



DEI Technical College

Department of Automobile

Proposal to introduce new course

CONNECTED CARS & VEHICULAR NETWORKS

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Department of Automobile

- It is proposed to merge two courses of fifth and sixth semesters i.e. DAE 50I Automobile Electrical Equipment and DAE 60I Automobile Electrical Systems after decreasing the depth of topics which are obsolete in the present scenario namely, dynamo, C.B. point ignition system etc. and make a single course as DAE 50I Automobile Electrical Systems.

- **DAE 60I CONNECTED CARS & VEHICULAR NETWORKS** is proposed to be introduced-
- EVOLUTION OF TELEMETRY IN CARS,
- VEHICULAR COMMUNICATION SYSTEM,
- CELLULAR V2X,
- AUTOMATION
- TOWARDS 5G.

This course is already taught in B.Voc. Telematics so we will initially take help from the staff of B.Voc. Telematics. In this regard we have already had a talk with the Coordinator.

Existing Course I

Course Number: DAE501 Course Title: AUTOMOBILE ELECTRICAL EQUIPMENT

Class: Diploma in Engg., Status of Course: MAJOR, Approved since session: 2016-17

Total Credits: 3, Periods(55 mts. each)/week:3(L-3+T-0+P/S-0), Min.pds./sem.:39

- **Unit 1: AUTOMOBILE WIRING SYSTEMS & CABLES**

Earth-return and insulated-return systems; 6 Volt, 12 Volt and 24 Volt systems. Positive and negative earthing. Cables-starting systems cables, general purpose cables and high-tension cables; specifications and colour codes. Diagram of a typical wiring system. Wiring harness, cable connectors, circuit breakers, plastic fibre optic wires, printed circuits. Fuses in circuits.

- **Unit 2: STORAGE BATTERY**

Principle of lead-acid cells; constructional details of battery - plates, separator, container, terminal, vent plug, grouping compound. Electrolyte: specific gravity of electrolyte and its variation with temperature. Effect of charging and discharging of specific gravity. Capacity of battery. Efficiency of battery. Methods of charging of battery. Internal circuit of battery charger. Care and maintenance of batteries. Checking for cell voltage and specific gravity of electrolyte.

Battery tests- high discharge test, cranking motor test, open-circuit voltage test, cadmium test, life test. Battery failures, Maintenance-free batteries, VRLA batteries, Traction battery. Alkaline type batteries. Fuel cell **and its types**, Battery Life enhancer.

- **UNIT 3: DYNAMO**

Principle of generation of D.C. Constructional details of a Dynamo. Armature reaction. Principle of commutation.

Construction of commutator. **Types of wound field generator-series, shunt and compound wound. Other types of D.C. generators-four brush & four pole, interpole, split field and bucking field. Dyna-Starter, Generator drive.**

- **UNIT 4: ALTERNATOR**

Principle of generation of A.C. Constructional details of an alternator. Working of alternators. Advantages over dynamo. Types of alternators. Charging of battery with an alternator. Regulator for alternators.

- **UNIT 5: REGULATORS**

Constant current and constant voltage systems. Double-contact and compensated voltage-control regulators. Current-and-voltage regulator. Cutout.

Existing Course 2

Course Number: DAE601, Course Title: AUTOMOBILE ELECTRICAL SYSTEM

Class: Diploma in Engg., Status of Course: MAJOR, Approved since session: 2011-12

Total Credits: 3, Periods(55 mts. each)/week:3(L-3+T-0+P/S-0), Min.pds./sem.:39

- **UNIT 1: STARTING SYSTEM**

Principle, construction and working of starter motor. Series motor and its characteristics. Compound wound motor. Engine starting circuit. Starter drives-Bendix (torsion, compression), over-running clutch and sliding armature types. Starter switch - manual, solenoid. Factors affecting the starting of engines. Torque terms. Starting torque and power required. Motor efficiency. Armature reaction. Typical motor specifications.

- **UNIT 2: IGNITION SYSTEM OF SPARK-IGNITED ENGINES**

Types of ignition systems- battery-and-coil, magneto ignition systems. Ignition circuit. **Details of the ignition system- ignition coil, distributor, condenser, contact breaker points, rotor, distributor cap, distributor drive.** Firing order. Ignition timing. Ignition advance and retard, need, and factors it depends upon. Methods for obtaining advance and retard-vacuum and mechanical. **Optical sensor for spark timing.**

- **UNIT 3**

Spark plugs-constructional details; types used in automobiles, conditions of working of spark plugs. Glow plugs of diesel engines. **Magneto-rotating armature and rotating magnet types.** Electronic ignition of cars & motor-cycles (CDI), Idea of Distributor-less Direct ignition system.

- **UNIT 4: LIGHTING SYSTEM**

Requirements of automobile lighting. Head lamp - **mounting and construction**; Plastic headlamp Lens, sealed beam assembly. Asymmetrical head light, dipper and full beam, **care of headlamp, Lens cleaners.** Dynamic headlight beam control, Advanced Front lighting system (AFS) Types of bulbs. Reflector optics. Light sources – **tungsten light Sources, tungsten halogen light sources, halogen infra-red reflective light sources, HID light sources (Xenon and bi-xenon), LED light sources, Blue vision head lamp.** Auxillary lights, Brake light, Fog light, Flasher unit, warning lights and panel lights.

- **UNIT 5: ACCESSORIES**

Fuel and oil pressure gauge, cooling water temperature gauge, electrical speedometer, amperemeter, wind-screen wiper, electrical horn and relay, **cigarette lighter, Odometer,** wind-shield washing equipment, engine rpm meter, glow plug indicator, cluster assembly. Radio and television Interference suppressors, **electrical switches.** Central locking of doors, power winding of window panes, car heaters AC, blower and air flow controls, Rear defogger.

New Course I

- **Course Number: DAE501 Course Title: AUTOMOBILE ELECTRICAL SYSTEMS**

Class: Diploma in Engg., Status of Course: MAJOR, Approved since session: 2021-22

Total Credits: 3, Periods (55 mts. each)/week: 3(L-3+T-0+P/S-0), Min.pds./sem.:39

- **Unit 1: AUTOMOBILE WIRING SYSTEMS AND BATTERY**

Earth-return and insulated-return systems; 6 Volt, 12 Volt and 24 Volt systems. Earthing. Types of cable cables its specifications and colour codes. Diagram of a typical wiring system. Wiring harness, cable connectors, circuit breakers, printed circuits. Fuses in circuits.

Principle of working of lead-acid cells. Constructional details and working of lead-acid battery. Specific gravity of electrolyte and its variation with temperature. Effect of charging and discharging on specific gravity. Methods of charging of battery. Internal circuit of battery charger. Care and maintenance of batteries. Battery testing. Battery failures. Maintenance-free batteries and VRLA batteries. Battery Life enhancer.

- **Unit 2: CHARGING SYSTEM**

Principle of working and constructional details of a Dynamo. Armature reaction. Commutation.

Principle of generation of A.C. Constructional details and working of an alternator. Advantages over dynamo. Battery charging with an alternator. Regulators for alternators.

- **UNIT 3: STARTING SYSTEM**

Principle, construction and working of starter motor. Engine starting circuit. Starter drives-Bendix, over-running clutch, and sliding armature types. Starter switch - manual, solenoid. Factors affecting the starting of engines. Torque terms. Starting torque and power required.

- **UNIT 4: IGNITION SYSTEM OF SI ENGINES**

Types of ignition systems- battery-and-coil and magneto. Ignition circuit. Components of the ignition system. Firing order. Ignition timing. Ignition advance and retard, need, and factors it depends upon. Methods for obtaining advance and retard-vacuum and mechanical.

Spark plugs- constructional details and types used in automobiles; conditions of working of spark plugs. Spark plug specification. Glow plugs of diesel engines.

Electronic ignition of cars & motor-cycles (CDI). Distributor-less Direct ignition system.

- **UNIT 5: LIGHTING SYSTEM AND ACCESSORIES**

Requirements of automobile lighting. Head lamp mounting and construction. Plastic headlamp lens. Sealed beam assembly.

Asymmetrical headlight, dipper and full beam. Dynamic headlight beam control. Advanced Front lighting system (AFS). Reflector optics. Types of bulbs. Light sources. Auxiliary lights- brake light, fog light, flasher unit, warning lights and panel lights.

Gauges and meters used in automobile. Wiper and washer, electrical horn and relay, glow plug indicator, radio and television interference suppressor, electrical switches. Cluster assembly. Central locking of doors, power winding of window panes, car heaters, AC, blower and air flow controls, rear defogger.

New Course 2

Course Number: DAE601, Course Title: CONNECTED CARS & VEHICULAR NETWORKS

Class: Diploma in Engg., Status of the Course No.: MAJOR, Approved Since Session: 2022-23

Credits: 3, Periods (55 mts. each) per week: 3 (L: 3 + T: 0 + P/S: 0) Min. Periods/Sem.: 39

➤ UNIT 1: EVOLUTION OF TELEMETRY IN CARS

Overview, History of telematics in cars and Automobile industry, Levels of telematics, Communication and Telecommunication, case studies of telematics in cars.

➤ UNIT 2: VEHICULAR COMMUNICATION SYSTEM

Vehicle to Everything (V2X), Vehicular communication and communication platform, Dedicated Short Range Spectrum (DSRC), DSRC Architecture, Cooperative- Intelligent Transport System (C-ITS).

➤ UNIT 3: CELLULAR V2X

Cellular communication, Cellular networks, Basics, Modes, Security, Spectrum, Application, Comparison, Deployment.

➤ UNIT 4: AUTOMATION

Overview of Connected cars, Understanding various level of automation in cars, Areas of innovation, history of Autonomous Vehicles, Basic Physical Component and Ecosystem of an Autonomous Vehicle, Cyber security, Common Security Permeability, Case study of self-driving or Autonomous cars.

➤ UNIT 5: TOWARDS 5G

5G V2X basics, architecture, 5G e-V2X, possibilities, challenges to adoption, 5G frequency bend, mm Waves, Deployment patterns, Dynamic Spectrum Sharing, Carrier Aggregation, .

• SUGGESTED READINGS

- 1. 5G-Enabled Vehicular Communications and Networking: Xiang Cheng, Rongqing Zhang, Liuqing Yang
- 2. Vehicular Networking: Automotive Applications and Beyond (Intelligent Transport Systems): Marc Emmelmann, Bernd Bochow, Christopher Kellum
- 3. Automotive informatics and communicative systems: principles in vehicular networks and data exchange: Huaqun Guo, Huaqun Guo