

Curriculum For Level-IV Certificate Course in
AUTO ELECTRICAL & ELECTRONICS

**SYLLABUS FOR
ONE YEAR - FULL TIME
LEVEL-IV CERTIFICATE COURSE IN
AUTO ELECTRICAL AND ELECTRONICS**

Effective From:-

UNDER DEVELOPMENT

Prepared by:

Curriculum development cell
Institute of Research Development & Training,
Kanpur

TEACHING AND EXAMINATION SCHEME

COURSE NAME : AUTO ELECTRICAL & ELECTRONICS

COURSE CODE : AEE- LEVEL IV

DURATION OF COURSE : ONE YEAR

WITH EFFECT FROM :

SR. NO.	SUBJECT	ST. CODE	TEACHING SCHEME					EXAMINATION SCHEME										
			TH.	TU	PR./WS	D R G	Total	Hrs.	THEORY			TH. TOTAL		PR. TOTAL			GRAND TOTAL (TR. +PR.)	
									Max	Min	SL. TEST	Max	Min	Hrs.	Marks	SL. Marks		Total Marks
1	AUTO ELECTRICAL & ELECTRONICS EQUIPMENTS	AEE 2.1	2	-	1	-	03	2.5	50	17	20	70	24	03	20	10	30	100
2	ELECTRONIC MEASURING INSTRUMENTS	AEE 2.2	2	-	2	-	04	2.5	50	17	20	70	24	03	20	10	30	100
3	SIGNAL SENSING AND CONDITIONING	AEE 2.3	2	-	2	-	04	2.5	50	17	20	70	24	03	20	10	30	100
4	BOOK KEEPING & BASICS OF ACCOUNTING	AEE 2.4	2	-	-	-	02	2.5	50	17	20	70						70
5	ENTERPRENAURAL SKILLS & SETUP SMALL BUSINESS	AEE 2.5	2	-	-	-	02	2.5	50	17	20	70						70
6	GROOMING AND FINISHING SKILLS	AEE 2.6	-	-	2	-	02						24	03	20	10	30	30
7	BASICS OF ELECTRONICS-II	AEE 2.7	3	-	5	-	08	2.5	50	17	20	70	24	03	40	20	60	130
8	SAFETY SYSTEMS	AEE 2.8	3	-	5	-	08	3.0	50	17	20	70	24	03	40	20	60	130
9	CAN BUS SYSTEM,IMMOBILISER SYSTEMS	AEE 2.9	2	-	4	-	06	2.5	50	17	20	70	24	03	40	20	60	130
10	DIAGNOSTICS & ACCESSORIES	AEE 2.10	2	-	4	-	06	2.5	50	17	20	70	24	03	40	20	60	130
8	STUDENT CENTRED ACTIVITIES		-	-	-	-	03											
TOTAL							48											990

NOTE:

- 1.** Each period will be of 50 minutes duration.
- 2.** Each session will be of 32 weeks
- 3.** Effective teaching will be at least 25 weeks.
- 4.** Remaining periods will be utilized for revision etc.
- 5.** SI Systems of units shall be used in each subject.
- 6.** Student centered activities will comprise of various co-curricular activities like Seminar, extension lectures, field visits, NCC, NSS, Hobby clubs, Games and cultural activities

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II- MAIN FEATURES OF THE CURRICULUM

Title of the course: **LEVEL IV Certificate Course in ‘AUTO ELECTRICAL
& ELECTRONICS ’**

Duration: **One Year**

Pattern of the course: **Annual System**

Intake: **100**

Type of course: **Full Time**

III-LIST OF EXPERTS

List of Experts/Supports whose contribution helped the development of new curriculum for Three Year Diploma Course in **AUTO ELECTRICAL & ELECTRONICS** are honorably named below – Workshop's held on Dated: 26-12-2016

Sr.No.	Name of Expert & Designation	Organisation / Address
1.	Shri. Rituraj Mishra, Divisional Manager- HR	Tata Motors Ltd. Lucknow
2.	Shri. Sanjay Srivastva, Training Officer	Tata Motors Ltd. Lucknow
3.	Shri. Rajan Singh, Principal	Govt. Polytechnic, Lucknow
4.	Shri. Rajendra Prasad, J.D	I.T.I, Lucknow Mandal
5.	Shri M.C.Anand, H.O.D Electrical	Govt. Polytechnic, Lucknow
6.	Shri. Meenu Dwivedi, Lecturer (Mech. Engg.)	Govt. Polytechnic, Lucknow
7.	Shri. Aditya Kr. Maurya, Lecturer (Mech. Engg.)	Govt. Polytechnic, Lucknow
8.	Shri. M.S.Dogra, A.W.S	Govt. Polytechnic, Lucknow
9.	Shri Manjeet Singh, Instructor	I.T.I, Aliganj, Lucknow
10.	Shri.M.P.Singh Bhadauria, H.O.D. (Mech.Engg.)	I.R.D.T,U.P Kanpur
11.	Shri.L.K.Verma, H.O.D. (Electronics Engg.)/Coordinator	I.R.D.T,U.P Kanpur
12.	Shri.Yogesh Singh Yadav, Professor	I.R.D.T,U.P Kanpur
13.	Shri Lalji Patel, T.B.O	I.R.D.T,U.P Kanpur
14.	Shri. Arvind Nath Mishra, Computer Programmer	I.R.D.T,U.P Kanpur
15.	Shri. Vivek Kumar/Shri Sushil Kumar , Draughtsman	I.R.D.T,U.P Kanpur

2.1 AUTO ELECTRICAL AND ELECTRONIC EQUIPMENT

1. Introduction :

Various Electrical components/system in Automobile, their function and demands, earth return system., types of earthing, 6V, 12V system.

2. Batteries

2.1 Lead Acid Batteries : Construction, working, elements, types, materials used. Electrolyte and its strength, effect of added plate area and temperature, rating capacity, efficiency, temperature characteristics, terminal voltages, charging and discharging.

2.2 Battery Testing : Electrolyte testing by hydrometer, voltage test, high discharge and cadmium test. (Voltage)

2.3 Battery Charging: Constant potential and constant current, initial charging, normal charging, trickle charging, intermittent charging, boost charging.

2.4 Battery Defects: Stipulation, plates decay, working, erosion, cracking, sedimentation, separator defects, short circuits, overcharging.

2.5 Alkaling Batteries : Construction, working, merits and demerits of Ni-Fe, Ni-Cd, Ag-Zn cells.

2.6 Lithium ion Battery: Construction and working.

3. Charging System

3.1 Circuits, function and various components, dynamo and alternator, types, construction, working, advantages and disadvantages of dynamo and alternators, drives cut out relay.

3.2 Regulation : Functions of various components of two unit, three unit and heavy duty regulators, Regulator adjustments, Regulators for alternators.

4. Starting System :

Function of various components, torque terms, principle and constructional details of starter motor, switches, types starter to engine drive and their types, Starter-alternators.

5. Ignition System :

5.1 Constructional details of coil, distribution, condenser, meaning of cam angle, Ignition advancing mechanisms, centrifugal and vacuum type, transistorized Ignition system, Construction and working details of magneto ignition system.

5.2 Spark Plug : Constructional details of spark plugs, classification as per reach, heat range, diameter and effect of leaded fuels, care and maintenance of spark plug.

6. Lighting System :
 - 6.1 Various lighting circuits, head lamp, types and constructional details, sealed beam, double filaments, asymmetric and dual units, vertical and side control lamps, fog light, side light, break light, instrument light, Indicator light, reversing light, lamp ,mounting.
 - 6.2 Wiring : HT and LT, their specifications, cable colour codes, wiring harness, cable connections, wiring diagrams of car and two wheeler, Fuses, faults and rectification.
7. Electrical Accessories :

Fuel gauges, bimetallic and balancing coil type, Air pressure gauges, temperature gauges, Ammeter, warning, Light speedometer, wind speedometer, wind screen wipers, horns, horn relay, electric fuel pump, Faults and rectification.
8. Miscellaneous Electric Equipment :

Impulse speedometer, tachometer, heaters, defrosters, Air conditioner and Electric Door locks, Window actuation, Seat adjustments.
9. Electronic Devices :

Familiarization with automobile electronic devices, Sensing units, Computer controlled sensors.
10. Electronics and Computer Application in Automobiles :

Introduction to circuit symbols : Integrated circuits, Amplifiers, filters stepper and synchronous motors, Logic gates, Combinational and sequential logics, Flip flops sensors, Analog and digital devices, converters, signal conditioners, communication chips, multiplexed wiring working of ECU, microprocessor and its applications, Concept of operation by wire.

LIST OF PRACTICALS

1. Testing of battery with hydrometer and high rate discharge tester, charging of batteries.
2. Testing and measurement of Ignition timing and dwell angle with timing light and cam angle tester.
3. Testing cleaning and setting of spark plug on spark plug cleaning and testing machine.
4. Testing of alternator rotor and stator winding for short circuit, ground and broken circuit.
5. Head light beam setting.
6. Testing of setting horn and relay.
7. Testing and fault tracing of field winding, armature and magnetic switch for short circuit, grounding of a starter.
8. Testing dipper switch, flasher unit and indicator circuits and fault tracing.
9. Testing and fault tracing of different components of transistorized Ignition system.
10. Testing of magneto ignition circuit and adjustment.
11. Identification of colour codes for continuity test in a wiring harness.
12. Study and sketching of complete wiring circuit of an Indian vehicle.

2.2 ELECTRONICS MEASURING INSTRUMENT

1. Basic of Measurement :

Measurement, method of measurement, types of instrument. Specifications of instruments; Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration.

2. Voltage, Current and Resistance Measurement :

Principles of operation and construction of permanent magnet moving coil (PMMC) instruments. Moving iron type instruments, measurement of d.c. voltage and current, measurement of d.c. voltage and current, mill-volt measurement. Measurement of voltage, current and resistance using multimeter. Specifications of multimeter and its applications. Limitations with regard to frequency and input impedance. Limitations with regard to frequency and input impedance.

6. Digital Instruments :

Comparison of analog and digital instruments. Working principle of ramp, dual slope and integration type digital voltmeter. Block diagram and working of a digital multimeter. Measurement of time interval, time period and frequency using universal counter/frequency counter. Working principle of logic probe, logic pulser, logic analyzer, logic comparator, signature analyser.

LIST OF PRACTICALS

1. To observe the loading effect of a multimeter measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multi meter for measuring high frequency voltage.
3. Measurement of voltage, frequency, time period and phase using CRO.
5. Measurement of time period, frequency, average period using universal counter/ frequency counter.

2.3 SIGNAL SENSING AND CONDITIONING

1. Introduction :
Signal, Types of signals, Functional Elements of System, Importance of Sensing of Signals.
2. Sensing Elements :
Resistive sensing Elements : Potentiometers, resistance thermometers, strain gauges, Load cell/Pressure cell.
Capacitive sensing elements : Variable separation, area and dielectric.
Inductive Sensing Elements : Variable reluctance and LVDT displacement sensors.
Electro Magnetic Sensing Elements : Velocity Sensors.
Thermo Electric Sensing Elements : Laws, thermocouple characteristics, installation problems.
Electric Sensing Elements : Sensing elements for force, torque, acceleration pressure.
Piezoelectric Sensing Elements : Static and dynamic characteristics.
Electrochemical Sensing Elements : Ion selective electrodes, solid state gas sensors.
Photo Sensing Elements : Basic principle and characteristics of photo sources and photo detector, photo resistors, photo diodes, photo transistors, photo electric cells, LCDs, LEDs and photocouplers, LDR.
Photo Detectors : Optical detection principles, Electro-optic effect, integrated optical devices, magneto optic effect, Acousto-optic effect.
Digital Transducer Element, Micro sensor, smart sensors.
3. Signal Transmission :
Introduction, Methods of Data Transmission, General Telemetry System, Types of Telemetry System, Land Line Telemetry System, Voltage Telemetry System, Current Telemetry System, Position Telemetry System, Land Line Telemetry, Feed back system. Radio Frequency (RF) Telemetry.
4. Signal Conditioning :
Basic Instrumentation Amplifier, Applications of Instrumentation Amplifiers (Specific Bridge), Chopped and Modulated DC Amplifier.

LIST OF PRACTICALS

1. Measurement of displacement using LVDT.
2. Measurement of temperature using Thermocouple and Thermistor.
3. Measurement of Strain using strain gauge.
4. Application of Load Cell/Pressure cell.
5. Application of capacitive transducer.
6. Application of Potentiometer.
7. Application and use of LDR, Photo cell.
8. Use of Telemetry System.

2.4 Book-Keeping and Basics of Accounting

Introduction

Human wants were limited in the past. Over a period of time, human wants started increasing and the resources available were utilised for satisfying human wants. In earlier times, Barter system was followed. Goods were exchanged for goods. Gradually, the need was felt to have a common medium of exchange for goods and services and thus, the evolution of money took place. All the activities performed involved money. Business activities came into existence. It was very difficult for businessmen to remember each and every transaction of the business and therefore, recording all the transactions became necessary. This process of recording all the transactions in a systematic manner is known as Book-Keeping. Book-Keeping is a systematic manner of recording transactions related to business in the books of accounts. In Book-Keeping, transactions are recorded in the order of the dates. An Accountant is a person who records the transactions in the books of the business and is expected to show the financial results of a business for every financial year. A financial year in India is followed from 1st April to 31st March. Book-Keeping is an art as well as a science. It is the art of recording day to day business transactions in the books of accounts in a scientific and systematic manner.

Features of Book-Keeping

- i. To record business transactions.
- ii. Records only monetary transactions.
- iii. Transactions are recorded in a given set of Books of Accounts.
- iv. Transactions recorded for a specific period are presented for future reference.
- v. Records business transactions in a scientific manner.

Objectives of Book-Keeping

- i. Permanent, Datewise and Account wise record of all the business transactions.
- ii. To ascertain the Profit / Loss of the business during a specific period.
- iii. Keep a record of the Capital Investment in the business.
- iv. Business keeps a record of Total Assets and Liabilities.
- v. It keeps a record of the amount a business owes to others and the amount receivable by the business from others.
- vi. It facilitates the comparison of the financial performance of a business with previous year's performance or with the performance of other businesses in the same line of business.
- vii. It is useful to ascertain the Tax liabilities and meet the Legal Requirements of a business.

Importance of Book-Keeping

- i. **Record:** Book-Keeping is recording transactions in a systematic manner. It may not be realistic for a businessman to remember all the transactions over a period of time. Thus Book-Keeping ensures that the record of all the transactions is kept on a permanent basis.
- ii. **Financial Information:**

Book-Keeping records the financial activities of a business. This financial record helps in generating financial information of the business regarding the Assets, Liabilities, Profit, Loss, Stock Investment etc. **iii. Decision Making:** All the information provided by Book-Keeping helps the company, business or businessman to make decisions for successful business operations. **iv. Controlling:** Management uses the financial records of business to manage and control the business operations in a smooth manner. Such financial records are available from Book-Keeping. **v. Evidence:** Book-Keeping records can be used as legal evidence in Courts as all the recorded transactions of a business are recorded from source documents which act as evidence in case of any disputes. **vi. Comparison:** Record of transactions in the books of accounts helps businesses to compare their financial positions year after year and with other business units. **vii. Tax Liability:** Book-Keeping helps the businessman in ascertaining the amount payable for Sales Tax, Property Tax, Income Tax etc.

Utility of Book-Keeping: Book-Keeping is vital for the below parties: **i. Owner:** Book-Keeping helps to ascertain the financial information and position of the business at any time. Financial information includes Profits, Losses, Assets, Liabilities etc. **ii. Management:** The various Management functions such as Planning, Organising, Directing and Controlling can be performed effectively and efficiently by the management based on the records and reports available through Book-Keeping. **iii. Government:** The various sources of information available through Book-Keeping facilitate the Government and the Tax Authorities to ascertain the tax liabilities of the business. **iv. Investors:** Investors are interested in the financial statements of a business before investments are made. It provides them with assurance about the safety of their investments. **v. Customers:** Customers are assured about the financial capacity of the business as well as the quality and quantity of goods supplied by the business, based on the information available through Book- Keeping. **vi. Lenders:** Book-Keeping provides financial information to the lenders enabling them to judge the credit worthiness of the business thus, ensuring uninterrupted supply of funds.

Basics of Accounting:

Meaning: Accountancy is a broad concept and Book-Keeping is the recording branch of Accounting. Accounting includes recording of transactions, classifying them in different books of accounts, summarising the transactions in the form of reports and interpreting them in financial statements. Accountancy helps management in decision making. Accountancy starts when Book-Keeping ends. **Definitions:** An act of

recording, classifying and summarising the business transactions, balancing of accounts, drawing conclusions and interpreting the results thereof.

Kohler: Accountancy refers to the entire body of the theory and process of accounting.

Prof. Robert N. Anthony: Nearly every business enterprise has an accounting system. It is a means of collecting, summarising, analysing and reporting in monetary terms information about the business transactions.

Objectives of Accountancy: The objectives of accountancy are as follows:

- i. Ascertain the Profit or Loss of a business for a particular accounting period.
- ii. To establish the financial position of a business during a given accounting period
- iii. Arrive at the Total Capital on any given date.
- iv. Determine the positions of Assets and Liabilities on any given date.
- v. Identify and keep a check on any frauds and misappropriations of money.
- vi. Spot the various errors and rectify them by passing the necessary entries.
- vii. Verify the arithmetic accuracy of the books of accounts.
- viii. Compute the cost of production.
- ix. Facilitate the management in decision making by providing accounting ratios, reports and relevant data.
- x. Facilitate the management in preparing, analysing and controlling the cash flows of the business.
- xi. Help the management form policies for controlling cost, preparation of quotation for competitive supply etc.

Basis of Accounting

There are two basic methods for accounting as stated below:

- i. **Cash Basis:** All the transactions of business which take place in cash are called Cash transactions. In Cash basis of accounting, only cash transactions are recorded. This is a very popular form of Accounting. In this method, an expense is recorded only when it is actually paid in cash. Similarly, an income is booked only when it is actually received in cash. The specific reason of the cash inflow or cash outflow is recorded with every transaction.
- ii. **Accrual Basis:** Both Cash and Credit transactions are recorded in this system of accounting. In the Accrual basis of

accounting, transactions are recorded as and when they occur. Incomes are recorded when they are earned, irrespective of whether the cash has been received or not and Expenses are recorded when they become payable, irrespective of whether they have been actually paid in cash or not. Accrual Basis of Accounting is also known as 'Mercantile Basis of Accounting'

2.5 Entrepreneurial Skills and Setup Small Business

Introduction to Entrepreneurship

- 1: Evolution, Characteristics, Types, Functions of Entrepreneur; Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager, Entrepreneur Vs. Intrapreneur; Growth of Entrepreneurship in India; Role of Entrepreneurship in Economic Development with special reference to Self-employment.
2. Framework of Entrepreneurship Theories and Models – Economic Theory, Sociological Theory, Psychological Theory and Resource-Based Theory; Social Development Model, Competency Model, Emerging Models of Corporate Entrepreneurship.

Management Concepts and Organization Behaviour:

1. Definition, Nature, Scope and Functions of Management; Evolution of Management Thought – Classical School, Neo-classical School, Human Relation School and Modern School of Thought; Planning – Concept, Nature, Significance and Process of Planning; Decision Making Process; Organising Principles, Delegation of Authority and Responsibility and Centralization Vs. Decentralization
- 2 Organisational Behaviour – Concepts, Nature and Scope; Personality – Determinants and Theories, Perceptual Process, Process of Learning and Attitude Formation

Business Opportunity Identification

Classification of Business – Environmental Scanning, Need Assessment, Resource Assessment, Sources of Supply; Challenges of New Venture Strategies, Pitfalls in Selecting New Ventures, Critical factors for New Venture Development, Sources of Finance and Problems.

Market Assessment – Needs, Tools and Techniques; Methods of Market Survey; Sources of Market Information; Presentation of Market Survey Report

Small Business Management

Definition and concept of Small Business; Evolution and development of Small Business; Significance and Importance of Small Business to the Economy; An Overview of Small, Medium and Large Industries.

Strategic Management: Vision, Mission and Objectives; Environmental analysis - PEST Framework, Internal Environment Analysis

Technical and Financial Aspects of Small Business; Importance of Selection Process and Technologies;

Human and Social Aspects of Small Business; Manpower Planning for Recruitment and Selection; Training and Development; Appraisal Techniques; Employment Relations; Socio-economic Aspects of Business.

Institutional Support System

Sources of Finance for Short, Medium and Long Term; Venture Capital- Sources and Criteria, Financing Steps; External Resource Generation - Licensing, Franchising, Strategic Alliance, Joint Venture, Merger, Private Placements.

2.6 GROOMING AND FINISHING SKILLS

1. First Impression
2. Dress code.
3. Confidence building.
4. Etiquettes- (Telephonic/ Interview/ Writing/ Mail/ Social)
5. Interview tips (Personal Interview/ FAQ/ Handy tips/ Dos & Don'ts)
6. Mock interview.
7. Professional soft skills.
8. Pronunciations-(Diphthongs/ Monotones/ Tongue Twister/ Phonetics)
9. Public speaking.

SECTOR : AUTOMOBILES**SPECIALIZATION : AUTOELCTRICALS & ELECTRONICS**

CERTIFICATE LEVEL- IV				
S.No.	VOCATIONAL CONTENT	HRS.	S.No.	PRACTICAL
1	<u>Basics of Electronics</u>	200	1	Identification of various electronic components
1.11	Current trends in modern automobiles		2	Assembly of various components in vehicle.
1.12	Open and close loop systems		3	Locating each component
1.13	Components for electronic engine management		4	Physical testing of sensors
1.14	Electronic management of chassis system.		5	Physical testing of actuators
1.15	Sensors and Actuators: Basic sensor arrangement		6	Working/Testing of sensor
1.16	Types of sensors such as-Oxygen sensors, Crank angle position sensors-		7	
1.17	Fuel metering/vehicle speed sensor		8	
1.18	Detonation sensor-Altitude sensor, flow sensor.		9	
1.19	Throttle position sensors. Solenoids, stepper motors relays		10	
1.2			11	
1.21			12	
2	<u>Safety Systems - Crash systems, Electronic Stability Controlling systems, Infomatics</u>	200	13	
2.1	Electronic Fuel Injection and Ignition Systems: Introduction,		14	
2.2	Feed back carburetor systems. Throttle body injection		15	
2.3	Multi port/ point fuel injection.,		16	
2.4	Fuel injection systems, Injection system controls.:		17	
2.5	Advantages of electronic ignition systems		18	
2.6	Types of solid-state ignition systems and their principle of operation,		19	
2.7	Contact less electronic ignition system, and electronic spark timing control	20		
3	<u>CAN Bus system, Immobiliser system, Integration of all ECU,</u>	150	21	
3.1	Digital Engine Control System: Open loop and closed loop control systems		22	
3.2	Engine cranking and warm up control		23	
3.3	Acceleration enrichment-Deceleration leaning and idle speed control. , Exhaust		24	
3.4	Distributor less ignition-Integrated engine control systems		25	
3.5	Vehicle motion control.		26	
3.6		27		

4	<u>Diagnostics, Accessories - Mobile, Wi-fi, GPS etc, Safety Systems</u>	150	28	
4.1	Emission control engineering.		29	
4.2	Electronic dashboard instruments-Onboard diagnosis system,		30	
4.3	Security and warning system.			
4.4				

Kindly mail the Suggestions & Comments for improvement of syllabus to:-

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(Please note that all information in this survey is confidential
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