

Curriculum For Level-IV Certificate Course in

ENGINE TESTING

**SYLLABUS FOR
ONE YEAR - FULL TIME**

LEVEL-IV CERTIFICATE COURSE IN ENGINE TESTING

Effective From:-

UNDER DEVELOPMENT

Prepared by:

Curriculum development cell
Institute of Research Development & Training,
Kanpur

TEACHING AND EXAMINATION SCHEME

COURSE NAME : ENGINE TESTING

COURSE CODE : ET- 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	THERMAL ENGINEERING	ET 2.1	2	-	1	-	03	2.5	50	17	20	70	24	03	20	10	30	100
2	WORKSHOP TECHNOLOGY	ET 2.2	2	-	1	-	03	2.5	50	17	20	70	24	03	20	10	30	100
3	MEASUREMENT & INSTRUMENTATION CONTROL	ET 2.3	2	-	2	-	04	2.5	50	17	20	70	24	03	20	10	30	100
4	BOOK KEEPING & BASICS OF ACCOUNTING	ET 2.4	2	-	-	-	02	2.5	50	17	20	70						70
5	ENTERPRENAURAL SKILLS & SETUP SMALL BUSINESS	ET 2.5	2	-	-	-	02	2.5	50	17	20	70						70
6	GROOMING AND FINISHING SKILLS	ET 2.6	-	-	2	-	02						24	03	20	10	30	30
7	BASICS OF AUTOMOBILE-II	ET 2.7	2	-	2	-	04	2.5	50	17	20	70	24	03	40	20	60	130
8	ENGINE TESTING PARAMETER	ET 2.8	3	-	5	-	08	3.0	50	17	20	70	24	03	40	20	60	130
9	TROUBLE SHOOTING & DIAGNOSTIC	ET 2.9	3	-	5	-	08	2.5	50	17	20	70	24	03	40	20	60	130
10	DATA COLLECTION/TRANSFER	ET 2.10	2	-	3	-	05	2.5	50	17	20	70	24	03	40	20	60	130
11	STUDENT CENTRED ACTIVITIES		-	-	-	-	07											
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

CONTENTS

Sr.No.	Particulars	Page No.
I.	Study and Evaluation Schemes	2-3
II.	List of Experts	6

DETAILED COURSE CONTENTS

2.1	THERMAL ENGINEERING	7
2.2	WORKSHOP TECHNOLOGY	8-9
2.3	MEASUREMENT & INSTRUMENTATION CONTROL	10
2.4	BOOK KEEPING & BASICS OF ACCOUNTING	11-14
2.5	ENTERPRENAURAL SKILLS & SETUP SMALL BUSINESS	15-16
2.6	GROOMING AND FINISHING SKILLS	17
2.7	BASICS OF AUTOMOBILE-II	18
2.8	ENGINE TESTING PARAMETER	18-19
2.9	TROUBLE SHOOTING & DIAGNOSTIC	19
2.10	DATA COLLECTION/TRANSFER	19

II- MAIN FEATURES OF THE CURRICULUM

Title of the course: **LEVEL IV Certificate Course in ‘ENGINE TESTING ’**

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 **ENGINE TESTING** 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.)/ Course Developer & Coordinator	I.R.D.T, U.P Kanpur
11.	Shri.L.K.Verma, H.O.D. (Electronics Engg.)	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 THERMAL ENGINEERING

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02 - 01

RATIONALE

A diploma holder in Automobile Engineering is supposed to look after the I.C engines, air compressors and air conditioning of automobiles. Therefore, it is essential to teach concepts, principles, applications and practices covering laws of thermodynamics, basic air cycles, types of fuel used and their properties and components of air conditioners. Hence this subject has been included in this course.

DETAILED CONTENTS

1. Thermodynamic terminology

Concept of thermodynamics, heat, temperature, intensive and extensive properties, path, process, system, surroundings, enthalpy, internal energy and thermodynamic work.

2. Gas Laws

Boyle's law, Charle's law, Joule's law, Characteristic gas equation, gas constant, universal gas constant. Simple numerical problems based on above laws.

3. Laws of Thermodynamics

Zeroth law of thermodynamics, Irreversible process, First law of thermodynamics, Second law of thermodynamics (concept only), Thermal efficiency, Heat pump, heat engine and heat sink, concept of entropy, Constant volume, constant pressure, isothermal, adiabatic, polytropic, throttling and free expansion processes.

4. Air Cycles

Carnot cycle – concept only, Otto cycle, Diesel cycle, Dual combustion cycle.

5. Air Compressors

Reciprocating air compressor, Centrifugal compressor, Rotary air compressor - its types. Working of single stage and double stage compressor and applications, super charging

6. Refrigeration and Air Conditioning

6.1 Concept of refrigeration, Unit of refrigeration, refrigerants, heat pump, coefficient of performance, rating of refrigeration machines

6.2 Principles of air conditioning, Concept of human comfort, Air-conditioning system, components of air conditioning system and their function

LIST OF PRACTICAL

1. Identification of components in air-conditioning system
2. Study of components of a refrigerator
3. To study different air compressors
4. To study room air conditioning system

2.2 WORKSHOP TECHNOLOGY

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3 0 2

RATIONALE

This subject provides knowledge about various welding processes and foundry work. Welding is very useful for fabrication work and foundry for production of castings used for manufacturing of machines which is included in this subject and it is very essential for diploma holders. This subject provides knowledge about various welding processes and foundry work. Welding is very useful for fabrication work and foundry for production of castings used for manufacturing of machines which is included in this subject and it is very essential for diploma holders.

DETAILED CONTENTS

Section – A (Welding)

1. Welding Process

- 1.1 Principle of welding
- 1.2 Classification of welding processes
- 1.3 Advantages and limitations of welding
- 1.4 Industrial applications of welding
- 1.5 Welding positions and techniques, symbols.

2. Gas Welding

- 2.1 Principle of operation
- 2.2 Types of gas welding flames and their applications
- 2.3 Gas welding equipments
 - 2.31 Gas welding torch
 - 2.32 Oxy acetylene cutting torch
 - 2.33 Blow pipe
 - 2.34 Pressure regulators
 - 2.35 Filler rods and fluxes

3. Arc Welding

- 3.1 Principle of operation
- 3.2 Arc welding machines and equipment
- 3.3 A.C. and D.C. arc welding
- 3.4 Effect of polarity, current regulation and voltage regulation
- 3.5 Flux for arc welding

4. Other Welding Processes

- 4.1 Resistance welding: Principle, advantages, limitations, working and applications of spot welding, seam welding, projection welding and percussion welding.
- 4.2 Shielded metal arc welding, submerged arc welding.

5. Modern Welding Methods

Principle of operation, advantages, disadvantages and applications of:

- 5.1 Tungsten inert gas (TIG) welding
- 5.2 Metal inert gas (MIG) welding
- 5.3 SHAW(Submerged Arc Welding)
- 5.4 Thermit welding
- 5.5 Electro slag welding

Section – B (Foundry)

6. Theory of metal cutting

6.1 Elementary theory of metal cutting, chip formation, continuous chip, continuous chip with BUE, discontinuous chips.

7. Machine Tool

- Lathe, Drill Machine, Grinder and their operations.

8. Cutting fluids and Lubricants

-Different Types of Lubricants

PRACTICAL EXERCISES

1-Preliminary joining practice by gas welding

- Exercises of gas welding on the following
 - Aluminum
 - Brass
 - Copper
 - C.I.

2- Gas cutting of the following types

- Preliminary gas cutting practice Making following types of joints by arc

3- welding:

- Preliminary joining practice by arc welding
- Butt and lap joint (in vertical position, travel up and down)
- Exercise on spot welding
- Exercise on TIG/MIG welding
- Testing & Inspection of welding defects visually

2.3 MEASUREMENT, INSTRUMENTATION & CONTROL

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3 -- 3

RATIONALE

A diploma holder should have knowledge of measurement systems, various sensors, transducers and devices for measuring various parameters.

DETAILED CONTENTS

1. Measurements and Measurement Systems

Definition, significance of measurement, generalized measurement systems, definitions and concept of accuracy, precision, calibration, sensitivity, repeatability, linearity, loading effect, sources of errors in measurement, classification of errors

2. Sensors, Transducers and Strain Gauges

Introduction, classification, primary sensing elements, photo sensors, resistance transducers, variable inductance type transducers, capacitive transducers, piezoelectric transducers, introduction to strain gauges, gauge materials,

3. Measurement of Force, Torque, Shaft Power, Speed and Acceleration

Introduction, force and weight measurement systems, measurement of torque, shaft power, speed and velocity, acceleration, pressure measurements

4 Temperature and Strain Measurement

Resistance thermometers, thermocouple, law of thermocouple, materials used for construction, pyrometer, optical pyrometer, strain measurements, strain gauge.

5 Comparators and Angular Measurement

Introduction to comparators, characteristics, classification of comparators, mechanical comparator, electric and electronic comparators- principles. LVDT, pneumatic comparators, angular measurements, bevel protractor

Lists of Practicals:

1. Study of strain gauges.
2. Study of optical pyrometer.
3. Study of Comparators.
4. Study of Thermocouples.

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.

SPECIALIZATION : ENGINE TESTING

CERTIFICATE LEVEL- IV					
S.No.	VOCATIONAL CONTENT (DETAIL CONTENT)	HRS.	S.No.	PRACTICAL	
1	BASICS OF AUTOMOBILE	100	1	Identification of various Testing Machine & Equipments	
1.11	History of Automobile		2	Identification of various engine components	
1.12	Types of vehicles, Classification vehicle , Gross Vehicle Weight , Kerb weight etc		3	Assembly of major engine parts & Measurements	
1.13	Important term related to vehicle , Vehicle Height , Wheel Base , Wheel track, Over all Lenth.		4	Setting and tuning of engine after assembly	
1.14	Different Types of engines		5	Clutch removal and disassembly and assembly & Measurements	
1.15	Term related to engine , TDC, BDC, Swept Volume, Clearance Volume , Valve Timing Diagram , Bumping Clearance		6	Gear box removal and disassembly and assembly, measurements	
1.16	Different systems in engine- Cooling system,		7	Differential Setting	
1.17	Component of Cooling system and its types		8	Steering Setting	
1.18	Different systems in engine- Lubrication system,		9	FIP And valve Timing	
1.19	Component of Lubricant System and its types		10	Brakes Adjustment	
1.2	Fuel system in spark ignition engine		11	Engine removing from vehicle	
1.21	Fuel system in compression ignition engine		12	Engine component removing	
1.22	Engine Tuning & Diagnostics		200	13	Re Assy. Of component in engine
1.23	Transmission - clutch, Gear Box, Differential, Transaxle			14	Re mounting on vehicle
1.24	Different types of Brakes & its function			15	Dismantling of fuel injection pump & injector
1.25	Steering & steering geometry			16	Dismantling & assy. Of Turbocharger
1.26	HVAC in vehicles			17	Dismantling & assy. Of Starter motor
1.27	Vehicle servicing & maintenance			18	Dismantling & assy. Of Alternator
1.28	Vehicle servicing & maintenance			19	Dismantling & assy. Of Air compressor
2	<u>ENGINE Testing Parameter</u>	20		Dismantling & assy. Of Oil pump & Water pump	
2.11	Engine Testing dynamo	21		Fuel injection timing setting	
2.12	Power and Mechanical Efficiency				

2.13	Fuel Air Ratio			
2.14	Volumetric Efficiency			
2.15	Specific Output	150		
2.16	Specific Fuel Consumption			
2.17	Thermal Efficiency and Heat Balance			
2.18	Exhaust Smoke and Emissions			
2.19	Effective Pressure and Torque	150		
3	<u>Trouble Shooting & Diagnostic</u>			
3.11	Failure of Engine to Start			
3.12	Low Power & Uneven running			
3.13	High oil temperature			
3.14	excess oil consumption			
3.15	Low oil pressure			
3.16	High oil pressure			
3.17	Engine vibrates excessively			
3.18	Engine scattering misfire			
3.19	Cause of pre ignition			
4	Data Collection / Transfer	100		

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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