

Curriculum for

B.Voc./ D.Voc.

in

Automotive Manufacturing
Technology

1. Introduction

All India Council for Technical Education (AICTE) Ministry of HRD, Government of India has introduced Entrepreneurship oriented Skill development courses of B.Voc. /D. Voc. /Skill Diploma. These courses will be run by AICTE approved institutes by using available infrastructure and facilities. In these courses the institute will conduct general education content and sector specific skills will be imparted by Skill Knowledge Providers/ Training Providers/ Industries.

1.1 Key Features:

Objectives

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education to enhance employability of the students and meet industry requirements. Such student apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students admitted in such vocational courses.
- The certification levels will lead to Diploma/Advanced Diploma/B. Voc. Degree in the Automobile Manufacturing stream of Automotive Sector and will be offered by respective affiliating University/Board of Technical Education.
- Students may be awarded Level Certificate/Diploma/Advance Diploma /Degree as out-lined in the Table below:

Award	Duration after class X	Corresponding NSQF level
Level 3 Certificate	1 Year	3
Level 4 Certificate	2Years	4
Diploma	3 Year	5
Advance Diploma	4 Years	6
B.Voc. Degree	5 Years	7

2. Course Objectives

After successfully completing the vocational course, the student would have acquired relevant appropriate and adequate technical knowledge together with the professional skills and competencies in the field of Automobile Manufacturing so that he/she is properly equipped to take up gainful employment in this Vocation. Thus he/she should have acquired.

A. Understanding of

- (a) The relevant basic concepts and principles in basic science subjects (Physics, Chemistry and Mathematics) so that the students is able to understand the different vocational subjects.
- (b) The basic concepts in engineering drawing.
- (c) The concepts, principles and procedures used Automobile Manufacturing.
- (d) The knowledge of working of Automobile components.
- (e) The procedure of replacing / installing Automobile Components.
- (f) The concepts and principles used in Hybrid Automobiles.

B. Adequate Professional Skills and Competencies in

- (a) Providing manufacturing knowhow of two-wheeler, three-wheeler, four-wheeler and SUVs.
- (b) Testing the performance of Automobile components.
- (c) Locating the fault at component level and at the stage level.
- (d) Installing components in the Hybrid Automobiles.
- (e) Developing the devices required for mass production of Automobiles.
- (f) Preparing the production layout according to the procedures involved in manufacturing of Automobiles
- (g) Locating the fault at Automobile Manufacturing level due to improper process, scheduling etc. and its rectification.

C. A Healthy and Professional Attitude so that the student has

- (a) An analytical approach while working on a job.
- (b) An open mind while locating/rectifying faults.
- (c) Respect for working with their own hands.
- (d) Respect for honesty, punctuality and truthfulness

D. NSQF compliant skills in Qualification developed by sector skill council in Automotive sector or Capital Goods Sector pertaining to Automobile Manufacturing**3. Course Structure**

The course will consist of combination of practice, theory and hands on skills in the Automotive sector and Capital Goods Sector.

Curriculum

The curriculum in each of the years of the programme would be a suitable mix of general education and skill development components.

Skill Development Components:

- The focus of skill development components shall be to equip students with appropriate knowledge, practice and attitude, to become work ready. The skill development components will be relevant to the industry as per its requirements.
- The curriculum will necessarily embed within itself, National Occupational Standards (NOSs) of specific job roles within the industry. This would enable the students to meet the learning outcomes specified in the NOSs.
- The overall design of the skill development component along with the job roles selected will be such that it leads to a comprehensive specialization in few domains.
- The curriculum will focus on work-readiness skills in each of the year of training.
- Adequate attention will be given in curriculum design to practical work, on the job training, development of student portfolios and project work.

General Education Component:

- The general education component adheres to the normal senior secondary and university standards. It will emphasize and offer courses which provide holistic development. However, it will not exceed 40% of the total curriculum.
- Adequate emphasis is given to language and communication skills.

The curriculum is designed in a manner that at the end of year-3, year-4 and year-5, students can meet below mentioned level descriptors for level 5, 6 and 7 of NSQF, respectively:

Level	Process required	Professional Knowledge	Professional skill	Core skill	Responsibility
Level 3	Person may carry put a job which may require limited range of activities routine and predictable	Basic facts, process and principle applied in trade of employment	Recall and demonstrate practical skill, routine and repetitive in narrow range of application	Communication written and oral with minimum required clarity, skill of basic arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment	Under close supervision some responsibility for own work within defined limit
Level 4	Work in familiar, predictable, routine, situation of clear choice	Factual knowledge of field of knowledge or study	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	Language to communicate written or oral, with required clarity, skill to basic arithmetic and algebraic principles, basic understanding of social political and natural environment	Responsibility for own work and learning

Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools materials and information	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and learning and some responsibility for other's works and learning
Level 6	Demands wide range of specialized technical skill, clarity of knowledge and practice in broad range of activity involving standard/ non-standard practices	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Reasonably good in mathematical calculation, understanding of social, political and reasonably good in data collecting organizing information, and logical communication	Responsibility for own work and learning and full responsibility for other's works and learning
Level 7	Requires a command of wide ranging specialized theoretical and practical skill, involving variable routine and non-routine context	Wide ranging, factual and theoretical knowledge in broad contexts within a field of work or study	Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Good logical and mathematical skill understanding of social political and natural environment good in collecting and organizing information, communication and presentation skill	Full responsibility for output of group and development

Curriculum

Level	Code	Educational Component	Credit	Marks
3 Semester I	Theory			
	3.GE.01	Language - I	3	50
	3.GE.02	Applied Chemistry	3	50
	3.GE.03	Applied Physics	3	50
	3.GE.04	Applied Mathematics-I	3	50
	Lab/Practical			
	3.GP.01	Applied Chemistry Lab	1.5	50
	3.GP.02	Applied Physics Lab	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
	Auto Body Technician Level 3 (ASC/ Q 1410)			15
3 Semester II	Theory			
	3.GV.01	General Foundation Course -I	3	50
	3.GV.02	Basic Electricity	3	50
	3.GV.03	Basic Electronics	3	50
	3.GV.04	Applied Mathematics - II	3	50
	Lab/Practical			
	3.VP.01	Basic Electricity - Lab	1.5	50
	3.VP.02	Basic Electronics - Lab	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
	Automotive Service Technician Level 3 (ASC/Q 1401)			(Any one)
Casting Technician Level 3 (ASC/Q 3202)			200	

Detailed Curriculum

Level 3 (Semester I)

(3.GE.01) Language - I

Module 1: Reading comprehension (prescribed texts) and functional grammar

A variety of genres – short stories, expository pieces, biographies, poems, plays, newspaper and magazine excerpts have been included. Teaching of grammar has been integrated with the reading texts. The emphasis is on functional grammar.

The following ten prose texts and five poems have been selected for development of different reading skills.

Prose texts (Prescribed)

1. A warmer or a colder earth (popular science) Arthur – C. Clark
2. The tiger in the tunnel (narrative) – Ruskin Bond.
3. First two or four pages from Sunny Days (autobiographical) – By Sunil Gavaskar
4. Case of suspension (narrative)
5. Big brother (narrative) Shekhar Joshi
6. Father, dear father (news paper article form the Hindu)
7. Face to face (autobiographical) Ved Mehta
8. I must know the truth (narrative) Sigrun Srivastva
9. If I were you (play) Douglas James
10. India, her past and her future (speech) Jawahar Lal Nehru

Poems

1. Leisure – W H Davis
2. The road not taken – Robert Frost
3. Where the mind is without fear- Tagore
4. My grandmother's house – Kamla Das
5. The night of the scorpion – Nissi, Ezekiel

Non prescribed

In this section learners will be exposed to newspaper, articles, tables, diagrams, advertisements etc. which they have to read carefully and interpret. In the examination similar pieces will be used.

Grammar and usage:

The following points of grammar and usage have been selected from the reading passages.

1. Agreement /concord: number – gender etc.
2. Tenses: simple past (negatives/interrogatives) present perfect, past perfect continuous, past perfect, expressing future time (will and going to)
3. Passive voice (perfect tenses and modals)
4. Modals (must, should ought to, would)
5. Linking words (to like because although, instead of, if, as, since, who, which that, when however, inspite of)
6. Reported speech, statements, questions (yes/no)

Module 2: Functional writing and study skills

This module help the learner to write descriptive and narrative paragraph, letters, reports notices etc. and also practice skills of note making

1. Paragraph writing
 - Describing objects
 - Describing people
 - Narrating events, stories
2. Letter writing
 - Application for leave
 - Application for jobs
 - Asking for information form various agencies (e.g. Last date for getting prospects; price of items before placing doers etc.)
3. Note making
4. Ending (punctuation, spelling, appropriate vocabulary, structures)

(3.GE.02) Applied Chemistry**1. Structure of Atom:**

Rutherford model of the structure of atom, Bohr's theory of electrons, quantum numbers and their significance, de-Broglie equation and uncertainty principle, electronic configuration of 1 to 30 elements

2. Periodic Properties of Elements:

Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic radii, ionization energy and electron affinity, Division of elements into s, p, d and f blocks

3. Chemical Bonds:

Electrovalent, covalent and coordinate bond and their properties, Metallic bonding (electron cloud mode) and properties (like texture, conductance, luster, ductility and malleability).

4. Fuel and their Classification:

Definition, characteristics, classification into solid, liquid and gaseous fuel,. Petroleum and brief idea of refining into various factions and their characteristics and uses, Calorific value of fuel, Gaseous fuels- preparation, properties, composition and use of producer gas, water and oil gas.

5. Water:

Impurities in water, methods of their removal, hardness of water, its types, causes and removal, disadvantages of hard water in boilers, pH value and its determination by calorimetric method.

6. Corrosion:

Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings

7. Plastic and Polymers:

Plastic-thermo-plastic and thermo-setting, Introduction of Polythene. P.V.C. Nylon, synthetic rubber and phenol-formal-dehyde resin, their application in industry.

(3.GE.03) Applied Physics

1. **Units & Dimensions:** M.K.S. fundamentals & derived units, S.I. base units supplementary units and derived units, Dimensions of various physical quantities, uses of dimensional analysis.
2. **Surface Tension and Viscosity:** molecular forces, molecular theory of surface tension, surface energy, capillary action, concept of viscosity, coefficient of viscosity, principle and construction of viscometers.
3. **Vibrations:** Vibration as simple spring mass system, elementary and qualitative concept of free and forced vibrations, resonance. Effects of vibrations on building bridges and machines members.
4. **Heat:** Temperature and its measurement, thermoelectric, platinum resistance thermometers and pyrometers. Conduction through compound media and laws of radiations.
5. **Optics:** Nature of light, reflection and refraction of a wave from a plane surface. Overhead projector and Epidiascope.

(3.GE.04) Applied Mathematics - I**Sets, Relations and Functions**

1. Sets
2. Relations and Functions-I
3. Trigonometric Functions-I
4. Trigonometric Functions-II
5. Relation between Sides and Angles of A triangle

Sequences and Series

1. Sequences and Series
2. Some Special Sequences

Algebra-I

1. Complex Numbers
2. Quadratic Equations and Linear inequalities
3. Principle of Mathematical Induction
4. Permutations and Combinations
5. Binomial Theorem

Co-ordinate Geometry

1. Cartesian System of Rectangular Co-ordinates
2. Straight Lines
3. Circles
4. Conic Sections

Statistics and Probability

1. Measures of Dispersion
2. Random Experiments and Events
3. Probability

(3.GP.01) Applied Chemistry – Lab

1. Proximate analysis of solid fuel.
2. Experiments based on Bomb Calorimeter.
3. Determination of turbidity in a given sample.
4. To determine the flash and fire point of a given lubricating oil.
5. To determine the viscosity of a given lubricating oil by Redwood viscometer.
6. To determine cloud and pour point of a given oil.

(3.GP.02) Applied Physics – Lab

1. To determine the surface tension of a liquid by rise in capillary.
2. To determine the viscosity of a given liquid.
3. To determine the frequency of tuning fork using a sonometer.
4. To determine the frequency of AC main using sonometer.
5. Time period of a cantilever.

Level 3 (Semester II)**(3.GV.01) General Foundation Course – I**

- A. Business Management and Entrepreneurship**
- (a) **Entrepreneurship Orientation**
Importance and relevance in real life: Emphasis on self-employment.
 - (b) **Entrepreneurship Values and Attitudes**
Innovativeness, Independence, Risk Taking, Analytical ability.
 - (c) **Entrepreneurial Motivation**
Achievement Planning, personal efficacy, entrepreneurial goal setting.
 - (d) **Launching of a Business Venture**
Identification of project, steps in setting up a business, information about various institutions providing assistance, project formulation.
- B. Computational Skills**
- (a) Percentage, ratio & proportion, profit & loss, discount, simple and compound interest, population growth and depreciation of value of articles using logarithm. Area and volume: rectangle, parallelogram, circle, cube, cone, cylinder &
 - (b) sphere.
- C. Environmental Education**
- (a) Environment and the society.
 - (b) Environment properties risks in different economic enterprises, in use of raw materials, in processing / manufacturing and designing.
 - (c) Poverty and environment.
- D. Rural Development**
- (a) Agriculture, the back bone of Indian Economy.
 - (b) Rural development projects in India including Integrated rural development programme.
 - (c) Agro based rural industries.
 - (d) Community approach to rural development.

(3.GV.02) Basic Electricity

- 1. Current Electricity**
Definition of Resistance, Voltage, Current, Power, Energy and their units, Relation between electrical, mechanical and thermal units, Temperature variation of resistance, Difference between AC and DC voltage and current
- 2. D.C. Circuits**
Ohm's Law, Series – parallel resistance circuits, calculation of equivalent resistance, Kirchhoff's Laws and their applications.
- 3. Electric Cells**
Primary cell, wet cell, dry cell, battery, Li-ion battery, series and parallel connections of cells, Secondary cells, Lead Acid Cell, Discharging and recharging of cells, preparation of electrolyte, care and maintenance of secondary cells.

4. Lighting Effects of Current

Lighting effect of electric current, filaments used in lamps, and Tube-light, LED, their working and applications.

5. Capacitors

Capacitor and its capacity, Concept of charging and Discharging of capacitors, Types of Capacitors and their use in circuits, Series and parallel connection of capacitors, Energy stored in a capacitor.

6. Electromagnetic Effects

Permanent magnets and Electromagnets, their construction and use, Polarities of an electromagnet and rules for finding them.

Faraday's Laws of Electromagnetic Induction, Dynamically induced e.m.f., its magnitude and induction, inductance and its unit. Mutually induced e.m.f., its magnitude and direction, Energy stored in an inductance.

Force acting on a current carrying conductor in magnetic field, its magnitude and direction, Principles and construction of dynamo.

7. A.C Circuits

Generation of A.C. voltage, its generation and wave shape. Cycle, frequency, peak value R.M.S. value, form factor, crest factor, Phase difference, power and power factor, A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C. series circuits.

(3.GV.03) Basic Electronics**i) Overview of Atom, Sub-Atomic Particles and CRO**

- Brief History of Electronics.
- Atom and its elements,
- Electron, Force, Field intensity, Potential, Energy, current
- Electric field, Magnetic field, Motion of charged particles in electric and magnetic field.
- Overview of CRO, Electronic and Magnetic deflection in CRO, Applications.

ii) Voltage and Current

- Resistance, Ohm's law, V-I Characteristics, Resistors, Capacitors, Inductors.
- Voltage and Current sources, Symbols and Graphical representation
- Overview of AC, DC, Cells and Batteries, Energy and Power.

iii) Basics of Semiconductor

- Semiconductor materials, Metals and Semiconductors and Photo-electric emission.
- N-type and P-type semiconductor, Effects of temperature on Conductivity of semiconductor.
- PN junction diode, depletion layer, Forward & Reverse bias, V-I Characteristic, Effects of temperature, Zener diode, Photo diode, LED, Types and applications of diode.
- Diode as a rectifier, Half wave and full wave rectification, Zener diode Regulator.
- Introduction to Filters, Clippers, Clampers

iv) Bipolar Junction Transistor

- Operation of NPN and PNP transistors, Biasing of BJT.

- CB, CE and CC configuration
 - Introduction to FET, JFET, MOSFET, CMOS and VMOS
- v) **Transistor Amplifier and Applications**
- Introduction, Single and Multi-stage amplifiers
 - Introduction to Oscillators
 - Introduction to Thyristors, PNP diode, SCR, LASCR, DIAC, TRIAC

(3.GV.04) Applied Mathematics – II

Algebra-II

1. Matrices
2. Determinants
3. Inverse of a Matrix and its Applications

Relations and Functions

1. Relations and Functions-II
2. Inverse Trigonometric Functions

Calculus

1. Limits and Continuity
2. Differentiation
3. Differentiation of Trigonometric functions
4. Differentiation of Exponential and Logarithmic functions
5. Application of Derivatives
6. Integration
7. Definite Integrals
8. Differential Equations

Vectors and Three Dimensional Geometry

1. Introduction to Three Dimensional Geometry
2. Vectors
3. Plane
4. Straight Line

Mathematical Reasoning

1. Mathematical Reasoning

(3.VP.01) Basic Electricity Lab

1. Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross-sectional area of the conductor.
2. Verification of Ohm's Law.
3. Verification of temperature co-efficient of resistance:
 - (i) Positive for Tungsten and Nichrome and
 - (ii) Negative for carbon.

4. Study of series resistive circuits.
5. Study of parallel resistive circuits.
6. Study of series and parallel connection of cells in circuits.
7. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
8. To find heat efficiency of an electric kettle.
9. Charging and Discharging of a capacitor.
10. Verification of magnetic field of a Solenoid with:
 - (i) Iron core and
 - (ii) Air core.
11. Verification of Faraday's Laws of electromagnetic induction.
12. Verification of Torque development in a current carrying coil in magnetic field.
13. Study of R.L. series circuit and measurement of power and power factor.
14. Study of R.C. series circuit and measurement of power and power factor.
15. Study of R.L.C. series circuit and measurement of power and power factor.
16. Study of R.L.C. series circuit for calculation of inductive reactance, capacitive reactance, impedance and Q- Factor.

Instruments Required

- Trainer kit for verifying ohm's law,
- Trainer kit for measuring TCR
- Lead acid battery,
- Hydrometer,
- Electric kettle,
- Trainer kit for measuring power and power factor in RLC circuits

(3.VP.02) Basic Electronics - Lab

1. Study of current and voltage measurement using Ammeter and Voltmeter.
2. Study of current and voltage measurement using Galvanometer.
3. Study of current, voltage and resistance measurement using of Multi-meter
4. Study of Power and Energy measurement using Wattmeter and Energy meter.
5. Study of working principle of Signal Generator and measurement of amplitude, time period and frequency of signal using Oscilloscope.
6. Study of V-I Characteristic of Diode.
7. Study of V-I Characteristic of Zener Diode. And use of Zener Diode as voltage regulator.
8. Study of Half wave rectifier with and without filter circuit.
9. Study of Full wave rectifier with and without filter circuit.
10. Study CE configuration for NPN and PNP transistors and measurement of voltage and current gain.
11. Study CB configuration for NPN and PNP transistors and measurement of voltage and current gain.
12. Study CC configuration for NPN and PNP transistors and measurement of voltage and current gain.
13. Study of working of single layer PCB manufacturing
14. Study of working of double layer PCB manufacturing.

15. Design of 7 segment display using LED and bread board.

Instruments Required

- Ammeter
- Voltmeter,
- Multi-meter,
- Galvanometer,
- Energy Meter,
- CRO,
- Diode Trainer kit
- Zener diode Trainer kit
- Rectifier trainer kit
- Transistor characteristics trainer kit,
- PCB manufacturing Lab
- Bread board trainer kit to design 7 segment displays.

Curriculum

4 Semester I	Theory				
	4.GV.01	Engineering Science	3	50	
	4.GV.02	IT Tools	3	50	
	4.GV.03	Manufacturing Technology - I	3	50	
	4.GE.01	Language – II	3	50	
	Lab/Practical				
	4.VP.01	Mechanical Workshop Practice - I	1.5	50	
	4.VP.02	IT Tools (Practical)	1.5	50	
	On-Job-Training (OJT)/Qualification Packs				
	Automotive Service Technician Level 4 (ASC/Q 1402)		(Any one)	15	200
	Auto Body Technician Level 4 (ASC/ Q 1405)				
	AC Specialist (ASC/Q 1416)				
Accessory Fitter (ASC/Q 1102)					
Level	Code	Educational Component	Credit	Marks	
		Lathe Operator (ASC/Q 1901)			
4 Semester II	Theory				
	4.GV.04	General Foundation Course –II	3	50	
	4.GV.05	Manufacturing Technology - II	3	50	
	4.GV.06	Material Science and Material	3	50	
	4.GV.07	Motor Vehicle Technology -I	3	50	
	Lab/Practical				
	4.VP.03	Material Science Lab.	1.5	50	
	4.VP.04	Mechanical Workshop Practice - II	1.5	50	
	On-Job-Training (OJT)/Qualification Packs				
	One more QP to be opted from the QPs mentioned in the Level 4 first semester		(Any one)	15	200

Detailed Curriculum

Level 4 (Semester I)

(4.GV.01) Engineering Science

i) Soldering and Brazing

General characteristics of soldering, brazing joints, processes and their characteristics, brief description of soldering and brazing tools equipment, types of solders and fluxes and their uses, soldering defects and their remedies, brazing materials, advantages and disadvantages of soldering and brazing. Introduction to PCB, PCB designing, wet etching, dry etching, track correction, wiring, single sided and double sided PCB.

ii) Measuring Instruments

Construction and working principles of moving iron and moving coil voltmeters and ammeters, dynamometer type wattmeter, ohm meter, megger and induction type energy meter- their circuit connection and application for measurement of electrical quantities.

iii) Electrical Engineering Drawing

Schematic and wiring diagram for domestic simple wiring, symbols used for different electrical devices and equipments.

iv) Electrical wiring

Types of wiring – cleat wiring, casing and capping, C.T.S./T.R.S. wiring, metal sheath wiring, conduit wiring and concealed wiring – their procedure. Factors of selection of a particular wiring system, importance of switch, fuse

v) Earthing

Earthing of wiring system, types of faults, their causes and remedies, Types of earthing-plate earthing and Pipe earthing, their procedure and application. Methods of finding numbers of circuits and circuit distribution by distribution board system loop in system of wiring connections IE rules related to wiring.

(4.GV.02) IT Tools

- I. Computer Organization & OS: User perspective.
 - Understanding of Hardware.
 - Basics of Operating System.
- II. Networking and Internet.
 - Network Safety concerns.
 - Network Security tools and services.
 - Cyber Security.
 - Safe practices on Social networking.
- III. Office automation tools:
 - Spreadsheet.
 - Word processing.
 - Presentation.
- IV. Multi Media Design: (Open Source Design Tools).

- Interface and Drawing Tools in GIMP.
 - Applying Filters.
 - Creating and handling multiple layers.
 - Using Stamping and Smudging tools.
 - Importing pictures.
- V. Troubleshooting: Hardware, Software and Networking.
- Commonly encountered problems.
 - (Monitor: No display, KB/Mouse not responding, monitor giving beeps, printer not responding, check for virus, Delete temporary files if system is slow, adjust mouse speed).
- Work Integrated Learning IT – ISM
- Identification of Work Areas.
 - Work Experience.

(4.GV.03) Manufacturing Technology -I

UNIT 1

(A) General Introduction: (a) Scope of subject "Workshop Technology" in engineering (b) different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication-carpentry (ii) Metal Fabrication (shaping and Forming, Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).

(B) Carpentry: (a) Fundamental of wood working operations (b) Common Carpentry Tools-Their classification, size, specification (name of the parts and use only): (i) Marking and measuring tools (ii) Holding and supporting tools: (iii) Cutting and Sawing Tools: (iv) Drilling and Boring Tools (v) Striking Tools-Mallet and Claw hammer (vi) Turning Tools & Equipment (vii) Miscellaneous Tools

UNIT 2

(A) Joining of Timber Components for Fabrications Works: Assembly of joints (Preparation steps and tools used only) Mortise, Tenon, Rivet, Groove, Tongue, Dowel, operations in assembly-simple lap and butt, Mortise, Tenon, Dovetail, Miter & bridle joints.

Metal Fabrication

(B) Metal Shaping-Smithy: (i) Operations involved (concept only) (ii) Tool and equipment used (Names, size, specification for identification only) (iii) Heating and fuel handling equipment (iv) Holding and supporting tools (v) Striking Tools (vi) Cutting tools (vii) Punching & Drifting Tools (viii) Bending Tools and figures (ix) Forming & Finishing Tools (x) Defects Occurring & its remedy

UNIT 3

Sheet metal working-Tools and operation: (1) Operations involved (Names and concept only) (2) Sheet metal joints (3) Tools and equipment used (Name, size, specifications for identification only) (4) Marking tools (5) Cutting and shearing Tools (6) Straightening tool (7) Striking Tools (8) Holding Tools (9) Supporting Tools (10) Bending tools (11) Punching-Piercing and Drafting tools (12) Burring Tools-Files (13) Defects Occurring & its remedy

UNIT 4

(A) Metal Joining During Fabrication-

(a) Permanent Joining: (i) Welding methods (ii) Electric welding

(b) Soldering & Brazing: (i) Its concept, comparison with welding as joining method and classification (ii) Soldering operation (iii) Materials Used (iv) Defects Occurring & its remedy

(B) Riveting-

(i) Its comparison with welding as joining method. (ii) Rivets and Materials. (iii) Operation involved (iv) Tools and equipment used (Names, Size, specification and uses)), Elementary knowledge about working of pneumatic, hydraulic and electric riveter. Temporary Joining (Fasteners & their uses), General Idea about temporary fasteners & their uses

(C) Familiarity with the Use of Various Tools Used in Mechanical Engineering Workshop

(a) Marking & Measuring Tools (b) Holding Tools (c) Cutting Tools (d) Files (e) Thread Cutting Tools (h) Miscellaneous Tools

They should be shown physically to each student for familiarity.

UNIT 5

(A) Protection of Fabricated Structures From Weather:

(a) Painting: Its need, Introduction to methods of painting (classification only) operations involved description steps only, surface preparation materials, tools and equipment used (name, size specification for identification), Brushes-round and flat wire brush, scraper, trowel, spray gun, compressor, Defects likely to occur in painting and their remedies

(b) Varnishing & Polishing: Its need, operation involved (description of steps only), surface preparation method of old and new articles, application of polishing materials, materials used for preparation of french and sprit polish, copal varnish, Defects likely to occur.

Safety of Personnel, Equipment & Tools to be observed

(B) Foundry Work:

Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding

Suggested Reading:

Workshop Technology, Vol. I: Hazra & Chaudhry

Workshop Technology, Vol. I: BS Raghuvanshi

Karyashala Takniki: JK Kapoor

(4.GE.01) Language - II

Module – 3: Listening and speaking skills

In this module the learners will be exposed to a variety of listening activities recorded on audiotapes. These will be samples of good spoken English, which the learners can use as models. Work sheets will accompany the listening material.

This module will include the following:

1. Introducing yourself/friends in formal and informal situations.
2. Inviting people (over the phone and face to face) giving details of occasion, time place and date. Acceptance and refusal of invitation – formal and informal.
3. Seeking and supplying information (example opening an account in a bank, applying for loans etc.)
4. Talking and conveying messages (over the phone and face to face).
5. Giving directions / instruction.
6. Discussing contemporary issues related to environment, child labour, gender bias

etc.

7. Listening to excerpts from television and radio.
8. Listening to poems/plays (prescribed).
9. Listening to speeches / talks.
10. Listening to songs like "We shall overcome".

Module – 4 to 6 (English for specific purposes) (opt any one)

These modules are being offered. A learner has to opt for any one. The first is for academic purposes and the next two are for vocational purposes. The focus is not on the teaching of the subject matter like science and literature but on the way in which language is used in the different subjects.

Module 4: English for Science

This course will introduce learners to some interesting pieces of popular science

1. Health and hygiene
2. Conservation of (nearly extinct) animals.
3. Plant life.
4. Bio gas / solar energy.

These pieces illustrate the use of English in scientific writing: giving information factually, logically and objectively.

Module 5: English for Receptionist

This module will introduce the learners to a variety of exercises, tasks and meaningful activities related to the receptionist's use of English. The printed course materials will be supported by tapes.

The following competencies be developed:

1. Receiving messages, making request etc.
2. Supplying information
3. Giving advice and making suggestions
4. Dealing with complaints
5. Making entries in an appointment book, register etc.

Module 6: English for Office Use

This course will help the learner to use English effectively and appropriately in the office environment. The competencies will be developed.

1. Using the telephone taking and passing messages.
2. Receiving messages
3. Marking noting on files and circular.
4. Writing office notes, memos, notices, agendas for meetings.
5. Telegrams and fax messages.
6. Writing business letters, application enquires, complaints.
7. Filling in forms, cheques, pay in slips etc.

(4.VP.01) Mechanical Workshop Practice - I

1. CARPENTRY SHOP WORK:

- (EX-1) Planing and sawing practice
- (EX-2) Making of lap joint

(EX-3) Making of mortise and tanon joint

2. PAINTING AND POLISHING:

(EX-1) To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and Polish the other side.

(EX-2) To prepare metal surface for painting, apply primer and paint the same.

(EX-3) To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

The sequence of polishing will be as below- (i) Abrasive cutting by leather wheel. (ii) Polishing with hard cotton wheel and with polishing material. (iii) Buffing with cotton wheel or buff wheel.

3. SHEET METAL WORKING AND SOLDERING:

(EX-1) Cutting, shearing and bending of sheet.

(EX-2) To prepare a soap case by the metal sheet

(EX-3) To make a funnel with thin sheet and to solder the seam of the same

(EX-4) To make a cylinder and to solder the same

4. FITTING SHOP WORK:

(EX-1) Hack sawing and chipping of M.S. flat

(EX-2) Filing and squaring of chipped M.S. job

(EX-3) Filing on square of rectangular M.S. Plate

5. PLUMBING SHOP WORK:

(EX-1) Cutting and threading practice for using socket, elbow and tee etc and to fit it on wooden practice board.

6. SMITHY SHOP WORK:

(EX-1) To prepare square angular piece by M.S. rod

(EX-2) To Braze M.S. flat/Tipped tool on M.S. shank

(EX-3) To make a screw driver with metallic handle

7. WELDING SHOP WORK:

(EX-1) Welding practice gas & electric

(EX-2) Welding for lap joint after preparing the edge

(EX-3) Welding Butt joint after preparing the edge

Suggested Reading:

Workshop Technology, Vol. I: Hazra & Chaudhry

(4.VP.02) IT Tools Lab.

- Spreadsheets, Word, Presentation
- Multimedia Design
- Troubleshooting
- Project / Practical File
- Viva Voce

Level 4 (Semester II)**(4.GV.04) General Foundation Course – II****A. Business Management and Entrepreneurship**

Management of Business, Elementary treatment/exposure to basic conceptual frame work of the topic listed below:

(a) Basic Function (b) Marketing Management (c) Financial Management (d) Production Management (e) Personnel Management

B. Computational Skills

1. (a) Solution of linear equations and their application to problem of commercial mathematics.

(b) System of linear equations and in equation in two variables. Applications in formation of simple linear programming problems

2. Statistics: Raw data, bar charts and Histogram; Frequency Tables; Frequency Polygon; Ogive; Mean, Median and Mode of ungrouped and grouped data; Standard Deviation; Introduction to Mortality tables; Price Index etc. Introduction to Computers

C. Environmental Education & Rural Development

Environmental Education:

- a. Modernization of agriculture and environment, irrigation, water logging, use of fertilizers, pesticides, soil erosion, land degradation (desertification and deforestation), silting and drying of water resources.
- b. Rational utilization, conservation and regeneration of environmental resources (soil, air, water, plant, energy, minerals).

2. Rural Development

Principles and goals of rural development, major problems/constraints in rural development in India

(4.GV.05) Manufacturing Technology – II**UNIT 1**

GENERAL PROCESS: Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility viz., Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking, Welding, Soldering, Brazing, Metal cutting processes-turning, Drilling, Boring, Shaping, Grinding, Elementary idea of machines used for the above processes.

WELDING: (a) Weld edge preparation, Introduction to various welding processes with procedure equipment and applications such as (i) Electric arc welding. (ii) Resistance welding. (iii) Thermit welding (iv) Carbon arc gauging. (v) Metal-Inert-Gas welding (MIG) (vi) Tungsten Inert Gas welding (TIG) (vii) Atomic Hydrogen arc welding. (viii) Stud welding. (ix) Laser Beam, Electron Beam welding, Explosion welding (b) Welding Arcs: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes.

UNIT 2

WELDING OF SPECIAL MATERIALS: (a) Welding of plastics, equipment, filler rods, weldability, procedures and precautions. (b) Welding of Grey Cast Iron, shielded metal arc gas welding procedures. (c) Welding of Aluminium, Argon arc and gas welding procedures. (d) Welding of copper, Brass and Bronze, Gas shielded metallic arc welding, TIG, Oxy-acetylene method.

TESTING OF WELDS & RELEVANT WELDING CODES: (a) Destructive methods (b) Non destructive methods-visual, X-ray, Y-ray, Magnetic particles, fluorescent, penetrant and ultrasonic testing.

UNIT 3 & UNIT 4: FOUNDRY PRACTICE

PATTERN & MOULDING: The pattern materials used, Types of pattern allowances and pattern layout, Colour scheme patterns defects, Types of cores and their utility.

Moulding and Pouring: Classification of mould materials according to characteristics, Types of sands and their importance test, parting powders and liquids, Sand mixing preparation, Moulding defects

MELTING AND POURING: Brief idea of refractory material and fluxes, Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces, their construction and operation, metals and alloys. Additions to molten metal, Closing and pouring of the moulds, Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spurring, Basic idea of fettling operations. Surface treatment, Salvaging of castings, Factors determining soundness of casting.

UNIT 5

FOUNDRY PRACTICE: Elementary idea of special casting processes-Shell mould casting, die casing, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanisation of foundries

POWDER METALLURGY: Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing, Self-lubricated bearings. Advantages of the process and its limitations (Elementary concept only)

Suggested Readings:

Workshop Technology, Vol. I: BS Raghuvanshi

Production Technology, Vol. I: Hazra & Chaudhry

(4.GV.06) Material Science & Materials**UNIT 1**

GENERAL: Brief introduction to the subject metallurgy and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry

STRUCTURE OF METALS AND THEIR DEFORMATION:

Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery re-crystallisation and grain growth, solid solutions, alloys and inter metallic compounds, effect of grain size on properties of metals.

PROPERTIES AND USAGE OF: (1) Metals: (a) Ferrous Metals (b) Non Ferrous Metals (2) Non-metallic Materials.

UNIT 2: METALS-FERROUS METALS

(a) Classification of iron and steel. (b) Cast iron types as per I.S. - White, malleable, Grey (c)

Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications (d) Alloy Steel: Effect of alloying various elements, viz Cr, Ni, Co, V, W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel - High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.

UNIT 3: NON-METALIC MATERIALS

(a) Plastic and Other Synthetic Materials: Plastics- Important sources-Natural and Synthetic, Classification, thermo-set and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms of Plastics

(b) Paints, Enamels, Varnishes and Lacquers: Paints and Enamels-types, its purpose, essential ingredients and their role, characteristics of a good paints and enamel, trade names of some important types of products. Varnishes-types purpose of varnish, essential ingredients and their role, characteristics, preparation, trade names storage of varnish, Lacquer- characteristics, preparation and uses

UNIT 4: NON-METALIC MATERIALS

(c) Heat Insulating Materials: Classification of Heat Insulating material, properties and uses of China clay, Cork, Slag wool, Glass Wool, Thermocole, Puff, Properties and uses of asbestos as filler material.

(d) Hardware: General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. Pipes and their uses. General sheets specification (I.S.) and uses, Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fitting

UNIT 5

IDENTIFICATION AND TESTING OF METAL ALLOYS: Selection, specification forms and availability of materials.

HEAT TREATMENT OF METALS: Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. and 'S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening

Suggested Reading:

MATERIAL SCIENCE: RS Khurmi & RS Shedha

(4.GV.07) Motor Vehicle Technology - I

UNIT1: INTRODUCTION & CHASSIS LAYOUT

General study of the motor vehicle with functions of its main components and assemblies (engine excluded), Development of a Tractor and its basic function and H.P. requirements, Conventional layout of chassis Front wheel drive, four wheel drive, rear engine vehicle, their advantages and disadvantages, Layout of Maruti car chassis and tractor chassis, Definitions of items-wheel track, wheel base, front and rear overhang, kerb weight, ground clearance.

UNIT2: CLUTCH SYSTEM

Layout of conventional transmission system, Maruti car transmission system, Tractor transmission system, clutch - necessity, functions, requirements, types, Constructional details and working of single plate, multiple plate, diaphragm clutches, fluid coupling, Centrifugal and semi-centrifugal clutch, Tractor clutch, Clutch pedal free play. Torque

transmitted by clutch. Simple numerical problems. Clutch defects, probable causes, remedies.

UNIT3: GEAR BOX

Function and necessity, Construction and working details of sliding mesh, constant mesh, synchromesh gear boxes; epicyclic gear box - its applications and advantages. Over drive, Torque convertor, Maruti-800 car gear box, tractor gear box and P.T.O. shaft, 4 wheel drive auxiliary gear box. Gear ratio

UNIT4: FINAL DRIVE

Torque tube drive, Hotchkiss drive, Universal joints, constant velocity joints, slip joints, Propeller shaft. Differential, slip differential, double reduction differential, final drive ratio. Tractor final drive construction and working, Rear axles-Fully floating, semi-floating, three quarter floating, Tractor axles

UNIT5: WHEELS AND TYRES

Road-wheels - Rim types and sizes, Tyres-conventional, radial, Tubeless tyre its advantages, Tyre sizes, wheels-front and rear, Tyre retreading, Tyre wear, wheel balancing, Tyre pressure, Advantages of filling nitrogen in tyres.

(4.VP.03) Material Science Lab.

1. (a) Study of various crystals structures through models BCC, FCC, HCP, tetrahedral and octahedral voids.
(b) Material identification of, say, 50 common items kept in a box.
2. Specimen preparation for metallographic examination /micro structural examination-cutting, grinding, polishing, etching.
3. Comparative study of microstructures of different given specimens (mild steel, gray C.I., brass, copper etc.)
4. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
5. Study of Microstructure and hardness of steel at different rates of cooling, Microstructure examination of white cast iron.

(4.VP.04) Mechanical Workshop Practice - II

1. Welding Shop Work

- Exp-1: Welding practice-gas and electric
- Exp-2: Welding for lap joint after preparing the edge
- Exp-3: Welding for Butt joint after preparation of the edge
- Exp-4: 'T' joint welding after preparation of edge.

2. Carpentry

(i) Bridle joint (ii) Dovetail joint (iii) Utility article like picture frame, larger peg, Name plate etc.

3. Fitting

(i) Drill a hole in MS Block & tapping the same (ii) Making a Bolt & Nut by Tap & Die set. (iii) Utility article-screw driver, Paper weight.

4. Smithy

(i) To make square or hexagonal head bolt (ii) To make ring with hook (iii) Utility article-to prepare a fan hook.

5. Tin Smithy, Soldering, Brazing

(i) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge. (ii) Utility article-waste paper basket or paper tray (iii) Study & sketch stakes/ anvils.

Suggested Reading:

Elements of Workshop Technology Vol. I: BS Raghuwanshi