VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University u/s 3 of the UGC Act, 1956)

PALLAVARAM - CHENNAI - INDIA

VELS UNIVERSITY

M.E
Automobile Engineering

Curriculum and Syllabus

(Based on Choice Based Credit System)

Effective from the Academic Year

2018-2019

Department of Automobile Engineering

School of Engineering

18CMAE11 **APPLIED MATHEMATICS** **L TPC**
310 4

COURSE OUTCOME :(Skill development)

- Develop the use of Fourier transformation
- Select the concepts of differential equations
- Evaluate the concepts of Calculus of Variations
- Construct the concepts of interpolation and integration
- Classify the linear programming problem.

UNITI MATRIXTHEORY **9**

Eigen values using QR transformations– generalized eigenvectors– canonical forms – singularvaluedecompositionandapplications–pseudoinverse–leastsquareapproximations.

UNITIIDIFFERENTIALEQUATIONS–
NONLINEARORDINARYDIFFERENTIAL&PARTIALDIFFERENTIALEQUATIONS **9**

Introduction–Equations,withseparablevariables–Equationsreducibletolinearform–Bernoulli's equation – Riccati's equation – Special forms of Riccati's equation – Laplace transformmethodsforonedimensionalwaveequation–Displacementinalongstring– Longitudinalvibrationof an elastic bar.

UNITIIICALCULUSOFVARIATION **9**

Introduction – Euler's equation – several dependent variables Lagrange's equations of Dynamics – Integrals involving derivatives higher than the first – Problems with constraints – Direct methodsand eigenvalue problems.

UNITIVINTERPOLATION ANDINTEGRATION **9**

Hermite's Interpolation, Simple case and General case – Cubic Spline Interpolation, Algorithm ofinterpolating cubic spline–Gaussian Qundraline –Cubature.

UNITV LINEARPROGRAMMINGPROBLEM **9**

Simplex algorithm, Fundamental property of the simplex method – Graphical, Two phase and Big MTechniques–Duality theory–Dual simplex method–Integer programming.

TOTAL:45Hours

TEXTBOOKS:

1. Stephenson,G,Radmore,P.M.,AdvancedMathematicalMethodsforEngineeringandSciencestudents , Cambridge University Press 1999.
2. Bronson,R.,MatrixOperations,Schaum'soutlineseries,McGrawHill,NewYork,1989.
3. Kreyszig,E.,AdvancedEngineeringMathematics,JohnWiley,10th Edition,2011.

REFERENCES:

1. Froberg,C.E.NumericalMathematics,TheBenjaminn/CummingsPulblishingCo.,Inc.,1985.
2. Jain,M.K., Iyengar,S.R.K.,andJain,R.K.,NumericalMethodsforScientific&Engineeringcomputation,WileyEastern Ltd., 1987.
3. Gupta,A.S.CalculusofVariationswithApplications,PrenticeHallofIndiaPvt.Ltd.,NewDelhi,1997.
4. SankaraRao,K.,IntroductiontoPartialDifferentialEquations,PrenticeHallofIndiaPvtLtd.,New Delhi 1997.
5. Boyce&DiPrima,ElementaryDifferentialEquationsandBoundaryvalueproblems,withODEArchitectCD, 9th Edition,2014.

3 1 0 4

COURSE OUTCOME: (Employability)

- The build concept, construction and principle of operation of various types of mechanicaltransmissioncomponents,hydrodynamicdevices,hydrostaticdeviseesandautomatictransmissionsystem willbetaughttothestudents.
- Assess the Constructional details and Theory of important drive line, Structural, Steering,Brakingand Suspension Systems of Automobiles.
- Organize the drive line study and different types of final drive.
- Apply the concept in Transmissionsystem of clutch and gearbox.
- Identify the hydrodynamic drives inautomotivechassisandtransmissionconcepts withtheapplication.

UNITIINTRODUCTION **9**

Automotive chassis, Elements of the Chassis, Layout with reference to power plant, steering locationanddrive,frames,considerationofvariousloadsactingonthefame,Framelessconstructionaldetails, materials, testingofframes, integral bodyconstruction.

UNITIIFRONT AXLE STEERINGSYSTEM **9**

Front axle type, rigid axle and splitaxle, Constructional Details, Materials, Front wheel geometryviz., camber, castor, kingpin inclination, toe-in and toe-out. Condition for true rolling motion of roadwheels during steering. Steering geometry. Ackermann and Davis steering. Construction details ofsteering linkages. Different types of steering gear box. Steering linkages layout for conventional andindependent suspensions. Turning radius, instantaneous centre, wheel wobble and shimmy. Over-steerand under-steer. Powerand power assisted steering

UNITIIIDRIVE LINE STUDY **9**

Effect ofdriving thrust and torque – reaction. Hotchkiss drives.Torque tube drive, radius rods.Propellershaft.Universaljoints.Finaldrive-differenttypes.Twospeedrearaxle.Rearaxleconstruction-fullfloating,threequarterfloatingandsemi-floatingarrangements.Differential-conventionaltype,Non-slip type,Differentiallocksand differential housing.

UNITIVCLUTCH AND GEARBOX **9**

RequirementofTransmissionsystem.Differenttypesofclutches:Principle,constructionandoperation of friction clutches. Problems on performance ofautomobile such as Resistance to motion, Tractive effort, Engine speed & power and acceleration.Determinationofgearboxratiosfordifferentvehicleapplications.Differenttypesofgearboxes.

UNIT VHYDRODYNAMIC DRIVES **9**

Principles, performance and limitations of fluid coupling Constructional details of a typical fluidcoupling. Reduction of drag torque, Principle, construction and advantages of hydrodynamic torqueconverters.Performancecharacteristics,convertercouplings.Multi-stage Torqueconverterandpolyphase torqueconverter

TOTAL:45Hours

TEXTBOOKS:

1. K. Newton, W.Steedsand T.K.Garret, “The Motor Vehicle”, 13thEdition,ButterworthHeinemann,2004
2. P.M.Heldt,“Automotive Chassis”, ChiltonCo., NewYork,1982.
3. W.Steed,“MechanicsofRoadVehicles”,IlliffeBooksLtd.,London.1992.

4. Heldt P.M, TorqueConverters,Chilton BookCo.,1992.

REFERENCES:

1. HarbanSinghRayat,"TheAutomobile",S.Chand&Co.Ltd, NewDelhi,2000.
2. G.J.Giles,"SteeringSuspensionandTyres",IlliffeBooksLtd.,London,1975.
3. KirpalSingh,"AutomobileEngineering",Standardpublishers,Distributors,Delhi,12th Edition,2011.
4. G.B.S.Narang,"AutomobileEngineering",KhannaPublishers,NewDelhi,5th Edition,2014.
5. R.P.Sharma,"AutomobileEngineering",DhanpatRai&Sons,NewDelhi,2000.
6. HeinzHeisler,"AdvancedVehicleTechnology",secondedition,Butterworth–Heinemann,NewYork,2002
7. Dr.N.K.Giri,"AutomobileMechanics",Seventhreprint,KhannaPublishers,Delhi,2005

18CMAE13 AUTOMOTIVEENGINESAND ACCESSORIES L TPC 3104

COURSE OUTCOME:(Employability)

- Tobuildknowledgeonvariousautomotiveenginetypesandits performancecharacteristics.
- Toevaluate theknowledgeon fuelandfuel systems.
- To differentiate the cooling system and lubrication systems.
- To apply the concept of laminar and turbulent combustion in the combustion chambers.
- Tocompare thecurrenttrendsinenginetechnology.

UNITIENGINE BASICTHEORY 9

Engine types - operating cycles of SI and CI Engines - Engine design and operating parameters - Twoand four stroke engines - Typical performance curves for automobile engines- two stroke engine -performanceand pollution aspects.

UNITIIFUEL SUPPLYANDIGNITION SYSTEM 9

Fuel supply system of I.C. engine and elements, Theory of carburetion and carburetors — Designaspects — Petrol Injection and diesel fuel injection - pumps and injectors, gasoline direct injectionsystem -conventional andelectronicignitionsystems forSIengine.

UNITIIICOOLING AND LUBRICATING SYSTEM 9

Air cooling and water cooling – thermosympon cooling, forced cooling systems. Fins and radiator - design aspects. Theory of lubrication — types of lubrication, splashlubrication system,petroillubricationsystem,forced feed lubrication system.

UNITIVAIR MOTION, COMBUSTIONAND COMBUSTIONCHAMBERS 9

Premixed combustion, diffused combustion, laminar and turbulent combustion of fuels in engines.Droplet combustion —combustion in SI and CI engines. - Cylinder pressure data and heat releaseanalysis.Optimized designof combustion chambers.

UNITVNEW ENGINE TECHNOLOGY 9

Lean Burn engine – Different approaches to lean bum – LHR engine – Surface ignition concept – catalyticignition–homogenous charge compression ignitionindiesel engines–variablevalvetiming-electronic enginemanagement.

TOTAL:45Hours

TEXTBOOKS:

1. J.B.Heywood,'Internal combustion engine Fundamentals', McGraw Hill BookCo, 1989.
2. V.Ganesan,'InternalcombustionEngines',TataMcGrawHillBookCo,3rdEdition,2007.

REFERENCES:

1. EdwardF.Obert,'Internal combustionengines and airpollution'Harberand RowPublishers,1973.
2. M.Khovakh,'MotorVehicleEngines',MirPublishers,Mascow,1976
3. W.H.CrouseandA.L.Anglin,'AutomotiveEmissioncontrol',McGrawHillBookCo,1995.
4. G.S.SpringerandA.J.Patterson,'Engineemissionsandpollutantformation',plenumpress,Newyork,1985.
5. LarsErikssonandLarsNielsen,'CombustionandEmissions',JohnWiley&Sons,Ltd,2014.

18CMAE14 AUTOMOTIVEELECTRICALS AND ELECTRONICS L TP C
3 1 0 4

COURSE OUTCOME:(Employability)

- To build knowledge to the students in the principles of operation and constructional details ofbatteriesand startingsystem.
- To review the chargingsystem, lightingsystemand accessories.
- To classify the electronic ignition and injection systems.
- To implement the knowledge in sensors in automobiles.
- To describe the microprocessor used inautomobiles.

UNITIBATTERIESAND STARTINGSYSTEM 9

Different types of Batteries – Principle, Construction and Electrochemical action of Lead – Acidbattery, Electrolyte, Efficiency, Rating, Charging, Testing and Maintenance.Starting System, StarterMotors–Characteristics, Capacityrequirements.Drive Mechanisms.StarterSwitches.

UNITII CHARGINGSYSTEM, LIGHTINGSYSTEMAND ACCESSORIES 9

D.C. Generators and Alternators their Characteristics. Control cutout, Electrical, Electro-mechanicalandelectronicregulators.Regulationsforcharging.WiringRequirements,Insulatedandearth return system, details of head light and side light, LED lighting system, head light dazzling andpreventive methods. Lighting design, Dash board instruments, Horns, wiper, Trafficators, Warningsystem andsafety devices.

UNITIIIELECTRONIC IGNITION AND INJECTION SYSTEMS 9

Electronic ignition system and components, Spark plugs, Advance mechanisms. Different types ofelectronic ignition systems - variable ignition timing, distributor less ignition. Spark timing control.Electronicfuel injection systems. Enginemapping.

UNITIVSENSORS IN AUTOMOBILES 9

Basic sensor arrangement.Types of sensors – Oxygen sensor, fuel metering/Vehicle speed sensor,mass air flow sensor, temperature sensor, altitude sensor, pressure sensor and detonation sensor.Variousactuators andits applicationin automobiles.

UNIT V MICROPROCESSOR INAUTOMOBILES 9

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

TOTAL:45Hours

TEXTBOOKS:

1. Judge.A.W.,ModernElectricalEquipmentofAutomobiles,Chapman&Hall,London,1992.
2. William B. Ribbens-Understanding Automotive Electronics, 5thedition-ButterworthHeinemann, 1998
3. Young.A.P.,&Griffiths.L.,AutomobileElectricalEquipment,EnglishLanguageBookSociety&New Press, 1990.

REFERENCES:

1. Vinal.G.W.,StorageBatteries,JohnWiley&Sonsinc.,NewYork,1985.
2. Crouse.W.H.,AutomobileElectricalEquipment,McGrawHillBookCoInc.,NewYork,1980.
3. Robert N Brady Automotive Computers and Digital Instrumentation, PrenticeHall, Eagle WoodCliffs,NewJersey, 1988.
4. KohliPL.,"AutomotiveElectricalEquipment",TataMcGrawHillPublishingCo.,Delhi,2004
5. TomDenton,'AutomobileElectricalandElectronicSystems',Routledgepress,2013

18CMAE21 AUTOMOTIVEPOLLUTION ANDCONTROL L TP C
3 1 0 4

COURSE OUTCOME:(Employability)

- Todevelopanawarenessonthevariousenvironmentalpollutionaspectsandissuesandtogiveacompre hensiveinsight into thepollutioninengine and gas turbines.
- Toreview theknowledge on pollutantformation and controlandtoimpartknowledge onvariousemissioninstruments and techniques.
- To examine the emissionfrom compressionignitionengineand itscontrol.
- To apply the knowledge in noise pollution from automobiles.
- To explain the test procedures andemission measurements.

UNIT IEMISSION FROM AUTOMOBILES 05

Vehiclepopulationassessmentinmetropolitancitiesand contributiontopollution,effectsonhuman health and environment, global warming,various emissions from Automobiles — Formation,transientoperational effects on pollution.

UNITIIEMISSIONSFROM SPARK IGNITION ENGINEAND ITSCONTROL 12

Emission formation in SI Engines- Carbon monoxide- Unburned hydrocarbon Nitric oxide. Leadparticulate—Poly-nuclearAromatichydrocarbonemissions— Effectsofdesignandoperatingvariables on emission formation- controlling of pollutants from Engine-Thermal reacts — Catalyticconverters — Charcoal Canister Control for evaporative emission — Positive Crank case ventilationsystem for UBHC emissionreduction.

UNITIIIEMISSIONFROM COMPRESSIONIGNITIONENGINEAND ITSCONTROL 12

Physical and Chemical delay — Significance — Intermediate Compounds Formation — emissionformation due to incomplete Combustion — Effect of Operating variables on Emission formation —White, Blue, and Black Smokes. Nitric Oxide and Particulate controlling of Emission — OperatingBehavior-Fumigation EGR- Air Injection—Cetaneumber Effect.

UNITIVNOISE POLLUTION FROM AUTOMOBILES 8

Causes for Noise from Automobiles—Traffic Noise—Engine Noise—Transmission Noise—vehiclestructural Noise, Exhaust Noise, Noise reduction in Automobiles — Encapsulation technique fornoisereduction —SilencerDesign on Sound reduction inautomobiles.

UNITVTEST PROCEDURES ANDEMISSION MEASUREMENTS 8

Constant Volume Sampling I and 3 (CVSI &CVS3) Systems- Sampling Procedures — Seven mode andthirteen mode cycles for Emission Sampling — Sampling problems — Quantifying Emissions — Measurement of CO, CO by NDIR. Hydrocarbon emission by FID- Chemiluminesecent detector forMeasurement of NOR— Smoke meters — Dilution Tunnel Technique for particulate Measurement-Soundlevelmeters.

TOTAL:45Hours

TEXTBOOKS:

1. G.P.SpringerandD.J.Patterson,EngineEmissions,Pollutantformation,PlenumPress,NewYork,19 86.
2. D.J.PattersonandN.A.Henin,'EmissionfromCombustionEngineandtheircontrol',AnnaArborScie nce Publication,1985.

REFERENCES:

1. V.Ganesan,'InternalcombustionEngines',TataMcGrawHillBookCo,3rdEdition,2007.
2. CrouseandAnglin,'AutomotiveEmissionControl',McGrawHillcompany.,Newyork1993.
3. L.Lberanek,'NoiseReduction',McgrawhillCompany.,Newyork1993.

18CMAE22	VEHICLEDYNAMICS	L	T	P	C
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COURSE OUTCOME:(Employability)

- Torevise aboutvibrationsandhowtoreducethevibrationunderdifferentloads.
- To select the tyreproperties.
- Toexaminewithspeedandroadconditionsinordertoimprovethecomfortforthepassengers
- To implement the handlingcharacteristicsof vehicles.
- To explain the dynamicsof suspensionsystem.

UNITI BASICOF VIBRATION **12**

Classification of vibration, definitions, mechanical vibrating systems, mechanical vibration and human comfort.

Modelingandsimulationstudies.Singledegreeoffreedom,free,forcedanddampedvibrations.Magnificatio nfactorandtransmissibility.Vibrationabsorber.Vibrationmeasuringinstruments.Twodegreeoffreedoms ystem.modalanalysis.

UNITII TYRES **12**

Tireforcesandmoments,Tirestructure,Longitudinal andLateralforce atvarious slip angles,rollingresistance,Tractive and cornering property of tire. Performance of tire on wet surface. Ride property of tires. Test on Various roadsurfaces. Tire vibration.

UNITIII PERFORMANCE CHARACTERISTICSOF VEHICLE **12**

Equation of motion and maximum tractive effort. Aerodynamics forces and moments. Power plant and transmissioncharacteristics.Predictionofvehicleperformance.Brakingperformance-BrakingForce,BrakeFactor,BrakingEfficiencyandStopping Distance.

UNITIV HANDLINGCHARACTERISTICSOF VEHICLES **12**

Mathematical model of handling, Fundamental condition for true Rolling Steady State Handling: Slip angle, corneringpower, Neutral steer, under steer and over steer, Steady state response, Lateral Acceleration, Transient responsecharacteristics.Directionalstability ofvehicle.

UNITV DYNAMICSOF SUSPENSIONSYSTEM **12**

Requirements of suspension system. Spring mass frequency, wheel hop, Wheel wobble, wheel shimmy, choice ofsuspension spring rate. Calculation of effective spring rate. Vehicle suspension in fore and aft, Hydraulic dampers andchoiceofdampingcharacteristics.Compensatedsuspension systems.

TOTAL:60Hours

TEXTBOOKS:

1. RaoJ.SandGupta.K "TheoryandPractice ofMechanical Vibrations",WileyEastern Ltd.,2002.
2. J.Y.Wong,'Theoryofgroundvehicle',4th Edition,JohnWileyandSonsInc.,Newyork,2008
3. Dr.N.K.Giri,"AutomobileMechanics",Seventhreprint,KhannaPublishers,Delhi,2005

REFERENCES:

1. MassimoGuiggiani,"TheScienceofVehicleDynamics:Handling,Braking,andRideofRoadandRaceC ars",Springer,2014edition
2. Groover,"MechanicalVibration",7th Edition,NemChand&Bros,Roorkee,India,2003.
3. W.Steeds,'Mechanicsofroadvehicle'IlliffeBooksLtd,London1992
4. JG.Giles,'Steering,Suspensiontyres',IllifeBooksLidLondon1975
5. P.M.Heldt,'Automotivechassis',ChiltonCo.,Newyork,1982

18CMAE23 VEHICLEBODYENGINEERING L TP C
3 1 0 4

COURSE OUTCOME:(Employability)

- To implement the various vibrating elements of a vehicle how to reduce the vibrationunderdifferentloads,speedandroadconditionsinordertoimprovethecomfortforthepassengersand life of thevarious components ofthevehicle.
- To assess the construction of vehicle, aerodynamic, concept, paneling of passengervehicles.Attheendofthecoursethestudentwillbewellversedinthedesignandconstruction ofexternal bodyof the vehicles.
- To compare the car aerodynamics.
- To apply the knowledge in commercial vehicle details.
- To explain the commercial vehicle aerodynamics.

UNITIBASICOFVIBRATION 9

Classificationofvibration,definitions,mechanicalvibratingsystems,mechanicalvibrationandhumancomfort.Modelingandsimulationstudies.Singledegreeoffreedom,free,forcedanddampedvibrations.Magnificationfactorandtransmissibility.Vibrationabsorber.Vibrationmeasuringinstruments. Twodegree of freedomsystem. modalanalysis.

UNITIIDYNAMICS OFSUSPENSION SYSTEM 9

Requirements of suspension system.Spring mass frequency, wheel hop, Wheelwobble, wheelshimmy, choice of suspension spring rate. Calculation of effective spring rate. Vehicle suspension infore and aft, Hydraulic dampers and choice of damping characteristics.Compensated suspensionsystems. Human response to vibration, vehicle ride model. Load distribution. Stability on a curvedtrack,bankedroadand ona slope.

UNIT IIICAR AERODYNAMICS 9

Objects—
Vehicletypesofdrag.Varioustypesofforcesandmoments.Effectsofforcesandmoments.Variousbodyoptimizationtechniquesforminimum.Principleofwindtunneltechnology.Flow visualization techniques. Test with scale models.

UNITIVCOMMERCIAL VEHICLE DETAILS 9

Classificationofcommercialvehiclebodies.ConstructionofTankerbodyandTipperbody.Dimensions of driver's seat in relation to controls. Driver's cab design. Compactness of Driver's cab.Segmentalconstruction of driver's cab.

UNITVCOMMERCIAL VEHICLE AERODYNAMICS 9

Effectsofroundingsharpfrontbodyedges.Effectsofdifferentcabtotrailerbody Forebodypressure distribution. Effects of a cab to trailer body roof height. Commercial vehicle drag reducingdevices.Modernpainting process of a passengercar body.

TOTAL:45Hours

TEXTBOOKS:

1. RaoJ.SandGupta.K"TheoryandPracticeofMechanicalVibrations",WileyEasternLtd.,2002.
2. J.Y.Wong,'Theoryofgroundvehicle',JohnWileyandSonsInc.,Newyork,1978
3. Dr.N.K.Giri,"AutomobileMechanics",Seventhreprint,KhannaPublishers,Delhi,2005
4. Powloski,J.,'VehicleBodyEngineering',BusinessBooksLtd,1970
5. J.G.Giles,'BodyConstructionandDesign',ButterworthandCo.,1975

REFERENCES:

1. Groover,"MechanicalVibration",7thEdition,NemChand&Bros,Roorkee,India,2003.
2. W.Steeds,'Mechanicsofroadvehicle'IlliffeBooksLtd,London1992
3. JG.Giles,'Steering,Suspensiontyres',IllifeBooksLidLondon1975
4. J.R.Ellis,'VehicleDynamics',BusinessBooks,London,1969.
5. JohnFenton'VehicleBodylayoutandanalysis',MechanicalEngineeringPublicationLtd.,1984
6. HeinzHeisler,"AdvancedVehicleTechnology",secondedition,Butterworth–Heinemann,NewYork,2002
7. V.Raodukkipati,andJ.Srinivas,'TextbookOfMechanicalVibrations',PHILearningPvt.Ltd.,2012.

18EMAE11 **ALTERNATIVEFUELS** **L TP C**
3 0 0 3

COURSE OUTCOME: (Employability)

- Toimplementtheknowledgeoftheengineeringissuesandperspectivesaffectingengineforusingalternate flues inanengine.
- Toevaluatefurtherfuelspecificationsandtheperformancerequirementsforadvancedcombustion systems.
- To organize the alternative fuels for ICengines. They will posses complete knowledge on producing different biofuels, modifyingthemand usingthemin ICengines
- To applyacquiretheskillsindevelopingnewtechnologiesforalternativefuelsefficiently in ICengines.
- To demonstrate the importance of using alternative fuels for sustainable energysupply and for emission control in ICengines.

UNITI CONVENTIONAL FUELS FOR I.C.ENGINES 9

PetroleumbasedconventionalfuelsforSIandCIengine,DemandandAvailabilityofcrude oil – vehicle population increase – national and international standards for conventional and alternativefuels.DesirablecharacteristicsofSIEnginefuels–Petrol–Properties,Specification,chemicalstructure, Volatility characteristics, knock rating and additives. Desirable characteristics of CI Enginefuels–Diesel–Properties,Specification,chemicalstructure,Ignitionquality,Cetaneratingandadditives.

UNITII ALCOHOLS AS FUELS 9

Availability of different alternative fuels for engines. Alcohols – Properties, Production methodsandusageinengines.Blending,dualfueloperation,surfaceignition,sparkignitionandoxygenatedadditives.Performance,combustionandemissionCharacteristicsinengines.Advantagesand disadvantages of alcoholfuels

UNITIII VEGETABLE OILS AND BIODIESEL ASFUELS 9

Properties of Vegetable oils and biodiesel- Methods of using vegetable oils – Blending, preheating,and emulsification – Preparation of biodiesel from non-edible, edible oil and Algae - Performance,combustionandemissionCharacteristicsindieselengines.Advantagesanddisadvantage sofVegetable oils and biodiesel.

UNITIV HYDROGEN AS FUEL 9

Hydrogen – Properties, Production methods, storageandsafetyaspects.Issues& limitation inHydrogen.Methodsofusinghydrogeninengines.Performance,combustionandemissionCharacteristicsinengines.AdvantagesanddisadvantagesofHydrogenfuel.

UNITV BIOGAS,CNGAND LPG AS FUELS 9

Biogas, C o m p r e s s e d Natural gas (CNG) and LPG – Properties andproductionmethods. $CO_2$and H_2S scrubbing in Biogas, Modifications required for use in Engines- Performance, combustionand emission Characteristics in engines. Advantages and disadvantages of Gaseous fuels. Workingof LPG and CNGkits used in automotiveengines.

TOTAL:45Hours

TEXTBOOKS:

1. ArumugamS.Ramadhas,"AlternativeFuelsforTransportation"CRCPress,2011.
2. AyhanDemirbasandM.FatihDemirbas,"AlgaeEnergy-AlgaeasaNewSourceof
3. Biodiesel",Springer-VerlagLondonLimited2010.
4. AyhanDemirbas,'BiodieselARealisticFuel Alternative for Diesel Engines',Springer-Verlag

London Limited 2008
5. DavidM.Mousdale,“IntroductiontoBiofuels”,CRCPress,2015.
6. M.K.GajendraBabuandK.A.Subramanian,“AlternativeTransportationFuels-Utilisationin Combustion Engines”, CRC Press, 2013.
7. M.L.Mathur,R.P.Sharma“Acourseininternalcombustionengines”,Dhanpatraipublication,2003.

18EMAE21 **TWOAND THREE WHEELERS** **L TPC**
3 0 0 3

COURSE OUTCOME: (Employability)

- Todeveloptheconstructionaldetails,operatingcharacteristicsanddesignaspectsof twoand three wheelers.
- Toreview thetheoreticalinformationandaboutelectricalandelectronicscomponentsusedin twoand three wheelers.
- To differentiate the clutches and transmission.
- To apply the knowledge in frames, suspension, wheels and tyres.
- To explain the concept of three wheelers.

UNITIINTRODUCTION **7**

Two and three wheelers Classifications- design considerations of the Two and three wheelers – weight and dimension limitations –requirements stability problems, gyroscopic effect-pendulumeffectof twoand three wheelers.

UNITIIPOWERUNITS, IGNITION SYSTEMSANDOTHERELECTRICAL SYSTEMS **12**

2 stoke and 4 stokeSI engines and CI engines design criteria for engines – design of cylinders,cylinder head, cooling fins, crank case, connecting rodand crank shaft.Carburettortypes anddesign. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electricalsystem.

UNITIIICLUTCHES AND TRANSMISSION **10**

Clutch, Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and threewheelers. Design of gear box and gear change mechanism. Belt drive, chain drive and shaft drive.Freewheelingdevices, starting systems.

UNITIVFRAMES, SUSPENSION, WHEELSAND TYRES **8**

Types of frames used for two wheelers. Wheel frames- construction design of frames for fatiguestrengthtorsionalstiffnessandlateralstability.Frontandrearforks.Springsforsuspension,Dampers,constructional details of wheel and tyres.

UNITV THREE WHEELERS **8**

Three wheelers, types of three wheelers, Auto rickshaws, different types of Auto rickshaws, Pick-Upsanddeliverytypevehicle,framesandtransmissionfor3wheelerswheeltypes,wheelattachmenttyretypes. Brakesandtheir operatingmechanism.

TOTAL:45Hours

TEXTBOOKS:

1. IrvingP.E.,"MotorCycleEngineering",TemplePressBook,London,1964.
2. MarshalCavandedish,'EncyclopediaofMotorcycling',NewYork,1989
3. Srinivasan.S.,'Motorcycle,Scooter,Mobeds',Newcenturybookhouse,1988.

REFERENCES:

1. M.M.Griffin.,'Motorcyclesfrom insideand outside',Prentice Hall Inc,New Jersey,1978.
2. Johns.B.A.,'Motorcycles',Good Heartwill,1984.
3. 'CycleMotorManual',TempletonPressLtd.,London,1992.

18EMAE22 TOTALQUALITYSYSTEMANDENGINEERING L TPC 3003

COURSE OUTCOME: (Employability)

- ToproposethevariousTQMtoolsandtechniquesofqualitymanagementtomanufacturingand servicesprocesses.
- To justify the quality and ISO standards.
- To organize the techniques used in TQM and JIT.
- To apply the concept of quality by design and communication.
- To explain the products liability.

UNITI INTRODUCTION 10

PrinciplesofQualityManagement-PioneersofTQM-Qualitycosts–CustomerOrientation-Benchmarking- Re-engineering -ConcurrentEngineering.

UNITII PRACTICES OFTQM 10

Qualitysystem- ISO9001:2000-QS9000,ISO14000-QualityAuditing- Leadership - OrganizationalStructure-TeamBuilding-InformationSystemsandDocumentation.

UNITIII TECHNIQUES OFTQM 10

SingleVendorConcept-J.I.T. -QualityFunction deployment -QualityCircles-KAIZEN -SGA -POKAYOKE-Taguchi Methods.

UNITIV QUALITYBYDESIGN 8

Introduction–Rationaleforimplementation–Benefits–Teams–CommunicationmodelsImplementation–Tools –Misconceptionsand Pitfalls.

UNITV PRODUCTS LIABILITY 7

Introduction–Productsafetylaw–productsliabilitylaw–defenses–Proofandtheexpertwitness–Financial Loss –The futureof products liability–Prevention.

TOTAL:45Hours

REFERENCES:

1. HarvidNooriandRussel,"ProductionandOperationsmangement-TotalQualityandResponsiveness", McGraw-Hill Inc, 1995.
2. SureshDalelaandSaurabh,ISO9000"AManualforTotalQualityManagement" S.ChandandCompany Ltd.,1997.
3. JohnBank,"TheEssenceofTotalQualityManagement",PrenticeHallofIndiaPvt.Ltd.,1995.
4. MohamedZairi,"TotalQualityManagementforEngineers",WoodheadPublishingLimited 1991.
5. BesterfieldD.H.,BesterfieldC.M,BesterfieldG.HandBesterfieldM.S.,"TotalQualityMan agement", Pearson Education, 2002.

18PMAE21 PRACTICAL - COMPUTER AIDED VEHICLE DESIGN L TPC
0 0 6 3

COURSE OUTCOME: (Skill development)

- To design the basic procedures of computer aided design related to automobile components
- To review the design of Piston,pistonpinandpistonrings
- To classify the design of connecting rod
- To implement the design in VehicleChassis
- To describe the design of gear boxes of a heavy vehicle

Designcalculation,modeland analyze thefollowing automobile components

1. Piston,pistonpinandpistonrings
2. Connectingrod.
3. Automobilevalves
4. Crankshaft
5. Camshaft
6. VehicleChassis
7. Leafspring,coilspringandtorsionbar.
8. Frontaxlesystem ofa typical4 Wheeledvehicle
9. Rearaxlesystemofatypical4wheeledvehicle
10. Threespeedandfour speedgearboxesofa heavyvehicle

TOTAL:45Hours

REFERENCES:

2. DeanAverns,"AutomobileChassisDesign",IlliffeBooksLtd,1992.
3. RichardStone,"IntroductiontoInternalCombustionEngines",McMillan.London,1985.
4. Bosch,"AutomotiveHandBook"6th edition,SAE,2004.
5. Heldt.P.M.," Automotive Chassis ",Chilton Co.,NewYork,1992.
6. Steeds.W.,"MechanicsofRoadvehicles",IlliffeBooksLtd.,London,1990.
7. Giles.J.G.,Steering,"Suspensionandtyres",IlliffeBooksLtd.,London,1988.
8. K. Newton, W.Steeds and T.K.Garret, "The Motor Vehicle", 13th Edition, Butterworth Heinemann,India, 2004.
9. Dr.N.K.Giri,"AutomobileMechanics",Seventhreprint,KhannaPublishers,Delhi,2005.
10. MarioHirz,WilhelmDietrichandAntonGfrerrer,'IntegratedComputer-AidedDesigninAutomotive',Springer 2013
11. AUTOCAD,CATIAandANSYSsoftwareguide/manual.

18PMAE22	IN-PLANT TRAINING	L	T	P	C
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COURSE OUTCOME:(Employability)

- To invent the new design in the core industry.
- To rank the process which is used in the industry from raw material to finished products.
- To classify the methods which carried out in the work.
- To implement the concepts which is used in the various functions available in the work.
- To summarize the application of the work carried out.

The objective of the in-plant training is to enhance and improve the skill set and knowledge of the automobile engineering students which boost their performance and consequently helping them to meet their career objectives. Training helps learners to acquire the latest techniques, skills, methodologies and to build a strong foundation for their career growth.Three periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the faculty. The student has to undergo a training of 10 to 12 days during the semester in the automotive related industries and submit a detailed report based on the industry, products and services, things learned from the industry. This final report shall be typewritten form as specified in the guidelines.