RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

AU501-Automotive Engines

Unit I Historical: development of automobiles classification of Automobiles, type of automobile engines, principle of engine operation, classification of engines, fuels for modern automobile engines like LPG, CNG, bio-diesel, national and international pollution norms.

Unit II
Engine parts and their functions, types of cylinder head, piston, special features in pistons, piston rings, types of piston rings, piston pin, connecting rod, special features of connecting rods, crank shaft, flywheel, cam and follower, camshaft, valve and valve mechanism, crank case.

Unit III
Fuel system in petrol engine, carburetion principle and carburetors, petrol injection system, MPFI fuel system, diesel engine- diesel fuel pump principle, types of fuel pumps, types of fuel injector nozzles, simple and multiple unit pumps, C. A. V. Bosch pump, types of fuel systems for diesel engines, modern distributers; Air cleaners.

Unit IV
Cooling system in Automobiles; air and water cooled engines; Lubricants system; lubrication of piston rings, piston pin and crank pin; ignition system; super charging; silencers and control of combustion noise; Vehicle safety, safety features in modern automobiles like air bags, anti-lock braking system, crumple zones, introduction to power steering and power brakes.

Unit V
Duel Fuel & Multi Fuel Engine: Combustion in duel fuel engines, factors affecting combustion in duel fuel engines performance of dual fuel engines, advantages of dual fuel engines; multi-fuel engines, characteris tics of Multi fuel engines, modification of fuel system, performance of multi-fuel engines, brief introduction to working of stratified charged engine, Sterling engine, Wankel engine, variable compression engine, Air cleaners & Silencers.

References:
1. Crouse , Automotive Mechanics TMH.
2. Srinivasan S; Automotive engines; TMH
3. Gupta HN; Internal Combustion Engines; PHI;
4. Joseph Heitner, Automotive Mechanics, Principles and Practices, CBS Pub.
5. Kripal Singh, Automotive Engineering Khanna Pub.
6. Newton &Steeds , Automotive Engineering
7. Emission standards from BIS and Euro –I and Euro-III
8. Mathur ML & Sharma RP; A Course in IC Engine by, Dhanpat Rai Publications

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

AU502-Automotive Chassis System

Unit 1 Introduction to Chassis: Chassis components, layout, classification, automotive frames, frame cross sections, load acting on frames.

Unit 2 Front Axle & Steering System: Construction & types of front axle, front wheel drive front wheel geometry, steering mechanisms, steering linkages & layout, types of steering gear, steering terminology, manual steering, power steering, power assisted steering; electronic power steering; four-wheel steering.

Unit 3 Suspension System: Need, factors influencing ride comfort; types, suspension springs-leaf spring, coil spring & torsion bar; spring materials, independent suspension, rubber suspension; pneumatic suspension, hydraulic suspension, shock absorbers-liquid & gas filled.

Unit 4 Braking Systems: Principles of braking, Drum brake, Disc brake, Parking brake, Hydraulic system, Power brake, Antilock braking system, Exhaust brake, Factor affecting braking performance.

Unit 5 Wheels and Tyres: Construction of wheel, wheel sizes, offset and back spacing. Tyre construction, tyre lining and load rating, speed ratings, tube and tubeless tyres, tyre wear, wheel bearings, wheel balancing and alignment.

References:

1) Giri NK; Automobile Technology; Khanna Publishers
2) Reimpell/Stoll/Betzler; The Automotive Chassis; SAE
3) Thomas W Birch- Delmar; Automotive Chassis Systems; Cengage Learning
4) Halderman/Mitchell; Automotive Technology; Prentice Hall
5) Don Knowles; Automotive Suspension & Steering Systems; Today's Technician
6) Jack Erjavec- Delmar; Automotive Technology; Cengage Learning

List of Experiments (Pl. expand it):

1 Study of types of chassis layouts.
2. Study and Construction of front axle
3. Study and Construction of steering linkages.
4. Study and Construction of rigid axle suspension system.
5. Study and Construction of independent suspension system.
6. Study and Construction of disc & drum brake assemblies.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

Departmental ElectiveAU- 503 (A) Automotive transmission system

UNIT 1 Transmission requirements: requirements of transmission system, general arrangement of power transmission, general arrangement of rear-engine vehicle with live axles, general arrangement of dead- axle and axles transmission; four-wheel-drive transmission.
Unit 2 Clutches Requirements of clutches, principle of friction clutches, types of clutches and materials used- cone, single-plate, diaphragm-spring, multi-plate, centrifugal, over-running and electromagnetic clutch. dimensions for single plate ,multi plate, centrifugal and cone clutch.

Unit 3 Gear box: Need of gear boxes, types- sliding mesh, constant mesh and epicyclic, gear boxes; synchronizers: principle, early and later Warner synchronizer, Vauxhall synchronizer- gear materials lubrication and design of gear box; Hydrodynamic drive: Advantages and limitations, principle of fluid coupling, constructional details, torque-capacity performance characteristics, drag torque, methods of minimizing drag torque; Torque converter: performance characteristics; single, multistage and poly phase torque converters, converter-coupling-performance characteristics, coupling-blade angle and fluid flow, converter fluid.

Unit-4 Transmission systems-Drive line: Definition, forces & torques acting; types of drives- Hotchkiss, torque tube & radius rod drives; components- propeller shaft, slip joint, universal joints & constant velocity universal joints; front wheel drive; Final drive: definition; types- worm-wheel, straight-bevel gear, spiral-bevel gear & hypoid-gear drives; double-reduction & twin-speed final drives; Differential: Function, principle, construction and working; non-slip differential; differential lock; rear axle- loads acting & types; multi-axled vehicles.

Unit 5 Automatic transmission: Chevrolet “turbo glide” transmission, power glide transmission, hydraulic control system of automatic transmission; Electric drive: advantages and limitations, principle of early and modified Ward-Leonard system, modern electric drive for buses; performance characteristics.

References:

1 Heldt P.M.; Torque converters; Chilton Book Co.
2 Giri NK; Automobile Engineering; Khanna Publisher
3 .Newton, Steeds & Garret; Motor Vehicles; B.H. Publication.
4. Judge, A.W., Modern Transmission Systems, Chapman & Hall Ltd.
5. Check Chart; Automatic Transmission; Harper & Row Publication.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

Departmental ElectiveAU- 503 (B) Fault diagnosis & Trouble Shooting

Unit I: Introduction Fault Diagnosis-
Introduction To Fault Diagnosis, Safe Working Practices And Techniques, Diagnostics On Paper, Mechanical And Electrical Diagnostic Techniques, Faults Codes, Systems And Standards, On - And - Off Board Diagnostics, Data Sources, Tools And Equipments, Oscilloscopes, Scanners/Fault Code Readers, Engine Analyzers, Application Methods And Procedures.

Unit II: On and off Board Diagnostics-
Introduction To Oscilloscope Diagnostics, Sensors And Actuators Associated With Oscilloscope Diagnostics, On-Board Diagnostics Various Perspectives, Petrol/Gasoline On-Board Diagnostics, On-Board Sensors And Actuators, Sensors And Actuators Comparative Case Study.

Unit III: Engine System Diagnosis-
Introduction Engine Systems Diagnostics, Engine Operation And Fuel System, Ignition System And Emission System, Fuel Injection, Starting And Charging System, Power Flow Control And Energy Efficiency Analysis, Engine Management And Faultfinding Information, Air Supply, Exhaust System, Cooling And Lubrication System.

Unit IV: Chassis and Brake System Diagnosis-
Introduction To Engine System Diagnostics ,Anti-Lock Braking System Diagnostics ,Traction Control System Diagnostics, Steering And Tires ,Transmission Systems Diagnostics , Diagnostics On Steering And Tires ,Case Study On Diagnostics Of Sub Assemblies.

Unit V:Electrical Systems Diagnosis
Introduction To Electronic Components And Circuits ,Multiplexing And De Multiplexing ,Lighting System Faults And Auxiliary Faults. In-Car Entertainment Security And Communications Implementation. Body-Electrical Systems, Instruments System Faults Heating Ventilation And Air Conditioning ,Cruise Control, Air Bags And Belt Tensioner .

Reference Books/Other Reading Material-
1. Tom Denton “Automotive Electronics Handbook”, - - McGraw-Hill Publishing Co.; 2nd Revised edition 1999, ISBN10:0070344531
2.Routledge “Automobile Electrical and Electronic Systems”, 4 edition 2012, ISBN10: 0080969429
3 Newnes “Understanding Automotive Electronics”, 6th Revised edition 2003,ISBN10:0750675993

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

Departmental ElectiveAU- 503 (C) Alternate Automotive Fuels & Emissions

Unit 1: Introduction Automobile Fuels:
Classification of Automobilealternative fuels(liquid, gaseous, hydrogen, LPG, CNG, Biogas etc.), Desirable characteristics of SI & CI engine alternative fuels, Rating of SI & CI engine fuels, Introduction to alternate energy sources. Like EV, hybrid, fuel cell and solar cars.merits and demerits of various alternate fuels.

Unit 2: Liquid alternative fuels:
Vegetable Oils: Various vegetable oils for automobile engines, esterification, performance in engines, performance and emission characteristics, bio diesel and its characteristics.Alcohols: Properties as engine fuel, alcohols and gasoline blends, performance in automobile engine, methanol and gasoline blends.

Unit 3: Gaseous Fuels:
Biogas: Introduction to Biogas system, Process during gas formation, Factors affecting biogas formation. Usage of Biogas in SI engine & CI engine., Properties of Natural gas, Hydrogen gas, LPG & CNG as engine fuels, storage and handling, performance and safety aspects to all gaseous fuel, fuel metering systems.

Unit 4: Automobile emissions:
Types of automobile emissions,emission characteristics, formation of automobile emissions, mechanism of HC , CO and NO in SI engine, exhaust emission and factors affecting the emission, evaporative emission, crankcase emission, lead emission CI engine emissions: formation of smoke, factors affecting the smoke formation, unburned hydrocarbons, carbon monoxide, oxides of nitrogen, smog and comparison of diesel and petrol emissions.

Unit 5:Emissions Norms & Measurement:
Emission norms as per Bharat Standard up to BS – IV and procedures for confirmation on production. Demerits of automobile emission to environment. Types Of Catalytic Conversion,Measurement Techniques Emission Standards and Test Procedure NDIR,FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards.

References:
1. J.B. Heywood. Internal combustion Engines, Wiley
2. Ganeshan V; Internal Combustion engines; TMH
3. Mathur M L & Sharma RP; A. Course in IC engines; DhanpatRai
4. R Yadav, Internal Combustion Engines
5 Halderman JD and Mitchell CD; Automotive Engines theory and servicing; Pearson
6. DomKundwar; Internal Combustion Engines; Dhanpat Rai Publications
7. Taylor GF; Internal Combustion Engines Theory & Practice; MIT Press
8. Richard Stone; Introduction to IC Engines; Society of Automotive Engr (Palgrave Mc Millan)

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

Open ElectiveAU- 504 (A) Entrepreneurship & Management

Unit-I: **System Concepts:** Types, definition & characteristics; supra & subsystems, key component; boundary & interface complexity; feedback (pull) & feed forward (push) controls, open flexible-adaptive system, computer as closed system, law of requisite variety; system coupling, stresses and entropy; functional & cross functional system; Steven Alter's nine element work system model and its comparison with IPO (input-processing-output) model, structure and performance of work systems leading to customer delight.

Unit-II: **Management:** Importance, definition and functions; schools of theories, knowledge driven learning organization and e-business; environment, uncertainty and adaptability; corporate culture, difficulties and levels of planning, BCG matrix, SWOT analysis, steps in decision making, structured and unstructured decision; dimensions of organizations, size/specialization, behavior formalization, authority centralization, departmentalization, span and line of control, technology and Minzberg organization typology, line, staff & matrix organization, coordination by task force, business process reengineering and process of change management, HR planning placement and training, MIS; attitudes and personality trait, overlap and differences between leader & manager, leadership grid, motivation, Maslow's need hierarchy and Herzberg two factor theory, expectation theory, learning process, team work and stress management.

Unit-III: **Marketing:** Importance, definition, core concepts of need want and demand, exchange & relationships, product value, cost and satisfaction (goods and services) marketing environment; selling, marketing and societal marketing concepts; four P's, product, price, placement, promotion; consumer, business and industrial market, market targeting, advertising, publicity, CRM and market research. **Finance:** Nature and scope, forms of business wnerships, balance sheet, profit and loss account, fund flow and cash flow statements, breakeven point (BEP) and financial ratio analysis, pay-back period, NPV and capital budgeting.

Unit-IV: Productivity and Operations: Productivity, standard of living and happiness, types of productivity, operations (goods and services) Vs project management, production processes and layouts, steps in method improvement, time measurement, rating and various allowances; standard time and its utility, predetermined motion and time method, product and process specification, TQM, cost of quality, introduction to lean manufacturing (JIT), QFD, TPM & six sigma quality.

Unit V: Entrepreneurship : Definition and concepts, characteristics, comparison with manager, classification, theories of entrepreneur, socio, economic, cultural and psychological; ntrepreneur traits and behavior, roles in economic growth, employment, social stability, export promotion and indigenization, creating a venture, opportunity analysis competitive and technical factors, sources of funds, entrepreneur development program.

References:

1- Daft R; The new era of management; Cengage.
2- Bhat Anil, Arya kumar; Management: Principles ,Processes and Practices; Oxford higher edu.

3- Davis & Olson; Management Information System; TMH.
4- Steven Alter; Information systems, Pearson, www.stevenalter.com
5- Kotler P; Marketing management;
6- Khan, Jain; Financial Management;
7- ILO; Work study; ILO.
8- Mohanty SK; Fundamental of Entrepreneurship; PHI.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

Open ElectiveAU- 504 (B) Engineering Economics & Management

UNIT I: Demand Utility and indifference curves, Approach to Analysis of demand, elasticity of demand, Measure of demand elasticity, Factors of Production, Advertising elasticity, Marginalism

UNIT II Laws of Return and costs, price and output determination under perfect competition, monopoly, monopolistic, competition, oligopoly, Depreciation and methods for its determination.

UNIT III Functions of central and commercial banks Inflation, Deflation, Stagflation, Direct and Indirect Taxes, Monetary and cycles, New economic policy, Liberalization, Globalization, Privatization, Market friendly state. Fiscal policy of the government, Meaning and phases of business.

UNIT IV Definition, Nature and scope of management, Functions of management- Planning, organizing, Directing, Controlling, Communicating UNIT V Meaning of marketing management, Concept of marketing, Marketing Mix, Administrative and cost plus pricing, Channel of distribution, Advertising and sales promotion.

UNIT V Meaning, Nature and scope of financial management, Brief outline of profit and loss account, Balance sheet, Budget and their importance, Ratio Analysis, Principles of costing.

REFERENCES

1) Modern Economics by H.L.Ahuja
2) Modern economics theory by K.K.Dewett
3) Monitory economics by M.L.Seth
4) Industrial Management by L.K.Chopde,A.M.Sheikh
5) Business organization and management by S.A.Sherlekar
6) Managerial economics by joel dean
7) Managerial economics by Pylee

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

Open Elective AU- 504 (C) Mechatronics

UNIT – 1 INTRODUCTION: Definition of Mechatronics, Multi-disciplinary scenario, origins. Evaluation of Mechatronics, An over view of mechatronics, Design of mechatronics system. Measurements system and function of main elements of measurement systems. Need for mechatronics in industries. Objectives, advantages and disadvantages of mechatronics. Microprocessor based controllers. Principle of working of engine management system, automatic washing machine.

UNIT – 2 REVIEW OF TRANSDUCERS AND SENSORS: Defination and classification of transducers. Definition and classification of sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors. **MICROPROCESSOR**: Introduction, Microprocessor based digital control. Digital member system, binary and hexadecimal number system, Logic functions, Data word representation basic Elements of control systems.

UNIT 3 : MICROPROCESSOR ARCHITECTURE: 8085A processor architecture Terminology-such as, CPU, memory and address, ALU, assembler, data, registers, Fetch cycle, write cycle, state, bus interrupts. Micro controllers – difference between microprocessor and micro controllers. Requirements for control and their implementation in micro controllers. Classification of micro controllers.

Unit 4 ELECTRICAL ACTUATORS: Actuator and actuator system. Classifications of actuator system with examples. Mechanical switches. Concept of bouncing Methods of Preventing bouncing of mechanical switches. Solenoids, Relays. Solid state switches – Diodes, Thyristors, Triacs, Trasistors, Darlington pair. Electrical actuator. Principle, construction and working of AC, DC motors, stepper motors, permanent motors, servomotors, Servo systems and control

HYDRAULIC ACTUATORS: Valves – Classifications, Pressure Control Valves – Pressure relief valves, Pressure regulating/reducing valves, Pressure sequence valve. Flow control valves – Principle, needle valve, globe valve. Direction control valve –sliding spool valve, solenoid operated.

Unit 5 :**SINGLE CONDITIONING:** Concept, necessity, op-amps, protection, filtering, wheat stone bridge – Digital Signals – Multiplexer. Data acquisition – Introduction to digital signal processing – Concepts and different methods.

REFERENCE BOOKS:

1. **Mechatronics** – Principles, Concepts and applications – Nitaigour and Premchand, Mahilik – Tata McGraw Hill -2003
2. **Mechatronics** – W. Bolton, Pearson Education Asia -2nd Edition, 2001.
3. **Introduction to mechatronics and measurement systems** –David G. Alciatore& Michel BiHistand – Tata McGraw Hill –2000
4. **Mechatronics** – H.D. Ramachandra – Sudha Publication -2003 **Mechatronics** by HMT Ltd. – Tata McGrawHill -2000.
5. **Mechatronics System design** by Devadas Shetty and Richard A. Kark – Thomas Learining– 1997.
6. **Mechatronics an Introduction** by Robert H Bishop – CRC
7 **Mechatronics systems Fundamentals** by Rolf Isermann - Springer

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

Open Elective AU- 504 (D) Automotive Design & Assembly Drawing

Unit-1 Frame Design: Loads & Moments acting on frames, Beam theories, Deflection of beams; Concepts of CG & MI in designing and selection of frame cross sections, frame materials.

Unit-2 Cam Design: Introduction, cam terminology, types of cam, follower and follower motions. Motion constraints, single-dwell and double-dwell cam design. Critical path motion, pressure angle and radius of curvature of cam motion; introduction of SOHC and DOHC.

Unit-3 Design of Suspension Spring and Front Axle: Types of suspension system, types of suspension springs, design of leaf spring, coil spring; design of front axle beam.

Unit-4 Design of IC Engine Parts: Introduction to principle parts of an I.C engine, design of cylinder and cylinder liner, piston, connecting rod, crank shaft (calculation for bearing pressure and stresses in crank shaft); design of valves; vehicle design and data characteristics.

Unit-5 Assembly Drawings:
a) Piston Assembly
b) Connecting Rod Assembly
c) Shackle Assembly
d) Wheel Cylinder Assembly
e) Master Assembly

References
1. Timoshenko S; Strength of Materials, CBS Pub
2. Shigley J E et al; Mechanical Engineering Design, TMH Pub
3. Bhatt, N D; Machine Drawing; Charotar Pub
4. Gopal Krishna K R; Machine Drawing, Subhash Pub
5. Gupta, R B ; Automotive Engineering Drawing, Satya Pub

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, V-Semester

AU505- Automotive Transmission Lab

List of Experiments (Please Expand it)

1. To study fundamentals arrangement of engine location with its drive arrangement.
2. To study location, assembly and dismantle of single plate, Multi-plate& centrifugal clutch arrangement with its trouble, causes and remedies.
3. To find free pedal play of clutch plate for 2-wheeler and 4-wheeler.
4. To study assembly and disassembly of gear box with trouble, caused and remedies of gear box.
5. To calculate gear ratio in a gear box.
6. To study fundamentals working of U-Joint, Constant velocity joint & propeller shaft.
7. To study working of differential with its trouble, caused and remedies.
8. To find different gear reduction in differential with respect to gears.
9. To study different type of drive shafts arrangement used in live axle.
10. To find different loading condition for drive shafts arrangement used in live axle.
11. Study of fluid couplings, hydrodynamic drives and torque converters
12. Electric drive vehicle study

References:

1 Heldt P.M.; Torque converters; Chilton Book Co.
2 Giri NK; Automobile Engineering; Khanna Publisher
3 .Newton, Steeds & Garret; Motor Vehicles; B.H. Publication.
4. Judge, A.W., Modern Transmission Systems, Chapman & Hall Ltd.
5. Check Chart; Automatic Transmission; Harper & Row Publication.

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Automobile Engineering, V-Semester

AU506- Python

List of Experiments (Please Expand it):

1. To write a Python program to find GCD of two numbers.
2. To write a Python Program to find the square root of a number by Newton's Method.
3. To write a Python program to find the exponentiation of a number.
4. TowriteaPythonProgramtofindthemaximumfromalistofnumbers.
5. TowriteaPythonProgramtoperformLinearSearch
6. To write a Python Program to perform binary search.
7. To write a Python Program to perform selection sort.
8. TowriteaPythonProgramtoperforminsertionsort.
9. TowriteaPythonProgramtoperformMergesort.
10. TowriteaPythonprogramtofindfirstnprimenumbers.
11. To write a Python program to multiply matrices.
12. To write a Python program for command line arguments.
13. To write a Python program to find the most frequent words in a text read from a file.
14. TowriteaPythonprogramtosimulateellipticalorbitsinPygame.
15. To write a Python program to bouncing ball in Pygame.

References:

1. Timothy A. Budd: Exploring python, McGraw-Hill Education.
2. R.Nageshwar Rao ,"Python Programming" ,Wiley India
3. Allen B. Downey; Think Python, O'Reilly Media, Inc.