with linkages.
9. Braking system components like, brake shoe, wheel cylinder, and master cylinder,

Tools and Instruments required:

1. Spanners (Ring and Double and 6mm to 32mm)
2. Players (Cutting and nose)
3. Hammer and mallet
4. Screw driver
5. Piston Ring Compressor
6. Piston Ring Extractor
7. Allen Key
8. Vernier caliper
9. Cylinder bore guage
10. Puller
11. Torque wrench

TOTAL : 45 PERIODS

OUTCOMES:

- At the end of course the students will get familiarized on the constructional arrangements of different chassis systems.

PTAU8501 AUTOMOTIVE COMPONENTS DESIGN L T P C
3 0 0 3

OBJECTIVE:

- 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 III GEAR DESIGN 8

Design considerations – strength of gear teeth – Lewis equation – Terminology of gears – Dynamic 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

OUTCOMES:

- At the end of course the students familiarize on the design procedure of different automotive components

TEXTBOOKS:

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. & Others, Machine Design, Schaum Publisher Co., 1982.
2. Sigley, Machine Design, McGraw Hill, 1981.
3. Design Data Book, PSG College of Technology, Coimbatore, 1992.

PTAU8502 SPECIAL TYPES OF VEHICLE L T P C
3 0 0 3

OBJECTIVES:

- To know about the various types of special types of vehicles,equipment and their working principles and applications.

UNIT I EARTH MOVING EQUIPMENTS 10

Construction layout, capacity and applications of earthmovers like dumpers, front-end loaders, bulldozers, backhoe loaders, scrappers, Bucket conveyors etc. Selection criteria of prime mover for dumpers and front end loaders based on vehicle performance characteristics.

UNIT II CONSTRUCTIONAL EQUIPMENTS 9

Layout of Constructional equipments, excavators, Jip Cranes, hoist, motor graders, Mixing machine, concrete ready mixers, drillers, ramming machines for construction of bridges and working principles, Power generators

UNIT III FARM EQUIPMENTS 9

Classification of tractors – Main components of tractor. Working attachment of tractors – Auxiliary equipment – Trailers and body tipping mechanism - plowing - paddy plantation machine harvesting machines. Sugarcane harvesting, power trailers

UNIT IV INDUSTRIAL APPLICATIONS 9

Constructional features, capacity and stability of jib cranes. Vibratory compactors, forklifts. Towing vehicles. Case studies.

UNIT V 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, bridge builders, communication vehicles.

TOTAL : 45 PERIODS

OUTCOMES:

- Get familiarized with various types of special vehicles and equipment.

TEXT BOOKS:

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.
4. Rodichev and G.Rodicheva, Tractor and Automobiles, MIR Publishers, 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.
5. Kolchin,A., and V.Demidov, Design of Automotive Engines for Tractor, MIR Publishers, 1972.

PTAU8503 VEHICLE BODY ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I CAR BODY DETAILS 10

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

UNIT II BUS BODY DETAILS 9

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

UNIT III COMMERCIAL VEHICLE DETAILS 8

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

UNIT IV VEHICLE AERODYNAMICS 9

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

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

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

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will

- Know about different aspects of car body and bus body, types, commercial vehicle.
- Role of various aerodynamic forces and moments, measuring instruments
- Know about the material used in body building, tools used, body repairs.

TEXTBOOKS:

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

REFERENCES:

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

PTAU8504 VEHICLE CONTROL SYSTEM L T P C
3 0 0 3

OBJECTIVES:

- The course is designed to know about automotive system dynamics, different controllers and tuning of different controllers.

UNIT I INTRODUCTION TO VEHICLE CONTROL SYSTEM 9

Steps in vehicle control system design- Influence of vehicle system design on vehicle control- examples w.r.to vehicle sub system - Degree of freedom for vehicle control- Calculation of the Control degree of freedom- Effect of feedback on Control degree of freedom- selection of controlled, manipulated, measured disturbance variables- classification of the variables in various automotive systems like engines, suspension, braking, air conditioning – General types of vehicle controller configurations- Feedback, Inferential, Feed-Forward, Ratio control

UNIT II DYNAMIC BEHAVIOUR AND HARDWARE OF VEHICLE CONTROL SYSTEMS 9

Transfer function and state-space models- Dynamic behavior of first order and second order vehicle system- Standard vehicle system inputs- Dynamic responses characteristics of more complicated vehicle system- Development of empirical models from vehicle system data

Hardware elements like vehicle plant, measuring instruments, transducers, transmission lines, controller, final control elements, recording elements- Use of digital computers in vehicle control

UNIT III FEEDBACK AND ADVANCED CONTROLLERS FOR VEHICLE CONTROL SYSTEM 9

Introduction- Basic Control modes- Proportional Control- Integral Control- Reset windup- Derivative Control- various forms of PID control- Enhancements of PID controllers- On-off controllers- Typical responses of feedback control systems- Digital Version of PID controllers

Feed-Forward control-Cascade control- Design considerations for cascade control, Time delay compensation, Inferential control- Nonlinear control- Adaptive control

UNIT IV ENGINE CONTROL SYSTEM 9

Fuel control- Ignition control- Lambda control- Idle speed control- Knock control-Adaptive knock control- Combustion torque estimation

UNIT V VEHICLE DRIVELINE, BRAKING AND SUSPENSION CONTROL SYSTEM 9

Driveline modeling- Modeling for neutral Gear- driveline Control- Driveline Speed Control- Driveline control for gear shifting- Active suspension control

Antilock braking control - Traction Control - Electronic stability Program control

TOTAL : 45 PERIODS

OUTCOMES

- Knowing the procedure for modeling different automotive sub system, various control actions and get the exposure of different automotive actuators, tuning controllers.
- Get familiarized with various complex control schemes for automotive systems

TEXT BOOKS:

1. Uwe Kiencke and Lars Nielson, Automotive Control System, SAE Publications, 2006
2. Bosch Automotive Handbook, Sixth Edition,2004
3. Richard C.Dorf and Robert H.Bishop, Modern Control Systems, Pearson Prentice Hall,2008

REFERENCES:

1. Katsuhiko Ogata, System Dynamics, Prentice Hall International, Inc. Third Edition,1998
2. Benjamin C.Kuo and Farid Golnaraghi, Automatic Control System, John Wiley & Sons, Eight edition, 2003.

PTAU8511	ENGINE TESTING AND EMISSION MEASUREMENT LABORATORY	L T P C 0 0 3 2

OBJECTIVES:

- To train the students in testing of the Engines.

LIST OF EXPERIMENTS:

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 analyzers used for IC engine testing.
4. Performance study of petrol engine.
5. Performance study of diesel engine.
6. Calculation of frictional power on petrol engines.
7. Heat balance test on an automotive diesel engine.
8. Testing of 2 and 4 wheelers using chassis dynamometers.
9. Study of NDIR Gas Analyzer and FID.
10. Study of Chemiluminescent NOx analyser.
11. Measurement of HC, CO, CO_2, O_2 using exhaust gas analyser.
12. Diesel smoke measurement.

TOTAL : 45 PERIODS

OUTCOMES:

- The student will get familiarized with the basics of engine testing of engine performance, combustion process and emission characteristics.

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.

PTAU8601	VEHICLE DYNAMICS	L T P C 3 0 0 3

OBJECTIVES:

- To know about the application of basic mechanics principles for dynamic analysis of vehicles.

UNIT I CONCEPT OF VIBRATION 9

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

UNIT II TIRES 9

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

UNIT III VERTICAL DYNAMICS 9

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

UNIT IV LONGITUDINAL DYNAMICS AND CONTROL 9

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

UNIT V LATERAL DYNAMICS 9

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

TOTAL : 45 PERIODS

OUTCOMES:

- The student will understand how passenger comfort is achieved along with vehicle stability.

TEXT BOOKS:

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

REFERENCES:

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

PTAU8602 **VEHICLE MAINTENANCE** **L T P C**
3 0 0 3

OBJECTIVES:

- To know about the various methods of maintaining vehicles and their subsystems.

UNIT I MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS 10

Maintenance – Need, importance, primary and secondary functions, policies - classification of maintenance work - vehicle insurance - basic problem diagnosis. Automotive service procedures – workshop operations – workshop manual - vehicle identification. Safety – Personnel, machines and equipment, vehicles, fire safety - First aid. Basic tools – special service tools – measuring instruments – condition checking of seals, gaskets and sealants. Scheduled maintenance services – service intervals - Towing and recovering.

UNIT II ENGINE AND ENGINE SUBSYSTEM MAINTENANCE 8

General Engine service- Dismantling of Engine components- Engine repair- working on the underside, front, top, ancillaries- Service of basic engine parts, cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls

UNIT III TRANSMISSION AND DRIVELINE MAINTENANCE 8

Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

UNIT IV STEERING, BRAKE, SUSPENSION, WHEEL MAINTENANCE 11

Inspection, Maintenance and Service of Hydraulic brake, Drum brake, Disc brake, Parking brake. Bleeding of brakes.

Inspection, Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers. Dismantling and assembly procedures.

Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation.

Inspection, Maintenance and Service of steering linkage, steering column, Rack and pinion steering, Recirculating ball steering service- Worm type steering, power steering system

UNIT V AUTO ELECTRICAL AND AIR CONDITIOING MAINTENANCE 10

Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis

Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon the completion of the course, the student can able to understand the importance of maintenance and also the step by step procedure for maintain the various automotive sub systems

TEXT BOOKS:

1. Ed May, Automotive Mechanics Volume One , Mc Graw Hill Publications, 2003
2. Ed May, Automotive Mechanics Volume Two , Mc Graw Hill Publications, 2003
3. Vehicle Service Manuals of reputed manufacturers

REFERENCE:

1. Bosch Automotive Handbook, Sixth Edition,2004

PTAU8611 VEHICLE MAINTENANCE AND RE CONDITIONING LABORATORY **L T P C 0 0 3 2**

OBJECTIVES

- To impart practical knowledge in automotive maintenance
- To understand the different procedures involved in any maintenance shop
- To impart practical knowledge in reconditioning of degraded parts
- To impart practical knowledge in Tuning the vehicle for best performance

STUDY EXPERIMENTS:

1. Tools and instruments required for maintenance
2. Safety aspects with respect to man, machine and tools
3. General procedures for servicing and maintenance schedule
4. Wheel Alignment procedure

LIST OF EXPERIMENTS:

1. Minor and major tune up of gasoline and diesel engines
2. Calibration of Fuel pump
3. Engine fault diagnosis using scan tool
4. Fault diagnosis and service of transmission system
5. Fault diagnosis and service of driveline system
6. Fault diagnosis and service of braking system
7. Fault diagnosis and service of suspension system
8. Fault diagnosis and service of steering system
9. Fault diagnosis and service of Electrical system like battery, starting system, charging system, lighting system etc
10. Fault diagnosis and service of vehicle air conditioning system
11. 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 tire and tube.

TOTAL : 45 PERIODS

OUTCOMES

- Students can able to do understand the functioning of maintenance shop
- Students can able to perform different maintenance procedures
- Students can able to rectify and replace and damaged parts
- Students can able to do some minor tuning on engine and vehicle

REFERENCES:

1. Service manuals of reputed vehicles.
2. Automotive Trouble shooting and Maintenance by Anderson Ashburn.
3. Venk Spicer, Automotive Maintenance and Trouble shooting.

PTAU8701 AUTOMOTIVE POLLUTION AND CONTROL L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I INTRODUCTION 6

Pollutants – sources – formation – effects of pollution on environment - human – transient operational effects on pollution – Regulated – Unregulated emissions - Emission Standards.

UNIT II EMISSIONS IN SI ENGINE 11

Chemistry of SI engine combustion – HC and CO formation in SI engines – NO formation in SI engines – Smoke emissions from SI engines – Effect of operating variables on emission formation.

UNIT III EMISSIONS IN CI ENGINE 10

Basics of diesel combustion – Smoke emission and its types in diesel engines – NOx emission and its types from diesel engines – Particulate emission in diesel engines. Odor, sulfur and Aldehyde emissions from diesel engines – effect of operating variables on emission formation.

UNIT IV CONTROL TECHNIQUES FOR REDUCTION OF EMISSION 9

Design modifications – Optimization of operating factors – Fuel modification – Evaporative emission control - Exhaust gas recirculation – SCR – Fumigation – Secondary Air injection – PCV system – Particulate Trap – CCS – Exhaust treatment in SI engines –Thermal reactors – Catalytic converters – Catalysts – Use of unleaded petrol.

UNIT V TEST PROCEDURE, INSTRUMENTATION & EMISSION MEASUREMENT 9

Test procedures CVS1, CVS3 – Test cycles – IDC – ECE Test cycle – FTP Test cycle - NDIR analyzer – Flame ionization detectors – Chemiluminescent analyzer – Dilution tunnel - Gas chromatograph – Smoke meters –SHED test.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon the completion of the course, the student will understand the fundamentals of formation of automobile pollutions in SI and CI Engines, various control techniques, test procedures etc.

TEXT BOOKS:

1. Springer and Patterson, Engine Emission, Plenum Press, 1990.
2. B.P.Pundir, " IC Engines Combustion and Emissions" Narosa Publishers, 2010

REFERENCES:

1. Ramalingam. K.K., Internal Combustion Engines, Scitech Publications, Chennai, 2003.
2. Ganesan,V., Internal Combustion Engines, Tata McGraw Hill Co., 1994.
3. SAE Transactions, Vehicle emission, 1982 (3 volumes).
4. Obert,E.F., Internal Combustion Engines, 1982.
5. Taylor,C.F., Internal Combustion Engines, MIT Press, 1972.
6. Heywood,J.B., Internal Combustion Engine Fundamentals, McGraw Hill Book Co., 1995.
7. Automobiles and Pollution SAE Transaction, 1995.

PTAU8702 MANUFACTURING OF AUTOMOTIVE COMPONENTS L T P C
3 0 0 3

OBJECTIVE:
To impart knowledge on basic principle and production methods of automotive components.

UNIT I CASTED ENGINE COMPONENTS 9
Material selection and Manufacturing methods for Piston, Piston rings, Cylinder block, wet and dry liners, Engine head, Oil pan, Carburetors. Thermal barrier coating of Engine head and valves.

UNIT II FORGED ENGINE COMPONENTS 8
Material selection and Manufacturing methods for Crank shaft, Connecting rod, Cam shaft, valve, Piston pin, Push rod, Rocker arm, tappets, spark plug.

UNIT III TRANSMISSION SYSTEM 10
Material selection and Manufacturing methods for Clutch – Clutch lining – Gear Box – Gear – Propeller Shaft – Differential – Axle Shaft – Bearing – fasteners – Wheel drum.

Methods of Gear manufacture – Gear hobbing and gear shaping machines - gear generation - gear finishing and shaving – Grinding and lapping of hobs and shaping cutters – gear honing – gear broaching.

UNIT IV VEHICLE CHASSIS 8
Material selection and manufacturing methods for chassis, dead axle, leaf spring, coil spring and shock absorbers – wheel housing – steering system, Brake shoes, wheel rim, Tyres. Heat treatment procedures.

UNIT V RECENT DEVELOPMENTS 10
Surface treatment – Plastics – Plastics in Automobile vehicles – Processing of plastics - Emission control system – catalytic converter – Hydro forming of exhaust manifold and lamp housing – stretch forming of Auto body panels – MMC liners –Selection of materials for Auto components. Use of Robots in Body weldment.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to know the methodology for manufacturing casted engine and forged engine components .

TEXT BOOK:

1. Heldt.P.M, High speed combustion engines, Oxford publishing Co., New York, 1990.

REFERENCES:

1. Kirpal Singh, Automobile Engineering, Vol. I & II, Standard Publishers, New Delhi, 1997.
2. Newton and steels, the motor vehicle, ELBS, 1990
3. Serope Kalpakjian and Steven R. Schmid, Manufacturing Processes for Engineering Materials, Fourth Edition – Pearson Education publications – 2003
4. Gupta K.M. Automobile Engineering Vol.I & II, Umesh Publishers, 2000.

PTAU8001 ADVANCE THEORY OF IC ENGINES L T P C
3 0 0 3

OBJECTIVES:

- Knowledge in usage of software for simulating the performance of IC engines
- Acquiring ability to simulate the various types combustion processes of IC engines.
- Knowledge in performance simulation of IC engines.

UNIT I COMBUSTION OF FUELS 9

Chemical composition and molecular structure of hydrocarbon fuels. Combustion Stoichiometry of hydrocarbon fuels – Chemical energy and heat of reaction calculations – Chemical equilibrium and adiabatic flame temperature calculation. Theory of SI and CI engine combustion – Flame velocity and area of flame front. Fuel spray characteristics – droplet size, depth of penetration and atomization.

UNIT II ENGINE CYCLE ANALYSIS 8

Ideal air, fuel air cycle and actual cycle analysis. Progressive combustion analysis in SI engines. Parametric studies on work output, efficiency and other engine performance.

UNIT III COMBUSTION MODELLING 10

Basic concepts of engine simulation – Governing equations, Classification of engine models- Thermodynamic models for Intake and exhaust flow process – Quasi steady flow - Filling and emptying - Gas dynamic Models. Thermodynamic based in cylinder models for SI engine and CI engines.

UNIT IV NON-CONVENTIONAL IC ENGINES 9

Concept of L.H.R. engine and its recent developments. Variable compression ratio engine and its use in engine research. Wankel rotafry combustion engine. Dual fuel engine concept for multi fuel usage in CI engines - performance studies on dual fuel engine. Free piston engine. Stratified charge and lean burn engines . Locomotive and marine engines.

UNIT V COMBUSTION ANALYSIS IN IC ENGINES 9

Photographic studies of combustion processes – Analysis of Pressure crank angle diagrams in SI and CI engines. Knock study for Pressure crank angle histories. Apparent heat release rate and Wiebe's law analysis for combustion. Calculation of Ignition delay and combustion duration. – Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS

OUTCOMES:

- At the end of the course, the student can able to model and simulate the engine cycle, perform combustion analysis, instruments used in measurement, recent developments in the IC engines.

TEXTBOOKS:

1. Ganesan,V., Internal combustion engines, Tata McGraw Hill Publishing Co., 1994.
2. Ganesan.V. "Computer Simulation of spark ignition engine process", Universities Press (I) Ltd, Hyderbad, 1996.

REFERENCES:

1. Ramalingam. K.K., Internal combustion engine, scitech publications, Chennai, 2003.
2. Ganesan,V., Compute Simulation of Compression Ignition engine process, Universities Press (India) Ltd., Hyderabad, 1996.

3. John,B., Heywood, Internal Combustion Engine Fundamentals, McGraw Hill Publishing Co., New York, 1990.
4. Benson,R.S., Whitehouse,N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979.

PTAU8002 ADVANCE VEHICLE TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES :

- To learn and understand the programming,data acquistion hardware and implementing small automotive related projects in virtual instrumention

UNIT I POWERTRAIN 9

Modern Engine Technology like DTS- i, DTS – Fi, DTS – Si, VVT, Camless Engine, GDi, CRDI

UNIT II VEHICLE SAFETY 9

Anti lock braking systems- Traction Control system- Electro-hydraulic brakes- Occupant safety systems- Airbags, seat belt tightening system, collision warning systems, child Lock – Power windows- Power Sunroof- Seat and steering Column- Biometric systems- Driver-assistance systems- Adaptive cruise control

UNIT III VEHICLE SECURITY AND COMFORT SYSTEM 9

Vision enhancement, road recognition system, Anti theft technologies, smart card system, number plate coding. Locking system- Central locking system- acoustic signaling devices
Active suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, Climate control management system

UNIT IV VEHICLE INFORMATION AND COMMUNICATION 9

Instrumentation- Vehicle Information system- Trip Recorders- Parking systems- Analog and digital signal transmission- Automotive sound systems- Mobile and data radio- Mobile Information services- navigation system- Traffic telematics- Multimedia systems
OBD-I Engine diagnostic system- OBD-II Engine Control systems- SAE DTC Standards- Scan Tools- Strategy based diagnosis – Engine and vehicle performance problems.

UNIT V INTELLIGENT TRANSPORTATION SYSTEM 9

Traffic routing system - Automated highway systems - Lane warning system – Driver Information System, driver assistance systems - Driver conditioning warning - Route Guidance and Navigation Systems- Hybrid / Electric and Future Cars

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student will understand the new developments in the area of automobile area.

TEXT BOOKS:

1. Nadovich, C., “Synthetic Instruments Concepts and Applications”. Elsevier,2005

2. Bitter, R., Mohiuddin, T. and Nawricki, M., “Labview Advanced programming Techniques”, CRC Press, 2nd Edition, 2007.

REFERENCE:

1. Robert N.Brandy, “Automotive Electronics and Computer Systems”, Prentice Hall ,2001

PTAU8003 ALTERNATIVE FUELS AND ENERGY SYSTEMS L T P C
3 0 0 3

OBJECTIVES

- To know about the types of alternative fuels and energy sources for IC engines.

UNIT I ALCOHOLS AS FUELS 9

Introduction to alternative fuels. - Need for alternative fuels - Availability of different alternative fuels for SI and CI engines. Alcohols as fuels. Production methods of alcohols. Properties of alcohols as fuels. Methods of using alcohols in CI and SI engines. Blending, dual fuel operation, surface ignition and oxygenated additives. Performance emission and combustion characteristics in CI and SI engines.

UNIT II VEGETABLE OILS AS FUELS 9

Various vegetable oils and their important properties. Different methods of using vegetable oils engines – Blending, preheating Transesterification and emulsification of Vegetable oils - Performance in engines – Performance, Emission and Combustion Characteristics in diesel engines.

UNIT III HYDROGEN AS ENGINE FUEL 9

Production methods of hydrogen. Combustive properties of hydrogen. Problems associated with hydrogen as fuel and solutions. Different methods of using hydrogen in SI and CI engines. Performance, emission and combustion analysis in engines. Hydrogen storage - safety aspects of hydrogen.

UNIT IV BIOGAS, NATURAL GAS AND LPG AS FUELS 9

Production methods of Biogas, Natural gas and LPG. Properties studies. CO_2 and H_2S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines.

UNIT V ELECTRIC, HYBRID AND FUEL CELL VEHICLES 9

Layout of Electric vehicle and Hybrid vehicles – Advantages and drawbacks of electric and hybrid vehicles. System components, Electronic control system – Different configurations of Hybrid vehicles. Power split device. High energy and power density batteries – Basics of Fuel cell vehicles.

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student will understand the various alternative fuels available, its properties, performance characteristics, combustion characteristics, emission characteristics, engine modifications required etc.,

REFERENCES:

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

PTAU8004	AUTOMOTIVE AERODYNAMICS	L	T	P	C
		3	0	0	3

OBJECTIVE

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

UNIT I INTRODUCTION 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. Case studies on modern vehicles.

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 and racing cars.

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. CFD analysis.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students will understand the fundamentals of aerodyanmics, vehicle body optimisation, measuring aerodynamics forces etc.

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.

PTAU8005	AUTOMOTIVE MATERIALS	L T P C
		3 0 0 3

OBJECTIVES:

- To introduce fundamental concepts on automotive materials and its selection criteria, materials for engine, transmission system, structure and application.

UNIT I ENGINEERING MATERIALS AND THEIR PROPERTIES 9

Classes of engineering materials - the evolution of engineering materials, Definition of materials properties, Displaying material properties using materials selection charts, Forces for change in materials selection and design, Materials and the environment

UNIT II BASIS OF MATERIAL SELECTION 9

Selection strategy, Attribute limits and Material indices, structural index Selection procedure: Design process - types of design, design requirements, Function, Material attributes, Shape and Manufacturing processes - Materials processing and design processes and their influence on design, Process attributes, Systematic process selection, Process selection diagrams, Process cost, Energy consumption for production, Material costs, Availability, Recyclability, Environmental consideration. Computer aided selection.

UNIT III MATERIALS FOR ENGINES AND TRANSMISSION SYSTEMS 9

Materials selection for IC engines: Piston, piston rings, cylinder, Engine block, Connecting rod, Crank shaft, Fly wheels, Gear box, Gears, Splines, Clutches.

UNIT IV MATERIALS FOR AUTOMOTIVE STRUCTURE 9

Materials selection for bearings, leaf springs, chassis & frames, Bumper, shock absorbers, wind screens, panels, brake shoes, Disc, wheels, differentials , damping and antifriction fluids, Tyres and tubes.

UNIT V ELECTRONIC MATERIALS FOR AUTOMOTIVE APPLICATIONS 9

Materials for electronic devices meant for engine control, ABS, Steering, Suspension, Sensors, anti-collision, Anti-fog, Head lamps.

TOTAL : 45 PERIODS

OUTCOMES:

- Student can able to know fundamental concepts about materials and its selection. Study on the materials Material costs, Availability, Recyclability, Environmental consideration Enhance knowledge on materials used for various automotive components, chassis, and its applications.

TEXTBOOKS:

1. Gladius Lewis, “Selection of Engineering Materials", Prentice Hall Inc. New Jersey USA, 1995.

2. Charles J A and Crane. F A. A., “Selection and Use of Engineering Materials”, 3rd Edition, Butterworths, London UK, 1996.

REFERENCES:

1. James A. Jacobs, Thomas F. Kilduff., “Engineering Materials Technology: Structure, Processing, Properties & Selection”, Prentice Hall, USA, 1996.
2. ASM Handbook, "Selection of Materials Vol. 1 and 2", ASM Metals Park, Ohio. USA, 1991.
3. M F Ashby, “Materials Selection in Mechanical Design”, third edition, Butterworth-Heineman, New York, 2005.
4. ASM Handbook. “Materials Selection and Design”, Vol. 20- ASM Metals Park Ohio. USA, 1997.
5. Cantor,“ Automotive Engineering: Lightweight, Functional, and Novel Materials”, Taylor & Francis Group, London, 2006

PTAU8006 AUTOMOTIVE TEST INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVES:

- The main objective of this course is to provide theoretical and applicative knowledge in automobile test instrumentation engineering based on virtual reality technologies through advanced instrumentation techniques, programming and data acquisition hardware and implementing small automobile related projects in virtual instrumentation environment.

UNIT I MEASUREMENT SYSTEMS 6

Introduction to Measurement systems-static and dynamic measurement –closed and open loop system - Requirements and characteristics – Analysis of experimental detail. Error analysis

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- Vehicle performance test - Brake tests.

TOTAL : 45 PERIODS

OUTCOMES:

- Possess knowledge in virtual instrumentation and how it can be applied in data acquisition and instrument control in automobile engineering.

- Can Experiment and analyze the automobile laboratory prototype measurement systems using a computer, plug-in DAQ interfaces.

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.

PTAU8007	COMBUSTION THERMODYNAMICS AND HEAT TRANSFER	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objectives of this course are to make the students to understand the principle of general and engine combustion. To understand engine heat release rate and various heat transfer models and to study the experimental methods for combustion and heat transfer in engines.

UNIT I THERMODYNAMICS OF COMBUSTION 10

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

UNIT II CHEMICAL KINETICS OF COMBUSTION 10

Fundamentals of combustion kinetics, rate of reaction, equation of Arrhenius, activation energy. Chemical thermodynamic model for Normal Combustion.

UNIT III FLAMES 10

Laminar premixed – flame speed correlations- quenching, flammability, and ignition, flame stabilization, laminar diffusion flames, turbulent premixed flames-Damkohler number.

UNIT IV HEAT TRANSFER IN IC ENGINES 8

Engine Heat transfer and heat Balance. Measurement of Instantaneous heat transfer rate. Heat transfer modeling. Heat transfer coefficients, radiative heat transfer.

UNIT V EXPERIMENTS IN IC ENGINES 7

Cylinder pressure measurement. Rate of heat release calculation – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS

OUTCOMES:

Get familiarized with the following

- The principle of general and engine combustion,heat release rate and various heat transfer models.

REFERENCES:
1. **Spalding.D.B**., "Some fundamental of Combustion", Butterworth Science Publications, London, 1985.
2. **Irvin Glasman**, "Combustion" Academic Press, London, 1987, ISBN 0-12-285851-4.
3. **Taylor.E.F.** "The Internal Combustion Engines ", International Text Book Co., Pennsylvania, 1982.
4. **V.Ganesan,** 'Internal combustion Engines', Tata McGraw Hill Book Co, Eighth Reprint, 2005.
5. **Ashley Campbel,** "Thermodynamic analysis of combustion engine", John book company, Newyork, 1979.
6. **J.I.Ramos**, "Modeling of Internal Combustion Engine", Mcgraw hill book company New york 1990
7. **John. B. Heywood**,' "Internal Combustion Engines", Tata McGraw Hill Co., Newyork, 1988.
8. **Ganesan.V.** "Computer Simulation of Spark Ignition Engine Process ", Wiley eastern India ltd,1996.

PTAU8008 COMPUTATIONAL FLUID MECHANICS L T P C
3 0 0 3

AIM

This course aims to introduce numerical modeling and its role in the field of heat and fluid flow, it will enable the students to understand the various discretisation methods and solving methodologies and to create confidence to solve complex problems in the field of heat transfer and fluid dynamics.

OBJECTIVES :

- To develop finite difference and finite volume discretized forms of the CFD equations.
- To formulate explicit & implicit algorithms for solving the Euler Eqns & Navier Stokes Eqns.

UNIT I GOVERNING DIFFERENTIAL EQUATION AND FINITE DIFFERENCE METHOD 9

Classification, Initial and Boundary conditions – Initial and Boundary Value problems – Finite difference method, Central, Forward, Backward difference, Uniform and non-uniform Grids, Numerical Errors, Grid Independence Test.

UNIT II CONDUCTION HEAT TRANSFER 9

Steady one-dimensional conduction, Two and three dimensional steady state problems, Transient one-dimensional problem, Two-dimensional Transient Problems.

UNIT III CONVECTION HEAT TRANSFER AND FEM 9

Steady One-Dimensional and Two-Dimensional Convection – diffusion, Unsteady one-dimensional convection – diffusion, Unsteady two-dimensional convection – Diffusion – Introduction to finite element method – solution of steady heat conduction by FEM – Incompressible flow – simulation by FEM.

UNIT IV INCOMPRESSIBLE FLUID FLOW 9

Governing Equations, Stream Function – Vortices method, Determination of pressure for viscous flow, SIMPLE Procedure of Patankar and Spalding, Computation of Boundary layer flow, finite difference approach.

UNIT V TURBULENCE MODELS 9

Algebraic Models – One Dimension model, K – ϵ Models, Standard and High and Low Reynolds number models, Prediction of fluid flow and heat transfer using standard codes.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the students can able

- To create numerical modeling and its role in the field of fluid flow and heat transfer
- To use the various discretization methods, solution procedures and turbulence modeling to solve flow and heat transfer problems.

TEXT BOOKS:

1. Muralidhar, K., and Sundararajan, T., "Computational Fluid Flow and Heat Transfer", Narosa Publishing House, New Delhi, 1995.
2. Ghoshdasdidar, P.S., "Computer Simulation of flow and heat transfer" Tata McGraw-Hill Publishing Company Ltd., 1998.
3. Subas, V.Patankar "Numerical heat transfer fluid flow", Hemisphere Publishing Corporation, 1980.

REFERENCES

1. Taylor, C and Hughes, J.B. "Finite Element Programming of the Navier-Stokes Equation", Pineridge Press Limited, U.K., 1981.
2. Anderson, D.A., Tannehill, J.I., and Pletcher, R.H., "Computational fluid Mechanics and Heat Transfer " Hemisphere Publishing Corporation, New York, USA,1984.
3. Fletcher, C.A.J. "Computational Techniques for Fluid Dynamics 1" Fundamental and General Techniques, Springer – Verlag, 1987.
4. Fletcher, C.A.J. "Computational Techniques for fluid Dynamics 2" Specific Techniques for Different Flow Categories, Springer – Verlag, 1987.
5. Bose, T.X., "Numerical Fluid Dynamics" Narosa Publishing House, 1997.

PTAU8009 FINITE ELEMENT TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

UNIT I INTRODUCTION 8

Engineering design analysis-meaning and purpose. Basic concepts of FEM. Advantages and limitations of FEM. Test for convergence. Element choice. Commercial finite element packages-organization-advantages and limitations. Raleigh Ritz's, Galerkin and finite difference methods- Governing equation and convergence criteria of finite element method.

UNIT II STATIC ANALYSIS 10

Formulation of element stiffness matrices-1D bar and beam elements. Plane stress, Plane strain and axisymmetric problems, constant and linear strain triangular elements, stiffness matrix, axisymmetric load vector, quadrilateral elements, Isoparametric elements. Treatment of boundary condition. Numerical Integration.

UNIT III DYNAMICS ANALYSIS 8

Equations of motion for dynamic problems. Consistent and lumped mass matrices. Formulation of element mass matrices. Free vibration problem formulation. Torsion problems.

UNIT IV HEAT TRANSFER AND FLUID FLOW ANALYSIS 10

Basic equations of heat transfer and fluid flow problems. Finite element formulation. One dimensional heat transfer and fluid flow problems. Derivation of element matrices for two dimensional problems.

UNIT V AUTOMOTIVE APPLICATION 9

Force distribution on different parts of automotive structure, design of the parts, static, dynamic and thermal analysis of the parts using finite element method. Material redistribution to minimize stresses and deflection. Optimization of location of ribs to maximize rigidity.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to understand different mathematical Techniques used in FEM analysis and use of them in Structural and thermal problem

TEXT BOOKS:

1. Tirupathi.R. Chandrapatha and Ashok D. Belegundu – Introduction to Finite Elements in Engineering – Printice Hall India, Third Edition, 2003.
2. Rao. S.S., Finite Element Methods in Engineering, Butterworth and Heinemann, 2001

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. Robert D Cook, David S Malkus, Michael E Plesha, 'Concepts and Applications of Finite Element Analysis', 4th edition, John Wiley and Sons, Inc., 2003.
5. Larry J Segerlind, 'Applied Finite Element Analysis', Second Edition, John Wiley and Sons, Inc. 1984.

PTAU8010 FLEET MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To provide detailed knowledge to students on Automobile management training, operation, vehicle maintenance, vehicle scheduling, fixation of fare and its structure. In addition the knowledge about vehicle parts supply management, budget allocation and the details of motor vehicle act will be imparted.

UNIT I MANAGEMENT TRAINING AND OPERATION 10

Basic principles of supervising. Organizing 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. Logistics and supply management over-view.

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, electronically controlled vehicle maintenance system.

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 – EURO Norms - Licensing of drivers – Control of permits – Limits of speed – traffic signs – Constructional regulations – Description of goods carrier, delivery van, tanker, tipper, Municipal, fire fighting and break down service vehicle.

TOTAL : 45 PERIODS

OUTCOMES:

- Demonstrate effective vehicle management skills such as scheduling, fare fixation for optimal usage on roads.
- Possess an extensive knowledge and understanding of the business and management practices on vehicles in fleets and their maintenance.

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, 1982
3. Kadiyali, L.R., Traffic engineering and Transport Planning.

PTAU8011 HYBRID AND ELECTRIC VEHICLES L T P C
3 0 0 3

OBJECTIVES :

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

UNIT I NEED FOR ALTERNATIVE SYSTEM 9

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

UNIT II ENERGY SOURCES : BATTERIES AND FUELL CELLS 9

Battery Parameters-Power requirement of electric vehicles- Different types of batteries - Lead acid-Nickel based-Sodium based-Lithium based- Metal Air based. Battery charging- Charger design- Quick charging devices- Battery Modeling.

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

UNIT III PROPULSION MOTORS AND CONTROLLERS 12

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

UNIT IV VEHICLE DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES 6

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

UNIT V HYBRID VEHICLES 9

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

TOTAL : 45 PERIODS

OUTCOMES:

- Get familiarized with hybrid and electric vehicle.

TEXT BOOKS:

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

REFERENCES:

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

PTAU8012 **SIMULATION OF IC ENGINES** **L T P C**
3 0 0 3

OBJECTIVE:

To impart knowledge in simulating IC engine processes. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. At the end of the course the students will have command over simulation of IC engine process.

UNIT I INTRODUCTION 9

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

UNIT II COMBUSTION AND STOICHIOMETERY 9

Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction - combustion equation for hydrocarbon fuels. Calculation of minimum air required for combustion, excess air supplied and stoichiometric air required for complete combustion. Conversion of volumetric analysis to mass analysis.

UNIT III ADIABATIC FLAME TEMPERATURE 9

Introduction, complete combustion in C-H-N-O systems, constant volume adiabatic combustion, constant pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state. SI Engine simulation with air as working medium, deviation between actual and ideal cycle.

UNIT IV SI ENGINE SIMULATION WITH ADIABATIC COMBUSTION 9

Introduction, Engine details, temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation, SI Engines simulation with progressive combustion. Wiebe's law combustion analysis.

UNIT V SI ENGINE SIMULATION WITH GAS EXCHANGE PROCESS 9

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

TOTAL : 45 PERIODS

OUTCOMES:

- The student will be familiar with the basics of simulation, combustion process, SI Engine modeling and simulation process

TEXTBOOK:

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

REFERENCES:

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

PTAU8013 VEHICLE AIR-CONDITIONING L T P C
3 0 0 3

OBJECTIVES:

- The course is designed to know about basic air-conditioning concepts, Principles, types , components and maintenance aspects of vehicle air-conditioning system

UNIT I AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS 9

Purposes of Heating, Ventilation and Air Conditioning- Environmental Concerns- Ozone layer depletion- Location of air conditioning components in a car – Schematic layout of a vehicle refrigeration system.

Psychrometry – Basic terminology and Psychrometric mixtures- Psychrometric Chart- Related problems

UNIT II AUTOMOTIVE COOLING AND HEATING SYSTEM 9

Vehicle Refrigeration System and related problems- Fixed thermostatic and Orifice tube system- Variable displacement thermostatic and Orifice tube system- Vehicle air conditioning operation

Types of compressor- Compressor Clutches- Compressor Clutch electrical circuit- Compressor lubrication- Condensers- Evaporators- Expansion devices- Evaporator temperature and pressure controls- receiver-drier- Accumulators- refrigerant hoses, Connections and other assemblies- Heating system

UNIT III AIR-CONDITIOING CONTROLS, DELIVERY SYSTEM AND REFRIGERANTS 9

Types of Control devices- Preventing Compressor damage- Preventing damage to other systems- Maintaining driveability- Preventing Overheating

Ram air ventilation- Air delivery Components- Control devices- Vacuum Controls

Containers – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT IV AUTOMATIC TEMPERATURE CONTROL 9

Different types of sensors and actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system

UNIT V SYSTEM SERVICING AND TESTING 9

Special tools for servicing vehicle air conditioning – Diagnosing components and air conditioning systems- Diagnosing cooling system- Air delivery system- Automatic temperature Control system diagnosis and service

TOTAL : 45 PERIODS

OUTCOMES:

- Students will be able to understand the components of the automotive air-conditioning and their functions and the latest developments in this field
- Students will be able to understand the of the automotive air-conditioning and their functions and the latest developments in this field

TEXT BOOKS:

1. Warren Farnell and James D.Halderman, Automotive Heating,Ventilation, and Air Conditioning systems, Classroom Manual, Pearson Prentice Hall,2004
2. Warren Farnell and James D.Halderman, Automotive Heating,Ventilation, and Air Conditioning systems, Shop Manual, Pearson Prentice Hall,2004

3. William H Crouse and Donald L Anglin, Automotive Air conditioning, McGraw Hill Inc., 1990.

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.

PTGE8551 ENGINEERING ETHICS AND HUMAN VALUES L T P C
(Industrial, Mechanical Printing, Automobile, EEE 3 0 0 3
CSE, ECE, Civil, Textile)

OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time– Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II 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 – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies

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 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

OUTCOMES;

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXT BOOK

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

PTMG8651 TOTAL QUALITY MANAGEMENT L T P C

(EEE, Mechanical, Automobile, Printing, Industrial, Manufacturing, CSE, ECE, IT, Leather, Production) 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 product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II TQM PRINCIPLES 9

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA 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 – Performance measures - BPR.

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 –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

TOTAL : 45 PERIODS

OUTCOMES

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfiled, et al., "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, Third 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.

PTGE8071 DISASTER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

TEXTBOOK:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

PTGE8072 **HUMAN RIGHTS** **L T P C**
3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOME :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.