

SYLLABUS

B.VOC. (AUTOMOTIVE MANUFACTURING AND ASSEMBLY



Uttarakhand Residential University

Almora

DURATION 3 YEARS

OBJECTIVE:

To provide demand driven certificate courses to school pass outs and industrial workers.

The course will focus on technical, behavioral and employable skills so that the local youth and the industry is benefited.

INTRODUCTION:

Mainly the course will focus on development of:

- Attitude Behavior and communication skills
- Specialised skills in Manufacturing processes and
- Practical skills (on the job training)

COURSE STRUCTURE:

Total Duration: 3 year

The course curriculum for the first two and half years shall comprise of 15 modules. The student will study these modules along with his Industrial training. The student will appear for written exam conducted by the university at the end of each Year. After successful completion of theory and practical training The student will undergo a six month Project based Specialization in the industry as per his/her choice.

Detailed course structure hours and credits for each module is given below:

Module wise Study Hours and Credit details

Module	Course Content	Theoretic al Hours	General Education Credits	Practical Hours	Skill Component Credits
Semester 1					
Module-1	Workshop Safety, Behavioral Training and Technical English	30	2	30	2
Module-2	Computer Awareness, Workshop calculation and Engineering drawing	30	2	60	4
Module-3	General Engineering	45	3	120	8
Module-4	Manufacturing Process, Quality Control and Inspection	45	3	120	8
Total		150	10	330	22

Student has option to exit the program after first semester with a certificate of Technical excellence in manufacturing

Module	Course Content	Theoretical Hours	General Education Credits	Practical Hours	Skill Component Credits
Semester 2					
Module-5	Behavioral & Communication Skills	45	3	0	0
Module-6	Computer Fundamentals & Awareness	45	3	120	4
Module-7	Measuring Instruments	45	3	120	4
Semester 3			0		
Module-8	Workshop Calculation & Science	60	4	0	0
Module-9	Fitting, Sheet metal & General Engineering	45	3	120	4
Module-10	Industry specific Manufacturing process	30	2	360	12
Semester 4					
Module-11	Engineering Drawing	45	3	0	
Module-12	Electrical & Electronics	45	3	120	4
Module-13	Basic Engineering 1	45	3	120	4
Semester 5			0		0
Module-14	Basic Engineering 2	45	3	120	4
Module-15	Industry Specific manufacturing process	30	2	360	12
Semester 6					
* Industry Specific project work (Six Month)		30	2	360	12
*After completion of Two and half years Student will take up project work in the industry					
TOTAL		765	51	2340	96

Module 1

UNIT: I (WORKSHOP SAFETY)

1. Familiarization with the institute, importance of the course.
2. Occupational health and safety.
3. Accidents- Definition types and causes.
4. First-Aid, nature and causes of injury and utilization of first-aid.
5. Safety: - its importance, classification, personal, general, workshop and machine safety.
6. General safety precaution observed in the institute and section, safety rules for bench work.
7. Safety signs and norms.
8. Fires: - types, causes, use of fire extinguisher, how to use.
9. Use of personal protective Equipments (PPE), standardization.

UNIT: II (BEHAVIORAL TRAINING)

1. Psychology: definition of psychology, definition of education, training, knowledge, skill, attitude, aptitude, teaching and learning.
2. Personal hygiene: definition, methods of maintaining cleanliness, conditions of maintaining disinfected/germ free health
3. Motivation:- definition, kinds of motivation, elements of motivation, use of motivation, techniques, sources of motivation, methods of motivation, maintaining learners interest, causes of loss of interest.
4. Communication:- Elements of communication, procedure step in communication, media, classification, 5W's and 1H in communication 7C's in communication, credibility gap, listening, tips for improving communication skills, barriers in communication

UNIT: III (TECHNICAL ENGLISH)

Group: A (Glossary)

1. Introduction: Difference between general English and technical English
2. Application of technical English at work
3. Glossary of technical terms used in the industry.

Group: B (Basic grammar)

1. Articles (a, an, the)
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2. Editing (Correcting of passages with changing of words like – articles, preposition, verbs, tenses etc.)
3. Omission (Correcting of passages with putting new and right words)
4. Syntax (Agreement between subject and verb)
5. Use of preposition (fill in the blanks)
6. Tense (knowledge of all kind of tenses-Present past future)

Group: C (writing skill)

Report writing (making a report of a topic)

Letter writing (writing official and formal letters)

Group: D (Reading section) 1. Read technical texts and give answers.

Module 2

UNIT: I (BASIC COMPUTER AWARENESS)

PART: I (Theory)

1. Introduction to Computer Fundamentals and Its Parts, Familiarizing With Disk Drives, Booting Of a Computer System,
2. Using The Mouse, Right Click, Left Click And Use Of Operating Systems Like Windows XP, Linux , Menu System, Tool Bars, File Structures, Directories, Moving And Copying A File From Floppy To Hard Disk, Hard Disk To Floppy Disk, Creating Directories, Formatting of Floppy Disk.
3. Use of desktop , control panel settings, Explorer, regional settings, creating shortcuts, Use of Simple applications like Paint, Notepad.
4. Creating sample documents using MS WORD. Text wrapping, Text Formatting, Changing Letters to different case, drawing table, Mail Merging, Page formatting, using different Font Types, Printing a document
- 5.Using Excel as spread Sheet, Familiarizing with Cells, Formulae, Text , Numbers, and date, Using shortcuts for entering date and Numbers in Progressive cells, Copying Formulae, Text and Numbers, Using borders, Merging Cells, Unmerging, Changing Cell width, Row height, Printing an area of the sheet, Options of Printing like fit to paper, shrinking, etc , Using different Sheets in a work book, changing Colour of cells, fonts, text .
- 6.Study of Internet Explorer, Modem, Settings in the IE and Modem, Dial Up and Broadband connections, Outlook Express, Viewing Email from the web site and Outlook Express, Creating email Accounts, using search engines, Video conferencing, MS Chat.

PART: II (PRACTICAL/ON JOB TRAINING)

1. Booting The Computer , Opening Windows Menus, using the mouse, refresh computer desktop using right click of the mouse, create a directory in xp and Linux, format a floppy, create a file using notepad, save the file in Floppy, copy the file into hard disk, copy a file from hard disk to floppy, create a directory in floppy, create a directory in hard disk, use my documents, use start menu for opening an application, to open a document recently written, change control panel settings for display, change the volume name of the hard disks using system properties., Familiarize with Keyboard and Keys.
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2. Techniques of Changing desktop wall paper, changing Desktop Screen properties, Control Panel, User Accounts, customizing icons, writing a sample text using Notepad, Using Paint for drawing figures to get accustomed with mouse, saving a file. Using Windows Explorer, Install a software, Remove a Software, Add new hardware to the system (like a Printer, Change the system date and Time, changing the Regional Settings of the system like country, Currency , Date Format , Using Start Menu, Creating Desktop Short Cuts

3. Open internet explorer, change the settings in IE, customize Internet Explorer for default applications, enable cookies, change the security settings, setup an internet connection, user ID and password saving in the computer for future usage, setup outlook express for an e-mail account, setup server authentication settings, receive and send emails from the account. Search using Yahoo and Google for certain topics, download a file from the internet, save the downloaded file. Set up the net meeting using MSN or Yahoo Messenger.

4. Open MS WORD, Create a new file, Save a file, open an existing file, Save as a text file, type a paragraph , Set for left and right margins, change the letters from upper to lower case, vice versa, cut a paragraph, copy a paragraph, setup tab positions, set hanging indents, draw a simple table, insert rows, insert columns, erase rows, erase columns, search the document for spelling corrections, print the letter in a printer attached, in portrait and landscape.

5. Open Excel, and workout the following to understand the theory commands:

Prepare a salary bill for ABC organization with Column A for names, column B for Basic Salary, Column C for DA, and Column D for addition of B & C to get the full salary. Add the Column D into a new cell as TOTAL amount.

Copy the sheet into sheet 2. Sort the sheet1 as per names. Sort the sheet2 as per Total salary. Insert two rows in sheet1. Merge these rows. Enter heading as Salary Bill. Use border and shading for the entire used column.

Print the sheet using set print area with margins, and use scale factor for reduction and enlargement. Use portrait and Landscape.

UNIT: II(WORKSHOP CALCULATION AND SCIENCE)

1. Units & Measurements – Systems of units, Fundamentals and derived units Conversion of units and applied problems. FPS, CGS, MKS and SI units

2. Fraction & decimals – Addition, Subtraction, multiplication and division simple problems

3. Algebra: addition multiplication subtraction division, simplification problems, simultaneous equation. Square & Square roots

4. Plotting and reading of simple graph.

5. Logarithm: Multiplication division, Simplification of fraction and decimals

6. Ratio and Percentage – Direct – Indirect and mixed proportions Calculate the Percentage of Metal removal by machining and metal added by welding
Estimation and cost finished products

7. Trigonometry: trigonometrically ratios and simple formulae, calculate the area of triangle by using trigonometry and application of Pythagoras theorem, calculate height and distance by using trigonometry.

8. Mensuration – area of circle, triangle and polygons Surface area, Volume of cube and Sphere Surface area and volume of Cone and prism surface area and volume of cylinder and hollow cylinder

9. Mass weight, volume and Density and their units. Problems on density and volume of Steel, Aluminum and copper

10. Friction and kind of friction, advantages disadvantages simple problems

11. Definition – Force, Pressure, and their units, problems

12. Heat, Temperature and conversion of scales Fahrenheit, Centigrade & Kelvin. Thermometer, Thermocouple and Pyrometer and its application Transmission of heat and co-efficient of Thermal expansion of solid and related problems.

13. Definition- Stress, Strain and Modulus of Elasticity simple problems

14. Simple machines – Mechanical advantage, velocity ratio and efficiency Simple problems on simple machines

15. Classification of ferrous and non-ferrous metal and alloys. Physical and mechanical properties of metal

16. Meaning of H.P., I.H.P., B.H.P., and F.H.P. Efficiency and problems on Horse power

UNIT: III (ENGINEERING DRAWING)

Introduction to Engineering Drawing and its importance. Different types of standards used in engineering drawing.

Drawing instruments and their uses-Drawing board, 'T' square, set squares, protractor, Drawing sheets, Drawing Pencils – Grade and selection, eraser.

Practice : Layout of drawing sheet

Types of lines – Thickness, shade of lines and its General applications. Practice : Draw type of lines as per IS-70714 – 1983

Draw figures involving horizontal, vertical and inclined lines

Type of Angle, Triangles and their types.

Practical : Construct Scalene triangles, right angle triangles, Isosceles triangles and equilateral triangles

Lettering styles- Single stroke letters, Gothic letters as per IS standard. Lettering practice

Dimensioning- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement and indication of dimensions.

Practice : Place dimensions in the drawing by aligned system and unidirectional system, Give dimension to the given drawing by following dimensioning principles as per BIS

Method of dimension common features

Geometrical construction using drawing instruments-Lines, Angles, patterns, Circle, Arc, Tangents, Triangles, Quadrilaterals, Regular Polygons. Different type of Tapers, Related Exercise on this topic.

Free hand sketching of straight lines, rectangular, circles, squares, Polygons, ellipse. Prepare proportionate free hand sketches of plane figures. Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand

Orthographic projection I and III angle – Simple machine elements, Procedure for preparing a scale drawing.

Drawing Isometric views out of orthographic views- Simple Machine Elements

Practice : Construct an isometric scales to a given length

Practice : Draw the isometric projection of cube, hexagonal prism, cylinder and cone

Practice : Draw the isometric view of the objects/blocks with curved surfaces

Missing lines and views.

Practice : Visualize the shape of the object from the given two views and add the third views – simple machine elements

Practice: Identify the lines missed in multi views and supply them. Identify at least five shapes satisfying a given view.

Identify the third view for the given two views of similar in shapes and size.

Development of regular objects bounded by plane surfaces-cube, prisms, cylinder and cones.

Practice: Draw the development of surfaces of a cube, prisms, cylinder and cones.

Explanations of full – sectional view, half-sectional view, aligned sections. Practice of Draw full and half sectional view of simple machine elements

Conventions and symbols used in drawing, Abbreviations used in engineering drawing, surface finish symbols, Welding symbols and Annotations.

Practice: Draw surface finish symbols, Welding symbols and Annotations.

Classification of engineering Drawings, Difference between Assembly drawing and Working drawing.

Blue print reading of various Engineering drawing and Machine drawing.

Practice: Blue print reading of Engineering Drawings and Machine drawing.

Introduction to free hand sketching of machine parts. Tracing and printing of drawing. Introduction to Auto CAD, 3D modeling concept.

Practice : Draw the elevation, plan and the side view of bench vice and lathe tail stock

Module 3

(GENERAL ENGINEERING 1)

PART: I (Theory)

UNIT: I (ENGINEERING MATERIALS):

1.Introduction to materials:- Material science, classes of engineering materials, selection of materials, level of structure

2.Iron:- pig iron, constituent elements of pig iron, cast iron- types of cast iron, wrought iron, steel and its types, uses, Alloy steel- effect of alloying elements, types of alloy steel and uses

3.Non-ferrous metal and alloys:- types and uses

4.Semiconductor:- Definition types uses merits and demerits

5. Plastics: - Classification- thermosetting plastics and thermoplastic plastic- uses, laminating plastic, reinforced plastics, bonding plastics, deformation of plastics.

UNIT: II (FITTING, MEASURING INSTRUMENT AND GAUGES):-

1. Introduction to Metrology, Objectives of Metrology – measurements – principles –methods of measurement. – Terminology used in Metrology – Accuracy – Repeatability – Resolution etc. – SI units of measurements – physical quantities under SI system

2.Selection of measuring instruments, care, use and maintenance of measuring instruments – Handling of precision instruments – Vernier Caliper, Micrometer, Height Gauge, Dial Gauge (Plunger and bevel type) with stand (0.01 mm Resolution), checking squareness using combination set. Vernier Bevel Protector-reading and use. Use of thread gauge & screw thread micrometer. Gauges – its types, uses, specifications.

3. Introduction to hand tools and their safety. – Environmental Factors and Personal Safety

4.Marking and punching tools and their uses – Hacksaw – types, specification and their uses

5. Classification and specification of files, shapes, sizes & grades. Selection criteria of files
Bench vice – constructional details

6. Drilling machine – Types – Drilling operation – Drill bits.
Reamers – types, care and maintenance

7.Taps and Dies – Description, care and maintenance – Selection of Spindle RPM for drilling – Lubrication for tapping – Determination of drill size for tapping

8. Tool holding and work holding devices – Types of Fasteners – Standard size of threads, types – Applications of adhesives, Metal, Shellac etc.

9.Limits and fits according to IS: 919

UNIT: III (WELDING):

1.Safety in welding work – Types of welding processes and application – Nomenclature of welding joints & Edge preparation – Terms applied to welding – Welding symbols – Description and uses – Distortion and its control – Different process of metal joints – Bolting – Riveting – Soldering – Brazing, & Welding – Simple Electrical terms – uses of Electricity and applied to

welding

2. Gas welding hand tools – uses – Oxy-acetylene welding – Principles and applications. - Common gases used for welding – Types of Oxy-acetylene flames – their uses - Flame Temperature – chemistry and structure of oxy-acetylene flame – Oxygen cylinder, DA Cylinder description – Regulator – Types – Construction – Care & maintenance of blow pipes and cutting torches. – Filler rods used in Gas welding – Welding flux – Faults in gas welding – Causes – Corrections

3.Principles of Arc welding, tools & accessories

4.Types of welding machine AC/DC and applications – Care & maintenance of welding machine

5. Welding position – Flat, Horizontal, Vertical and O.H.

6.Electrodes – Types, Functions of flux loading – Criteria for choice of electrodes

7. Welding defects, Causes and remedy.

UNIT: IV (MACHINE TOOLS):-

1. Transmission of motion and power: - Introduction, methods of drive, power transmission elements- description and place of uses.

2. Centre Lathe, Capstan and Turret lathe: - function and principle, types, parts and specification, operation performed in lathe machine, cutting speed, feed, depth of cut and machining time, tools used in lathe.

3. Milling: - function and principle, types, parts and specification, operation performed in milling machine, cutting speed, feed, depth of cut and machining time, cutters used in milling machine. Direct and Simple indexing.

4. Shaper-Slotter-Planner: - function and principle, types, parts and specification, operation performed, cutting speed, feed, depth of cut and machining time, tools used.

5. Grinding: - function and principle, types, parts and specification, operation performed, different types of grinding wheels used, grinding wheel specification. cutting speed, feed, depth of cut and machining time

6.Jig and Fixture:- Introduction, principle of jig and fixture design, location, loading and unloading, clamping, clearance in a jig and fixture, types, difference between jig and fixture.

7.Numerical control of machine tools: - Introduction, NC and its components, position and motion control, open and closed loop, machine axes, classification of NC system, part programming, NC/CNC/DNC system, NC machines.

8. Non-traditional machining: - Introduction, classification, principle of AJM, USM, CHM, ECM, EDM, LBM, EBM, PAM, IBM.

9. CAD, CAM and CIM: - Introduction, computer system, computer aided design, input and output device of CAD-work, geometric modeling, Computer added manufacturing, Computer integrated manufacturing.

(GENERAL ENGINEERING 2)

PART: I (Theory)

1. Importance of safety, description, specification, general care and maintenance of common hand tools.

2. Wires and cables- conductors Insulators & semiconductors their shapes, sizes with respect to low, medium & high voltage.

3.Soldering printed circuit boards & its uses- different fluxes for different purposes on metal- crimping equipment- joining of conductors by soldering

4. Importance or preventive maintenance & routine tests.

5. Earthing & its importance.

6.Resistance , voltage, current 7 open circuits & short circuits, Ohm's Law, voltage drop, series & parallel circuits, power & energy relations, Electrical measuring instruments, millimeters

7. Common electrical accessories used in industries, Bus-bars, Relays, Contactors, Circuit breakers etc.

8. Fuses & its Rating- materials used.

9.Induction principles, Electro magnetism- Faraday's Law

10. Single phase & Poly phase system, three phase star delta connection Impedance and power factor

11. Principle and application of DC motors, series shunt and compound motor, AC motors

12. Transformers and its application

13. Chemical effect of electric current rechargeable batteries care and maintenance of cells

14. AC motors starting with DOL starter and star delta starter

15. Static electricity capacitors and its applications

16. Fundamentals of electron theory semiconductor devices symbols specifications diodes transistors uni-junction transistors field effect transistors silicon controlled rectifier and ICs half wave full wave and bridge rectifier with filters, DC power supply

Module 4

UNIT: - I (MANUFACTURING PROCESS)

1. Metal casting and pattern making: - introduction – the casting process – pattern and mould, melting and pouring, solidification and cooling, removal and finishing – metal casting processes- sand casting, investment casting, permanent mould casting

2. Metal finishing processes: - Introduction, lapping, honing, super finishing, polishing, buffing, powder brushing, electroplating, hot dipping, galvanizing, metal spraying.

3. Boring, broaching and sawing machines

4. Gear Manufacturing

5. Recent development of manufacturing: - Introduction, manual manufacturing & mechanization, hard automation, soft automation- NC/CNC/DNC, industrial robots, FMC/FMS, CAD/CAM, rapid prototyping, integrated manufacturing

UNIT: - II (INTRODUCTION TO MANUFACTURING PROCESS)

1. Metal forming:- Introduction, cold and hot working, primary metal forming processes – rolling, forging, extrusion, drawing, deep drawing, punching and blanking

2. Processing of plastic: - introduction, forming and shaping of plastics – Extrusion, injection molding, blow molding, thermoforming, compression molding, transfer molding, and casting
3. Powder Metallurgy Processing: - Introduction and characteristics of P/M processing, Production of powder, mixing and blending, compaction, sintering.
4. Foundry Tools & Equipments
5. Heat treatment of metals: - Phase diagram (iron-carbon), TTT-diagram for carbon steel, heat treatment processes

UNIT: - III (WORKSHOP PROCESS)

1. Manufacturing Processes: - What is a manufacturing- manufacturing material – types of manufacturing processes, selection of manufacturing processes.
2. Fundamental of machine tools:- Introduction, Basic machine tools- primary drive , secondary drive, selection of speeds and feeds, guide ways, structure, control system
3. Metal Cutting and Cutting Tools: - Introduction types of cutting tools, orthogonal and oblique cutting, types of chips, chip breakers, cutting tool nomenclature, machinability, cutting tool materials, cutting fluids

BLOCK: II (QUALITY CONTROL)

(Theory)

1. Awareness of ISO: 9001 & TS 16949.
 2. Process inspection.
 3. Deviation handling.
 4. Awareness of quality tools.
 5. Statistical quality control.
 6. Sampling inspection.
 7. Definition of ISO 9000:2000
 8. Common metrology terms
 9. Standardization of product and meaning.
 10. Factors influencing measurement, sources of error, types of error, need for higher accuracy, rules of measuring.
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Module 5

Behavioral & Communication Skills

Syllabus:

: BUSINESS COMMUNICATION & BEHAVIOURAL SCIENCE

1) COMMUNICATION:

Art of listening, Art of English speaking

Barrier to communication & methods to overcome, Meaning of Communication – Definition
Need importance

Types of communication – Verbal, written non-verbal, Channel of communication – Formal, informal

Non-Verbal communication / written communication advantages and disadvantages/letter writing/enquiries/replies/quotations/notice/Circular/Order/Reporting/Insurance Format/Bank Correspondence, Essential of effective correspondence, Verbal Communication /Oral Communication, Telephone Handling

2) GENERAL AWARENESS:

Brief introduction to following acts

Factory Act & Apprentice Act 1961, ESI Act, Payment wages Act 1936,

Employee's Provident fund and payment of Gratuity Act 1952

3) OCCUPATIONAL HAZARDS & SAFETY MEASURE

Causes of Accident & Safest Management and accident prevention

Medical first – Aid

4) PERSONAL HYGIENE:

Introduction and methods of maintaining personal hygiene

5) MOTIVATION AND TEAM BUILDING

Elements, techniques and sources of motivation, Importance of Team and how to perform effectively in team.

6) ENVIRONMENTAL AWARENESS AND ENERGY CONSERVATION

Importance of Energy conservation in Industries including Industrial lighting

Types of pollution and its source, effects of pollution on environment and on humanity, plant, animal, machine, health and thus on energy conversation

Introduction of work culture

7) Concept of Total Quality Management (TQM) 5'S and KAIZEN and other Japanese work culture

8) Concept of Just-In-Time (JIT)

Module 6

COMPUTER FUNDAMENTALS AND AWARENESS

Syllabus:

Practical	Theory
Verification of Logic levels, Verification of truth table of AND, OR INVERT gate.	Safety precautions and elementary First aid Introduction of Analog, Digital and Binary signals, Logic levels & pulse wave form ,Basic logic functions, Basic logic gates (AND,OR & Invert) Number system: Decimal, Binary, Octal, Hexa decimal system and their arithmetic.
Identification of System unit and I/O devices, Identify connectors, Identify components on desk top identify drives and capacity, Create folder and files, Drawing pictures using paint, using menus of paint.	Basic blocks of a computer, Hardware and software, I/O devices, HDD,FDD,different types of printers and their advantages, function and inter- connection, Booting concept, Windows O.S., various types of files , folder concept, various ports in the compute, saving ,copying, deleting & retrieving files , mouse operation , POST
Use start menu, check available programs in computer, use search, settings, run and options. Creation of short cuts, changing screen savors.	MS windows: Starting windows and its operation, file management using explorer, Display & sound properties, screen savers ,font management ,installation of program ,setting and using of control panel., application of accessories ,various IT tools and applications, Components of desk top
Editing the text, saving the text, changing the font and size of text. Creation of brochures. Use of mail merge and taking the printouts.	Concept of word processing,,: MS word – Menu bar, standard tool bar, page setting, editing, formatting ,advance features i.e. highlighting ,cut & paste, subscript & super subscript ,drawing features, mail merging , tables and borders, printing of document etc. Introduction to power point
Use of search engines, Creation of	Concept of Internet, Browsers, Web sites, search

email accounts, sending and receiving the mails configuration of email clients.	engines, email, chatting and messenger service. Downloading the files etc.
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Module 7

Measuring Instruments

Practical	Theory
<p>Safety precautions and elementary First aid</p> <p>Calculate span, range for various measurement systems in 0% to 100%</p> <p>Calculate the accuracy and error in percentage and engineering units of various process measuring instruments</p> <p>Introduction to measurement basics: Accuracy, precision, errors and its types, calibrations etc.,</p>	<p>Elements of the measurement system</p> <p>Metrology – basic concepts</p> <p>Measurement terminology – measurement, true value, standard, error, accuracy, precision, repeatability, resolution, range, span, offset, calibration</p>
<p>Calculate and list the derived units from fundamental units and its dimension</p> <p>Calculate conversion of unit from English to SI.</p> <p>Discuss and List the prefix values and its symbols and equivalent of decimal multiples and submultiples</p>	<p>Units, Standards & Errors</p> <p>Units of measurement and realization of Mass, Length, Time</p> <p>Electric Current, Thermodynamic temperature, Amount of Substance, luminous intensity.</p> <p>Unit derivations from basic units</p> <p>Introduction standards – History, SI prefixes</p> <p>Errors – study of various classification</p>
<p>Faradays law of Electromagnetic induction, Flemings rule, Introduction to various types of instrument</p>	<p>Verification of Faraday's law of electromagnetic induction.</p> <p>Demonstration of Fleming's finger rules</p>
<p>Introduction to measurement basics: least count, Accuracy, precision, errors and its types, calibrations etc.</p> <p>Measure given jobs with Vernier caliper micrometer and Height Gauge.</p>	<p>Principles of measurement, Basics of Vernier caliper micrometer and Height Gauge. Understanding of parallax.</p>
<p>Different types of Galvanometers, Principle & operation of Voltmeter, Ammeter, Errors in Ammeters & Voltmeters, Sensitivity, and their loading effect, Conversion of Galvanometer into voltmeter, extension of ranges, Advantages & disadvantages of Moving coil & moving iron instruments Wattmeter, Energy meters</p>	<p>Study of Galvanometer</p> <p>Study of Voltmeter & Ammeter</p> <p>Study of Watt meter</p> <p>Study of 1-phase Energy meter</p>
<p>Different types of electronic voltmeters, Conventional Multimeter,</p>	<p>Study of Multi meter and measure the various parameter of a given circuit</p>
<p>Set up the circuit on Wheatstone Bridge, Resistance ratio, Maxwell Bridge and Schering Bridge and measure the various parameter</p>	<p>Bridge type of instruments: Wheatstone bridge, resistance Ration Bridge, Maxwell Bridge, Schering Bridge, LCR meter,</p>

Module 8

WORKSHOP CALCULATION & SCIENCE

Syllabus:

Basic algebra - algebraic formula – quadratic equations

Trigonometry – Trigonometric functions – calculation of areas

Graphs

Menstruation – Find the area and volume of different objects

Metals

Density and relative density

Work Power and Energy

Stress and strain, modulus of elasticity

Force, bending, twisting and shearing forces and applied problems.

Equilibriums of forces and composition of forces.

Pressure, atmospheric pressure and absolute pressure, problems related with pressure.

Heat and specific heat of solids, liquids and gases, heat gained and heat loss.

Current, Voltage and resistance

Series circuit, parallel circuit

Solve the series parallel and network circuits using Kirchhoff's law

Problems related to the DC generator – induced emf, voltage drop, efficiency etc.

Series and parallel circuits of capacitors, charge and voltage

Problems on series ac circuits, Impedance, power and power factor

Calculations on phase voltage, phase current, line voltage, line current in star and delta systems. Find the power and power factor.

Problems related to Zener regulator, Series regulator and series parallel regulator circuits.

Find the frequency of oscillation in various oscillator circuits.

Module 8

FITTING SHEET METAL & GENERAL AWARENESS

Syllabus:

Practical	Theory
Safety precaution and elementary First aid Familiarise with the tools ,Filing practice on Marking ,Hack Sawing, filing to size. Drilling practice, fitting exercises on various shapes, Tapping and Chipping Practice on cutting, planing and making different joints	Fitting and Wood work : Safety precautions and elementary First aid ,Introduction of Fitting Trade,familiarise with various Hand tools used in fitter workshop and their general uses. Methods of measuring and marking. Description of files, hammers , chisels, Hacksaw frames, blades -their specifications and uses. Different Metals and alloys- their characteristics and uses , Types of cutting tools Drills, Taps and Reamers, Limit fits and tolerances description and working of machines , use of Vernier calipers , Micrometer , height gauge etc., use of tap & dies, various types

	<p>of threads and their specific applications, different types of nuts & bolts</p> <p>Common hand tools used in carpentry workshop, marking, cutting and planing. Types of woods & their uses, Types of joints,</p>
<p>Practice on shearing, bending and making Various joints.</p> <p>Making rectangular boxes. Riveting exercises.</p> <p>.Selection of wires and cables.</p> <p>Simple wiring practice,</p> <p>Exercises on wire joints and crimping</p> <p>Simple exercise on Tinning, soldering etc</p>	<p>Sheet Metal, Wiring & Soldering: Familiarise with different hand tools used in sheet metal workshop, various types of joints used in sheet metal, Rivet and its types and uses. Making of rectangular box</p> <p>Wires and cables : specification , selection & used in electrical wiring ,connectors, lugs, various types of wire joints, crimping ,protective devices and their uses,SWG</p> <p>Soldering: various composition of solder wires, fluxes and their uses.</p> <p>Characteristics ,properties and uses of : Bakelite, PVC, Porcelain etc</p>

Module 10

INDUSTRY SPECIFIC MANUFACTURING PROCESS

This module will cover mostly practical training in the industry allotted to the student. The evaluation will be focused on the level of competency achieved by the student in the areas he has been trained.

Module 11

ENGINEERING DRAWING

Syllabus:

Engineering drawing and its importance
Types of lines and their applications.

Free hand sketching of tools
 Lettering practice.
 Dimensioning, their methods and specific uses.
 Types of projections
 Simple orthographic projections in 1st angle method.
 3rd angle projections of various objects and exercises with dimension
 Isometric views of objects.
 Draw the symbols for various electrical measuring instruments, switches, fuses, protective and controlling devices in electrical circuits.
 Draw the symbols of various electronic components.
 Draw the circuit diagram of various types of rectifiers, amplifiers, oscillators, power supplies, Multivibrators and Inverters.
 SCR motor speed control circuits.
 Draw the circuits of shift registers, Counters, Digital clock, Multiplexer,
 Interfacing circuits with the peripheral devices
 Detailed block diagram of Computer

Module 12

ELECTRICAL AND ELECTRONICS

Syllabus:

Practical	Theory
Identification of various Hand tools used Identification of different types of cables, workshop safety practice.	Safety precautions and elementary First aid , Identification , uses and maintenance of hand tools, DC & AC current, terms and definitions used in circuits , frequency, waveform
Measure the power , voltage and current in different circuits. Construct & verify Ohm's law. Construct and verify Kirchhoff's voltage law Tracing the magnetic field of Bar magnet using compass.	Measurement of AC & DC using Ammeter / Voltmeter , AC power, power factor, ,work, power & Energy - their units and measurements , Identification of AC / DC meters , Kirchhoff's law, Ohms law, electric power and dissipation in resistance, IR voltage drops Define magnetism, unit of measurement, types of magnetic properties, Magnet and its classification, materials used & its application, mutual & self inductance, unit of measurement, BH curve.
Identification of different resistors i.e. carbon, wire-wound, variable, pot., preset, Rheostat etc. Color-coding of resistors ,Construct a	Passive Components: Resistor -definition, types of resistors, their construction & specific use, color-coding, power rating, Series /parallel combination of resistances and measurement of

<p>series & parallel resistor circuits</p> <p>Identification of capacitor and their codes, construct the series /parallel circuit of capacitor</p> <p>Identification of inductor, construct the series /parallel circuit of inductor.</p> <p>Identification of capacitor and their codes, construct the series /parallel circuit of capacitor</p> <p>Construct an electromagnet and test it.</p> <p>Testing and construction of different types relays.</p> <p>Identification and testing of different types of transformers, measure the O/P voltage.</p>	<p>current in branches , Capacitance –define, construction ,types of capacitors, color coding charge/energy stored in capacitor, capacitive reactance , series /parallel combination of capacitors</p> <p>Inductors-define, types & their application, series and parallel combination, Q factor,</p> <p>Current carrying conductor, Fleming's rule</p> <p>Electromagnets –define, Solenoids & relays define ,construction & its application</p> <p>Working principle, construction of Transformers & their types, various losses of transformers.</p> <p>RC,RL, RLC Circuits, Series and parallel resonance</p>
<p>Identification of anode, cathodes of different types of diodes.</p> <p>Study the specifications of a semiconductor diode using a data sheet</p> <p>Construct a forward bias and a reverse bias circuit and plot V-I characteristic of diode</p>	<p>Electrons and protons in an atom, Structure of atom, valance & conduction electron ,Conductors, Insulators, Semiconductors, , charge in motion-current, units, electron flow, motion of +ve charge, Semiconductors, Crystal structure and bonds, Intrinsic & extrinsic semiconductors, N- type, P-type, Free electron & Hole charges, Fixed ion charges, The P-N junction, Barrier potential, Forward & Reverse voltage, Effect of temp., V-I characteristic, Special purpose diodes and symbols,</p>
<p>Construct a half wave rectifier, full wave (center tapped) rectifier and full wave (Bridge) rectifier</p> <p>observe wave forms with/ without using filter</p> <p>Study the specifications of zener diode using data sheet</p> <p>Construct the Zener regulator circuit</p>	<p>Rectifier types i.e. Half-wave, full-wave & bridge rectifiers, measurement of different currents i.e. I_m, I_{dc}, I_{rms}, d.c. out put voltage, efficiency, filter circuits and their types, i.e. capacitor input filter, Choke input filter, etc.,Junction break down, Zener break down, Zener diode, Forward & Reverse bias, Voltage regulation using Zener diode ,Zener regulators,</p>
<p>Series parallel combination of batteries</p> <p>Charging of batteries, maintenance of batteries</p> <p>Calculate the shorted load and matched load current for given cell</p>	<p>Battery: Electrochemical action, define ,symbol, types of cell, construction, principle ,charging ,specific gravity (Amp-hr capacity)</p> <p>specification of battery classification of battery, application, , service</p> <p>Needs, storage, lead acid battery, ideal voltage source, real voltage</p>

	source, shorted load current, matched load current, Current source
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Module 13

Basic Engineering 1

Syllabus

Practical	Theory
Familiarisation with the machinery use equipment and their use - Introduction to safety - Setting up of Arc and Gas apparatus. - Lighting and adjustment of Gas welding flame. - Striking an arc by MMAW	- Introduction to various types of welding process - Basic principal and application - Advantages and limitation - Nomenclature of welded joints - Term applied to welding - Explanation with simple sketches of various types of joints - Welding symbols - Edge preparation & application - Welding positions - Welding Techniques - Right ward & left ward practices.
- Fusion run with/without filler rod on M S sheet. - Square butt joint on M S sheet - Lap, T and Edge joint on M S sheet. - MS to MS brazing - SS to copper soldering	- Gas welding principle and application - Safety in Oxy-acetylene welding and cutting plant (DA & O ₂) - Flame setting and their uses - Specification for filler rods - - Use of gas welding flux - Construction and operation features of different type of regulators - Blow pipes & cutting torches - Gas welding, brazing & soldering procedures
- Straight line beads on M S plate - Weaved bead on M S plate. - Fillet weld open corner joint on M S plate - Fillet weld on Tee joint - Square butt joint on M S plate.	- Principles of Shielded Metal Arc Welding (SMAW) - Basic Electricity of welding power source - Types of power source & Connection features - AC/DC power source advantages and disadvantages. - Arc and its characteristics - Polarity types & Arc length - Electrode – Types, description & Specification– BIS, AWS, etc... - Function of flux & Characteristics of flux - Selection of electrodes and coating factors
- Spot welding of M S sheet	- Resistance welding process – Spot welding

<p>- Spot welding of S S sheet</p>	<p>- Seam welding – projection welding – Butt welding - MIG Welding, TIG Welding - Gas cutting and welding</p>
<p>Measurement of straightness and flatness using spirit level, straight edge and dial Measurement of circularity and roundness s using between centre and dial. Measurement of cylindricity using V Blocks and dial Measurement of angularity using sine bar, slip gauge and dial</p>	<p>Geometric features as per IS 8000-1985 Straightness, flatness, circularity and roundness, cylindricity, profile of any line or surface, parallelism, perpendicularity and squareness. Angularity, position, concentricity and coaxiality, Symmetry Maximum material condition and representation of geometrical features in engineering drawing.</p>
<p>Exercises including drilling, reaming, tapping, counter boring and counter sinking Exercise on slide fitting</p>	<p>Drills – Drill materials drill types and use Helix angle point angle and clearance angle according to depth of hole, material to be drilled drill sizes. System of drill size, standard designation, and, stems of drill size, of symmetry of point angle and lip length on size of holes, influence of symmetry of point angle and lip length on size of the holes, selection of centre drill size according to diameter of work piece, Carbide tipped drills and uses. . Reamers – Types of reamers and uses, reaming allowance, care and maintenance. Taps – Hand taps, machine taps and calculation of tap drill size for 60 degree metric thread. Counter bore, counter sink spot face and boring tools Drilling machines – Types, specifications tool and work holding devices. Drilling machine operations</p>

Module 14

BASIC ENGINEERING 2

Syllabus:

Practical	Theory
Precautions and safety including use of PPE's Practical on Metal cutting a) Milling b) Turning c) Shaping d) Grinding	Machining Process:- 1.Cutting speed / feed Different types of tools Turning – a) Facing b) plain turning c) Knurling d) threads and threading Milling a) Plain milling b) Slotting c) Side facing
Grinding- Surface speed / feed, Different types of wheels, marking wheels, selection of wheels a) Surface grinding b) Cylindrical grinding c) Tools and cutter grinding d) Dressing and balancing of wheel	
Visit to CNC Machining center	CNC machining : Basics of CNC machining Understanding of hardware and software
Precautions and safety including use of PPE's Use of brush and spray gun for painting, Cleaning and maintenance of the equipments and guns.	Introduction to different engineering processes Surface treatment and Painting
Precautions and safety including use of PPE's	Metal forming: Hot and Cold working Basic metal forming processes Heat treatment of metals
Visit to Plastic injection moulding Machine	Injection molding: Basics of plastic injection moulding Various types of raw materials Caution and care to operate the IMs. Types of Injection moulding processes
	Power transmission

Module 15

INDUSTRY SPECIFIC MANUFACTURING PROCESS

This module will cover mostly practical training in the industry allotted to the student. The evaluation will be focused on the level of competency achieved by the student in the areas he has been trained.
