RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Automobile Engineering, VI-Semester

AU601- Two wheeler & Three Wheeler

Unit I Introduction to 2 & 3 wheelers:
History of mopeds, scooters motorcycles, classification of 2 wheelers, mopeds, scooters, motorcycles; layout of moped, layout of scooter, layout of motorcycle, basic system, Basic system used in 2-3 wheelers: frame, wheelers & brakes, suspensions, engine, drive train, fuel system, ignition and electrical system, layout of passenger and loading rickshaw.

Unit II 2-wheeler starting system:
Basic cranking mechanism, push starting, moped cranking mechanism, kick start mechanism, layout of kick start mechanism, auto-start mechanism.

Unit III 2 & 3-wheeler steering system:
2-wheeler; steering geometry and effects, steering column construction, handlebar type and construction, suspension requirements, design considerations for suspension system, spring and shock absorber assembly, springer forks suspension, girder forks suspension, trailing and leading link suspension, 3-wheeler suspension system and brake.

Unit IV Electric 2 & 3 wheelers: Battery, battery charging system, electric motor, motor controller, battery balancer and battery management system, high performance electric two wheelers, ignition system, lighting system, electric horn, handlebar controls, side stand/ignition interlock system, stepper motor, instruments and indicators, working of electric 3-wheeler.

Unit V 2-wheelers Dynamics:
Linear and angular motions, handling characteristics, road holding, vehicle stability, aerodynamics, squat and drive, Performance measurements.

References:
1. Two and Three wheeler technology, Dhruv U. Panchal, :PHI Learning, 2015.
2. Irving. P.E., Motor cycle Engineering, Temple Press Book, London, 1992
3. The Cycle Motor Manual, Temple Press Ltd., London, 1990.
4. Encyclopedia of Motorcycling, 20 volumes, Marshall Cavensih, New York and London, 1989.
5. Bryaut. R.V., Vespa Maintenance and Repair series.
6. Raymond Broad, Lambretta – A practical guide to maintenance and repair, 1987

List of Experiments (Pl. expand it):
1. Comparative analysis of various brands of two wheelers in Indian Market.
2. Comparative study of Gear mechanism in Scooter.
3. Comparative study of Gear mechanism in Motorcycle.
4. Study of any three wheeler of Indian Market.
5. Study of any three wheeler pickup Van of Indian Market.

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Automobile Engineering, VI-Semester

AU602- Machine Component Design

Note: PSG Design Data Book and/or Mahadevan and Reddy's Mechanical Design Data Book are to be provided/ permitted in exam hall (duly verified by authority)

Unit -I

Stress concentration and fatigue: Causes of stress concentration; stress concentration in tension, bending and torsion; reduction of stress concentration, theoretical stress concentration factor, notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor. Design consideration for fatigue, Goodman and modified Goodman's diagram, Soderberg equation, Gerber parabola.

Unit -II

Shafts: Design of shaft under combined bending, twisting and axial loading; Shock and Fatigue factors, design for rigidity; Design of shaft subjected to dynamic load; **Keys and Coupling:** Design of keys and shaft couplings

Unit- III

Springs: Design of helical compression and tension springs, consideration of dimensional and functional constraints, design of leaf springs; fatigue loading of springs, surge in spring, nipping in spring. **Power Screws:** Design of power screw and power nut, differential and compound screw, design of simple screw jack.

Unit -IV

Clutch: Definition, classification and requirement of clutch, design equation for power transmission and clutch dimensions for single plate, multi plate, centrifugal and cone clutch.

Brake: Definition, classification and requirement of brake, energy absorption and heat dissipation through brake, design of shoe brake and double shoe brake, internal expanding brakes, band and block brake and disc brake.

Unit -V

Journal Bearing: Types of lubrication, viscosity, hydrodynamic theory, design factors, temperature and viscosity considerations, Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings. **Rolling-element Bearings:** Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings; lubrication and sealing.

References:

1. Shingley J.E; Machine Design; TMH
2. Bhandari VB; Design of Machine Elements; TMH

3. Sharma and Purohit; Design of Machine elements; PHI
4. Wentzell Timothy H; Machine Design; Cengage learning
5. Mubeen; Machine Design; Khanna Publisher
6. Sharma & Agrawal; Machine Design; Kataria & sons

List of Experiment (Pl. expand it):

Designing and sketching of components contained in the syllabus

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Automobile Engineering, VI-Semester

Departmental Elective AU603 (A) - Automotive Electrical & Electronics

Unit -I

Automotive batteries: Starter batteries- principle, construction & operation of lead-acid battery; battery capacity, efficiency & rating; tests on batteries; charging methods; battery faults; battery maintenance; maintenance-free batteries; Traction batteries: Applications; electric traction; electric drive vehicle layout.

Unit -II

Starter and charging systems: Requirements; principle, construction & working of starter motor; starting motor drive mechanisms; starter switch; starting system faults; Generating system: Working principle of dc generator & ac alternator; armature reaction; cut-out relay; voltage & current regulator systems.

Unit -III

Lighting and auxiliary systems: Development of lighting technology; principle of automobile illumination; head lights; tail lights; traffic lights; Auxiliary systems: Speedometer; electric horn; wind screen wipers; alarm systems; central locking system; immobilizer system; power windows; different types of gauges.

Unit -IV

Electronic engine control and sensors: Need of electronic engine control; engine functions & control; electronic fuel control system; basic sensor arrangement; sensors & actuators; types of sensors-oxygen sensor, vehicle speed sensor, detonation sensor, maf sensor, map sensor, rpm sensor, throttle position sensor, temperature sensor.

Unit -V

Electronic fuel injection and ignition systems: Introduction; fuel back carburetor system; throttle body injection; multi point fuel injection; Robert Bosch gasoline fuel injection system; ford electronic gasoline fuel injection system; injection system controls; Ignition systems: Introduction; advantages of electronic ignition systems; principle, operation & types of solid state ignition system, electronic spark timing control.

References:

1) Norm Chapman Delmar; Principles of Electricity and Electronics for Automotive; Cengage
2) BOSCH-SAE; Automotive Electrics & Electronics-
3) William B Ribbens- Newnes; Understanding Automotive Electronics-
4) Tom Denton; Automobile Electrical and Electronic Systems; SAE
5) Kanemitsu Nishio; Fundamentals of Automotive Engine Control Sensors; Fontis Media

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Automobile Engineering, VI-Semester

Departmental Elective AU603 (B) - Tractor & Farm Equipments

Unit-I
Introduction:
Fundamental of Soils and machinery; different equipments, purposes and operations;
Systems of Earth Moving Equipments: Engine-all systems of engine and special features like automatic timer, turbochargers, after coolers; Transmission: Basic types and planetary transmission constructional and working principles. Hydro shift automatic trans torque converters, retarders; Hydraulics: Basic components of hydraulic systems like pumps (types); control valves, relief valves and hydraulic motors; hydraulic cylinders, circuits and controls valves

Unit-II
Final Drive: Types of reductions, Structure and function suspensions like hydraulic suspension; Brakes and Steering: hydraulic power steering, main components and circuit; tire, brakes and components and functions; under carriage and tracked vehicles, advantages and disadvantages, tractor and components.

Unit-III
Earth Moving Equipments Management: Earth moving equipments; maintenance; type of maintenance schedules; purpose and advantages, organization set ups and documentation; method of selection of equipments: Selection of machines, basic rules of matching machine, selection of equipment including the nature of operation; selection- based on type of soil, based on haul distance and weather condition

Unit-IV
Calculations of Operating capacity; estimating owning and operating cost; calculation of productivity of bulldozer shovel, wheel Landers and dump truck.

Unit-V
Safety Methods and attachment for earth moving equipments

References:
1. John B. Llzedaw et-al; Tractors and their power units
2. Donald R. Hum and LGV Garner; Farm machinery and mechanism

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Automobile Engineering, VI-Semester

Open Elective AU604 (A) - Robotics

Unit-I

Fundamentals Of Robot : Robot – Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Functions – Need for Robots – Different Applications

Unit-II

Robot Drive Systems And End Effectors : Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of Drives End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

Unit-III

Sensors And Machine Vision : Requirements of a sensor, Principles and Applications of the following types of sensors– Position of sensors (Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, Pneumatic Position Sensors), Range Sensors (Triangulation Principle, Structured, Lighting Approach, Time of Flight Range Finders, Laser Range Meters), Proximity Sensors (Inductive, Hall Effect, Capacitive, Ultrasonic and Optical Proximity Sensors),Touch Sensors, (Binary Sensors, Analogue Sensors), Wrist Sensors, Compliance Sensors, Slip Sensors. Camera, Frame Grabber, Sensing and Digitizing Image Data – Signal Conversion, Image Storage, Lighting Techniques. Image Processing and Analysis –Data Reduction: Edge detection, Feature Extraction and Object Recognition-Algorithms. Applications – Inspection, Identification, Visual Serving and Navigation.

Unit-IV

Robot Kinematics and Robot Programming: Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems. Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effecter commands, and Simple programs

Unit-V

Implementation And Robot Economics : RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

Reference:

1. M.P.Groover, “Industrial Robotics – Technology, Programming and Applications”, McGraw-Hill, 2001.
2. Saha S. “Introduction to Robotics”, TMH
3. Ghoshal Ashitava, “Robotics,-Fundamental Concepts and Analysis”, Oxford.
4. Yu Kozyhev, “Industrial Robots Handbook”, MIR Publications.

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Automobile Engineering, VI-Semester

Open Elective AU604 (B) - Optimization Techniques

Unit-I

Introduction to optimization, engineering applications in brief, design constrains and objectives, classifications, classical optimization techniques, single and multi variable optimization with no constraints/ equality / inequality constraints.

Unit-II

Linear programming, definitions and theorems, standard forms of linear programming , algorithms, two phases of the simplex methods, duality in programming, decomposition of principle, sensitivity analysis, transportation problems, quadratic programming.

Unit-III

Non linear programming, unconstrained techniques one dimension minimization methods, elimination and interpolation methods, practical considerations, implementation in multivariable problems, comparisons, constrained optimization techniques, direct / indirect methods, test problems, trusses, welded beams, gear train design, heat exchanger design.

Unit-IV

Dynamic programming, introduction, posynomial, geometrical programming, unconstraint/constraint minimization, applications of geometric programming, multistage decision processes, suboptimization and principles of optimality, computational procedures, linear programming as a case of dynamic programming, continuous dynamic programming, design of continuous beam, trusses,

Unit-V

Integer linear and non linear programming, graphical representation, stochastic programming, Introduction to genetic algorithm, neural network based optimization, practical aspect of optimization,

Reference:

1. S.S. Rao, Engineering optimization, New Age International Publishers, ISBN: 8122411495
2. A. Ravindran, K. Ragsdell and G. Reklaitis, Engineering Opimization, John wiley &Sons
3. K. Deb, Optimization for Engineering Design, Prentice Hall of India

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Automobile Engineering, VI-Semester

Open Elective AU604 (C) - Renewable Energy Technology

Unit-I

Solar Radiation: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions. Solar thermal conversion: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration. Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems.

Unit-II

Wind energy characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes; Wind Energy Conversion: Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics. Power curve of wind turbine, capacity factor, matching wind turbine with wind regimes. Application of wind energy.

Unit-III

Production of biomass, Photosynthesis- C_3 & C_4 plants on biomass production. Biomass resources assessment. CO_2 fixation potential of biomass. Classification of biomass. Physicochemical characteristics of biomass as fuel Biomass conversion routes: biochemical, chemical and thermochemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values. Biomass Gasification: Different types, power generation from gasification, cost benefit analysis of power generation by gasification.

Unit-IV

Small Hydropower Systems: Overview of micro, mini and small hydro system; hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site selection and civil works; speed and voltage regulation; Investment issue load management and tariff collection; Distribution and marketing issues. Ocean Energy: Ocean energy resources, ocean energy routs; Principle of ocean thermal energy conversion system, ocean thermal power plants. Principles of ocean wave energy and Tidal energy conversion.

Unit-V

Geothermal energy: Origin of geothermal resources, type of geothermal energy deposits, site selection geothermal power plants; Hydrogen Energy: Hydrogen as a source of energy, Hydrogen production and storage. Fuel Cells: Types of fuel cell, fuel cell system and sub-system, Principle of working, basic thermodynamics

Reference:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learning
2. Khan, B H, Non Conventional Energy, TMH
3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: Basic principle & application, Narosa Publication.
5. Ravindranath NH and Hall DO, Biomass, Energy and Environment, Oxford University Press.
6. Godfrey Boyle, Renewable Energy: Power for a sustainable future, Oxford OUP.

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Automobile Engineering, VI-Semester

AU606- RDBMS Lab

Unit-I

Introduction : Advantage of DBMS approach, various view of data, data independence, schema and sub-schema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture. ER model: basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.

Unit-II

Domains, Relations and keys: domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys. Relational Algebra & SQL: The structure, relational algebra with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, modification of Database, join relation, DDL in SQL.

Unit-III

Relational Dependencies and Normalization: basic definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non loss decomposition, FD diagram, first second, third Normal forms, dependency preservation, BCNF, multivalued dependencies and forms normal form dependeny and fifth normal forms. Distributed Database: basic idea, distributed data storage, data replication, and data fragmentationhorizontal, vertical and mixed frangmentation.

Unit-IV

Emerging Fields in DBMS : object oriented Database-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousingterminology, definitions, characteristics, data mining and it’s overview, Database on www, multimedia Database-difference with conventional DBMS, issues, similarity based retrived continuous media data, multimedia data formats, video servers.

References:

1. A Silberschatz, H.F. Korth, Sudersan, “Database System Concept”, MGH Publication.
2. C.J. Date “An introduction to Database System” 6th ed.
3. Elmasri & Navathe “Foundamentals of Database system”- III ed.