Model Curriculum for

B.Voc/ D.Voc

in

Electronics Manufacturing Services

All India Council for Technical Education
Nelson Mandela Marg, New Delhi

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 Diploma, 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 Electronic Manufacturing Services 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	2 Years	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 Electronics Manufacturing Service 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 he/she is able to understand the different vocational subjects.
(b) The basic concepts in engineering drawing.
(c) The concepts, principles of working of basic electronic devices and circuits.
(d) The knowledge of testing procedure of components and circuits by making use of different test instruments.
(e) The procedure of making P.C.B.
(f) The concepts and principles used in Radio/Audio/Video Systems and Communication devices and its maintenance.

B. Adequate Professional Skills and Competencies in

(a) Testing different electronic components.
(b) Testing the performance of electronic circuits.
(c) Locating the fault at component level and at the stage level.

C. A Healthy and Professional Attitude so that He/She has

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

D. NSQF compliant skills in Qualification developed by sector skill council in Electronic sector

3. Course Structure

The course will consist of combination of practice, theory and hands on skills in the electronics sector.

Curriculum

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

Skill Components:

The focus of skill components shall be to equip students with appropriate knowledge, practice and attitude, to become work ready. The skill 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 adhere 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 each year after classXth students can meet below mentioned level descriptors of NSQF:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 3	Person may carry out 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 work and learning

Level 4	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 context; reasonably good in data collection, organizing information, and logical communication	Responsibility for own work and learning, and full responsibility for others' works and learning
Level 5	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 skills	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
	EMC-101-25	Entrepreneurship Setup and Launch*		2	100
	***The department of Higher Education and Languages, Government of Punjab endeavor to AI-powdered entrepreneurship learning platform on the said course. The Institute /Campus shall appoint an assistant professor as faculty coordinator.**				
		On-Job-Training (OJT)/Qualification Packs			
		Component Preparation Operator (ELE/Q5202)	(Any one)	15	200
		Through Hole Assembly Operator (ELE/Q5101)			
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			
		Manual Soldering Technician (ELE/Q0105)	(Any one)	15	200
		Safety Testing Technician (ELE/Q7403)			
4 Semester I		**Theory**			
	4.GV.01	Engineering Science		3	50
	4.GV.02	Trouble Shooting & Maintenance of Electronics Equipment – I		3	50
	4.GV.03	IT Tools I		3	50
	4.GE.01	Language – II		3	50
		Lab/Practical			
	4.WP.01	Engineering Science – Lab		1.5	50
	4.VP.02	Trouble Shooting & Maintenance of Electronics Equipment's Lab		1.5	50
		On-Job-Training (OJT)/Qualification Packs			
		Sales Executive IT Hardware (ELE/Q4104)	(Any one)	15	200
		Pick & Place Assembly Operator (ELE/Q5102)			
		Mobile Phone Hardware Repair Technician (ELE/Q8104)			

Level	Code	Educational Component		Credit	Marks
4 Semester II		**Theory**			
	4.GV.04	General Foundation Course – II		3	50
	4.GV.05	Digital Electronics		3	50
	4.GV.06	Trouble Shooting & Maintenance of Electronics Equipment's – II		3	50
	4.GV.07	IT Tools – II		3	50
		Lab/Practical			
	4.VP.03	IT Tools – Lab		1.5	50
	4.VP.04	Digital Electronics – Lab		1.5	50
		On-Job-Training (OJT) / Qualification Packs			
		LED Light Repair Technician (ELE/Q9302)	(Any one)	15	200
		Sales Executive – Consumer Electronics (ELE/Q3201)			
		PCB Assembly Operator (ELE/Q7804)			
5 Semester I		**Theory**			
	5.GV.01	Electronic Measurement and Instrumentation – I		3	50
	5.GV.02	Identification of Components, Tools, SOP & Work Instructions – I		3	50
	5.GV.03	Tools, Equipment & Safety Measures – I		3	50
	5.GV.04	Soldering & De-Soldering of Components – I		3	50
		Lab/Practical			
	5.VP.01	Identification of Components, Tools, Equipment and its Working – Lab		1.5	50
	5.VP.02	Electronic Measurement and Instrumentation – I Lab		1.5	50
		On-Job-Training (OJT) / Qualification Packs			
		Embedded Software Engineer (ELE/Q1501)	(Any one)	15	200
		Security System Service Engineer (ELE/Q4610)			
		Systems Analyst (ELE/Q8701)			
		Theory			
5 Semester II	5.GV.05	Electronic Measurement and Instrumentation – II		3	50
	5.GV.06	Identification of Components, Tools, SOP & Work Instructions – II		3	50
	5.GV.07	Tools, Equipment & Safety Measures – II		3	50
	5.GV.08	Soldering & De-Soldering of Components & Emergency Actions – II		3	50

Level	Code	Educational Component		Credit	Marks
		Lab/Practical			
	5.VP.03	Soldering & De-Soldering of Components – Lab		1.5	50
	5.VP.04	Electronic Measurement and Instrumentation – II (Lab)		1.5	50
		On-Job-Training (OJT)/Qualification Packs			
		Smartphone Assembly Inspector (ELE/Q4001)	(Any one)	15	200
		Business Development Executive (ELE/Q7101)			
6 Semester I		**Theory**			
	6.GV.01	Fault Analysis & Repairs		3	50
	6.GV.02	Good Manufacturing Concepts & Practices – I		3	50
	6.GV.03	Electronics Devices Circuit – I		3	50
	6.GV.04	Electronics System Packaging and Manufacturing		3	50
		Lab/Practical			
	6.VP.01	Electronics Devices Circuit – I Lab		1.5	50
	6.VP.02	Fault Analysis & Repairs – Lab		1.5	50
		On-Job-Training (OJT) / Qualification Packs			
		Field Engineer RACW (ELE/Q3105)	(Any one)	15	200
		Security System Service Engineer (ELE/Q4610)			
		Pre-Sales Solar Technical Support Engineer (ELE/Q5602)			
6 Semester II		**Theory**			
	6.GV.05	Good Manufacturing Concepts & Practices – II		3	50
	6.GV.06	Manufacturing & Quality Norms		3	50
	6.GV.07	Good Manufacturing Concepts & Practices – III		3	50
	6.GV.08	Electronics Devices Circuit – II		3	50
		Lab/Practical			
	6.VP.03	Electronics Devices Circuit – II Lab		1.5	50
	6.VP.04	Manufacturing Practices		1.5	50
		On-Job-Training (OJT) / Qualification Packs			
		Purchase Executive (ELE/Q5901)	(Any one)	15	200
		Quality Engineer (ELE/Q7901)			
7 Semester I		**Theory**			
	7.GV.01	Valuation & Storage		3	50
	7.GV.02	Shelf Life, Warehouse Operations Management & Material Transactions		3	50

Level	Code	Educational Component		Credit	Marks
	7.GV.03	Industrial Electronics Product Design		3	50
	7.GV.04	Pre-Production Activities		3	50
		Lab/Practical			
	7.VP.01	Pre-Production Activities – Lab		1.5	50
	7.VP.02	Valuation & Storage – Lab		1.5	50
		On-Job-Training (OJT) / Qualification Packs			
		Product Engineer (ELE/Q4201)	(Any one)	15	200
		Incoming QC Technician (ELE/Q4401)			
		Assembly Supervisor (ELE/Q6305)			
7 Semester II		**Theory**			
	7.GV.05	Entrepreneurship / Accounting / Management		3	100
		Lab/Practical			
	7.GV.06	Project Work		12	200
		On-Job-Training (OJT) / Qualification Packs			
		FPGA Design Engineer (ELE/Q8201)	(Any one)	15	200
		Sales Executive – Consumer Electronics (ELE/Q3201)			

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.

(EMC-101) Entrepreneurship Setup and Launch

EMC-101	L	T	P
Entrepreneurship Setup and Launch	**0**	**0**	**4**

Introduction:

This semester lays the foundation for the learner to understand what entrepreneurship is, beyond just starting a business. It introduces key ideas like problem-solving, value creation, and self-awareness. The learner will begin exploring basic business concepts while discovering their own interests and strengths.

Learners Objective:

1. Understand the core concepts of entrepreneurship through relatable, real-life examples.
2. Begin to see themselves as problem-solvers and creators.
3. Learn about business paths and choose one to try based on interest or local fit.
4. Launch a micro-hustle (online or offline) to earn their first income.
5. Build confidence and self-belief by doing.

Outcome: By the end of this semester, learners will start a simple business activity, earn their first income, and build belief in their ability to do business.

Guiding Principles/Approach:

This syllabus is built on principles of **experiential learning, growth mindset development**, and **identity-first learning**. Drawing from learning science and behavior design, the course shifts students from passive learning to *active doing*, where they try out small business activities in real contexts. The design helps students not just learn entrepreneurship but begin to see themselves as entrepreneurs. Emphasis is placed on *small wins, peer collaboration, and locally relevant opportunities* to ensure learning feels achievable and connected to their realities. The curriculum focuses on conceptual understanding without heavy theory, combining *practical action, reflection, and collaboration. By making progress visible and success feel possible, it plants the seeds of self-reliance, initiative, and long-term motivation.*

Semester Syllabus:

Format: 12 weeks, 4 hours/week | 2 credits
Revenue Target: ₹10,000

Week	Learning Goal	Measurable Outcome
1	Understand what entrepreneurship is and who can be an entrepreneur	Students define entrepreneurship in their own words and list 2 entrepreneurs from their local area or community
2	Connect personal identity to entrepreneurship (strengths, interests, struggles)	Students create a "value map" showing how a skill/interest/problem from their life could become a business opportunity
3	Learn about 5 business paths: content creation, drop-shipping, cloud kitchen/food business, gig economy and local services	Students explore 1–2 examples from each domain and share one they're most curious to try and why

4	Choose a path and generate a basic business idea	Students write down a clear offer (what, for whom, why) and one way to reach their customer
5	Take first real action: message, post, pitch, or sell	Students reach out to or serve 1 real potential customer and record what happened
6	Reflect on first attempt and share with peers	Students share their result, a challenge faced, and one idea to improve next time
7	Improve and try again: aim for first ₹100	Students apply a change, try again, and aim to make their first ₹100 or get meaningful response
8	Learn how to identify and understand your target customer	Students talk to 2 potential customers or observe them and list 3 insights about their needs
9	Learn how to serve your target audience better	Students improve one part of their offer (product, delivery, messaging, or interaction) based on customer feedback or need

10	Explore core entrepreneurial values (resilience, honesty, effort)	Students reflect on 1 value they're building and show it in a business task or peer story
11	Focus on earning and staying consistent	Students complete a second earning task and track their consistency (e.g., same product or message for 3 days)
12	Reflect on earnings, grit, and how to keep going	Students record total earnings, one resilience moment, and one support system or habit they'll continue with

Weekly Component:

Component	Duration	Description
Learning Module	~1.5 hrs	- Introduces key concepts in a simple and engaging way - Includes, examples, and 1–2 interactive discussions or quizzes
Action Lab	~2 hrs	- Hands-on task on the weekly concept - Includes step-by-step guidance, templates, and worksheets - Ends with a submission (e.g., video, reflection, or proof of action)
Resources	Self-paced	- Supplementary videos, short readings, real- life stories, and tools to deepen understanding at their own pace

Evaluation Criteria

Evaluation Component	Description	Weightage
Weekly Task Completion	Timely submission of weekly tasks including reflections, activities, quizzes etc.	40%
Target Completion	Performance-based evaluation on hitting **revenue or profit targets** (e.g., generating ₹10,000 revenue)	30%
Final Project	A comprehensive project based on the semester's theme	30%

Week 1: What is Entrepreneurship? Who Can Be an entrepreneur?

INTRODUCTION: Could *You* Be an entrepreneur?

When people hear "entrepreneur," they often think it means having a company, investors, or an MBA. Some even believe it's only for toppers or those with high grades. But entrepreneurship is more about mindset than qualifications: it's about seeing a problem and doing something about it. Like someone who starts selling snacks because their school canteen is always shut, or a friend who fixes broken chargers for others. If you've ever spotted a need and thought, "I can solve this," - you've already taken your first step.

Component 1: Learning Module (~1.5 hours) Unit 1: What is Entrepreneurship?

1. *Solving problems or creating value in exchange for money.*
2. Entrepreneurship is not just about starting a company: it's about initiative, resourcefulness, and value creation.
3. Different types of entrepreneurs: small shop owners, street vendors, YouTubers, local tailors, mechanics, and more.
4. Entrepreneurs build opportunities instead of waiting for them.

Simple Slide/Visual Aid Tip:

A circle that says "Problem", an arrow pointing to "Solution", then an arrow to "Earn". That's entrepreneurship.

<A video that visually shows how entrepreneurship starts with spotting a problem (e.g., long food lines), creating a solution (e.g., pre-order lunch service), and earning from it: illustrating the simple flow: Problem → Solution → Earn>

MCQ 1

Q: What best describes entrepreneurship?

A. Getting a job in a company
B. Solving problems for others and earning from it ☑
C. Studying business in college
D. Buying expensive things

Feedback:

1. *Correct! Entrepreneurs solve problems or offer value and get paid for it.*
2. *Not quite! Entrepreneurship is about creating something useful, not just getting a job or studying.*

Unit 2: Who Can Be an entrepreneur?

Entrepreneurship starts with spotting a problem, finding a solution, and creating value. Today, anyone with a phone and an internet connection can start a business: money helps, but mindset and initiative matter more at the start.

You just need:

1. A problem to solve
2. A simple skill or product
3. The courage to start small

Examples Carousel (Swipeable cards)

1. **Pooja (India)** – Sells handmade rakhis on Instagram, learned designing on YouTube.
   ***Problem she saw**: Expensive or generic rakhis in the market; no personal touch.*
2. **Luis (Mexico)** – Repairs used phones in his garage, now has loyal customers.
   ***Problem he saw**: Many people couldn't afford new phones or didn't trust local repair shops.*
3. **Sana (Kolkata)** – Started tiffin delivery from her home kitchen, now earns ₹500/day.
   ***Problem she saw**: Office workers struggled to find affordable, homemade meals.*
4. **Sal Khan (USA)** – Started Khan Academy with YouTube lessons to help his cousin.
   ***Problem he saw**: His cousin needed help with math, but good learning resources were hard to access.*

MCQ

Q: Which of these can be a form of entrepreneurship?

A. Making reels on skincare tips and selling homemade face packs ✅
B. Buying new clothes from malls
C. Studying engineering
D. Playing games without sharing or streaming

Feedback:

1. *Correct! Sharing useful tips + selling a product = solving a need!*
2. *Try again! Entrepreneurship is about creating value and helping others.*

Reflection Prompt

1. If you had to earn ₹100 this week, what would you do?

Component 2: Action Lab (~2 hours) Task

Find & Learn from 2 Entrepreneurs Near You

Steps (Checklist):

1. Look around your neighborhood or online: find 2 people who earn through their own work
2. Ask or observe:
   a) What do they do?
   b) How do they earn?
   c) What makes them entrepreneurial?
3. Use the **Entrepreneur Tracker Template** (available in the resources tab)

Final Deliverable

Learner submits:

1. A short definition of entrepreneurship (in their words)
2. 2 entries from the Entrepreneur Tracker (name, what they do, what learner learned)

→ Submitted in the submissions tab.

Supplementary Resources (Optional)

1. Danny O'Neill - Getting started | Entrepreneurship | Khan Academy
2. The Better India – Stories of local entrepreneurs

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Week 2: Can I Be an entrepreneur?

INTRO – What Makes an entrepreneur?

You don't need a suit, a degree, or a lot of money to be an entrepreneur.
You need one thing: a mindset. Entrepreneurs notice problems around them: and do something about it. From the boy fixing bikes outside his house to the girl teaching dance on Instagram, they all started small. What matters most is not what you have: it's how you think and act.

Component 1: Learning Module (~1.5 hours)

Unit 1: What Makes an entrepreneur?

Key Concepts:

1. **Entrepreneurs are driven by curiosity:** they ask questions, explore possibilities, and seek better ways to do things.
2. **They take initiative:** they act, experiment, and create using limited resources with creativity and courage
3. **They learn by doing:** embracing mistakes as stepping stones to progress.
4. **They take full ownership:** one day they're the marketer, the delivery person, and the customer support, all in one.
5. **They are resilient:** they persist through challenges, adapt to change, and keep moving forward with purpose.

Real-Life Examples:

1. Nithin & Nikhil Kamath (Zerodha) – Started India's largest stock brokerage without formal degrees or external funding, just deep curiosity about stock markets and a desire to simplify investing.
2. *Qualities: Took initiative early and stayed persistent through challenges.*
3. Prajakta Koli (MostlySane) – Started by making comedy sketches about everyday Indian life: family, school, relationships: and became one of India's top digital creators.
4. *Qualities: Stayed consistent, adapted over time, and built strong audience trust.*
5. Tilak Mehta (Paper n Parcels) – As a teenager, launched a courier startup using Mumbai's dabbawala network for delivery.
6. *Qualities: Thought creatively and acted with confidence at a young age.*

Unit 2: Start Small: Build Ideas from What You Know

In the last unit, you learned that entrepreneurs don't just have ideas: they act, solve problems, and use what they have.

But the big question now is:

"What can I offer?"

That's where the Value Map comes in. It helps you take your first step toward thinking and acting like an entrepreneur: in your own way.

What is a Value Map?

A Value Map connects three simple things:

A. **What people around you need**
   → *Look around: is there something people often struggle with or something that could be better?*

B. **What you *enjoy* or are *willing to try***
   → *You don't need to be an expert. Start with small things you like doing: talking to people, fixing, organizing, helping, designing, or learning something new.*
   → *Even if you're just curious about something: that's enough to begin.*

C. **What solution you can create**
   → *Use what you enjoy or are learning to try solving a real need around you: even in a small way*

Visuals:

3 overlapping circles:

1. "People Need"
2. "I Can"
3. "My Offer"

Examples:

1. **People Need → Affordable meals**
   I Can → Cook + have access to home kitchen My Offer → ₹40 tiffin service
2. **People Need → Study tips in Punjabi I Can → Speak clearly + love teaching**
   My Offer → 3-minute video tips on Instagram

MCQ

Q: What's the first step to being an entrepreneur?

A. Waiting for the perfect idea
B. Solving a problem with your skills ☑
C. Buying a shop
D. Studying for years

Feedback:

1. *Correct! Entrepreneurs start by solving small problems using what they already have.*
2. *Try again! It's not about waiting: it's about starting.*

Reflection Prompt

1. If someone gave you ₹500 and asked you to earn from it, what would you do?

Component 2: Action Lab (~2 hours)

Task: Create Your Personal Value Map Steps (checklist in app):

1. Think of 2–3 problems people face around you (hunger, phone repair, boredom, etc.)
2. List your own skills, interests, or resources.
3. Match each problem with something you could offer.
4. Use the **Value Map Template in the resources** to organize your ideas.

Final Deliverable (Submitted in App):

1. Your completed **Value Map** (in 3 columns: Need, Skill, Offer)
2. Highlight **1 idea** you'd like to explore for your future hustle

Supplementary Resources (Optional)

1. "Start with Why" by Simon Sinek
2. 10 Characteristics of Successful Entrepreneurs | Business: Explained

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.

(b) Area and volume: rectangle, parallelogram, circle, cube, cone, cylinder & 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 Tubelight, 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, PNPN 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

Linear Programming and Mathematical Reasoning 1.
Linear Programming
2. 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,
Multimeter,
Galvanometer, Energy
Meter, CRO,
Diode Trainer kit Zener
diode Trainer kit Rectifier
trainer kit
Transistor charactrics trainer kit,
PCB manufacturing Lab
Bread board trainer kit to design 7 segment display.

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) Trouble Shooting & Maintenance of Electronic Equipments-I

1. Basic Occupational Safety and Precautions
2. Microphones and Loudspeakers
   Construction, working principle and frequency response of Carbon Microphone, Variable Reactance Microphone, Capacitance Microphone, Piezo-Electric Microphone, Moving Coil Microphone.
   Frequency ranges of musical instruments, Intensity and Dynamic Range, Constructions and working principles of Moving Coil Loudspeaker, Impedance and Power Level of loudspeaker, Frequency characteristics of Practical Loudspeakers: Woofer, Tweeter, Squawker
3. Recorder
   Block diagram of disk recording and reproduction.
   Principle of optical recording, CD/ DVD manufacturing and recording, CD/ DVD player system, Advantages/ Disadvantages.
   Steps for Fault finding & Analysis.

(4.GV.03) IT Tools-I

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.

(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 excepts form 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)

There 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 deferent 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 4: 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 4: 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) Engineering Science - Lab

1. Introduction to tools and measuring instruments, their safe keeping, safety
2. precautions
3. Measurement of resistance by ammeter and voltmeter method and Ohm meter.
4. Dismantling and reassembly of dynamo.
5. Calibration of ammeter, voltmeter and wattmeter with the help of standard meters.
6. Calibration of single phase energy meter with the help of standard wattmeter and stop watch.
7. Controlling lamps in series, parallel and series parallel.
8. Controlling lamps for two or three places.
9. Drawing schematic diagram to give supply to consumers.
10. Practice on casing and capping wiring.
11. Practice on cleat wiring.
12. Practice on CTS/TRS wiring.
13. Practice on metal sheet weather proof rigid PVC wiring.
14. Practice on conduit wiring.
15. Practice on concealed wiring.
16. Measurement of insulation resistance of wiring installation by megger.
17. Polarity test of wiring installation.
18. Testing of wiring installation.
19. Installation of pipe earthing for wiring installation.
20. Installation of plate earthing for wiring installation.

Instruments Required

Ammeter
Voltmeter
Ohm meter
Dynamo
Wattmeter,
Stop watch controlling lamp
Different types of wire for practice on wiring,
Conduit pipes
Megger
Materials for earthing

(4.VP.02) Trouble Shooting & Maintenance of Electronic Equipment's Lab

1. Assembly study and fault finding of an audio amplifier.
2. Assembly, study and fault finding of a graphic equaliser.
3. Study working, assembly & fault finding of Colour TV.
4. Study working, assembly & fault finding of LCD TV.
5. To trace the fault in the following panel controls and correct them:
   - Volume control.
   - Brightness control.
   - Contrast control.
   - Vertical hold control.
6. To trace the following stages of T.V. set: Tuner, MF stage, Video detector, Video amplifier.
   - Sound I.T. Sound output stage.
   - Syne separator.
   - Vertical oscillator.
   - Horizontal oscillator.
   - Line Driver Stage.
   - Line output transformer.
   - Power supply.
7. To find fault for the following defects:
   - No picture no sound.
   - Sound present, picture missing.
   - Picture rolls vertically.
   - Picture tears (Horizontal oscillator).
   - Faults in tuner/IF/power supply.
8. Study working, assembly & fault finding of tape recorder system.
9. Study working, assembly & fault finding of CD/DVD player system.
10. Study working, assembly & fault finding of Printer.
11. Study working, assembly & fault finding of Scanner.
12. Study working, assembly & fault finding of Microwave oven.
13. Study working, assembly & fault finding of Telephone.
14. Study working, assembly & fault finding of Fax Machine.
15. Study working, assembly & fault finding of UPS system.
16. Study working, assembly & fault finding of DTH kit.

Equipment's Required

1. Demo kit to understand the working of different section of colour TV and to create the fault and rectifying the faults.
2. Trainer kit/ demo module to understand the working and fault finding of tape recorder system
3. Trainer kit/ demo module system to understand the working and fault finding of CD/ DVD.
4. Trainer kit/ demo module system to understand the working and fault finding of Printer.
5. Trainer kit/ demo module system to understand the working and fault finding of Scanner.
6. Trainer kit/ demo module to understand the working and fault finding of Microwave ovan system
7. Trainer kit/ demo module to understand the working and fault finding of Telephone system
8. Trainer kit/ demo module to understand the working and fault finding of Fax Machine system
9. Trainer kit/ demo module to understand the working and fault finding of UPS system
10. Trainer kit/ demo module to understand the working and fault finding of DTH kit

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;Menu, 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) Digital Electronics

1. Number Systems and Boolean Algebra
   Basics of Analog and Digital.
   Boolean algebra, De-morgan 's law, Truth tables.

2. Logical Circuits
   Logic gates: AND, OR, NOT, NOR, NAND, XOR, XNOR.
   Combinational Circuits:
   (i) Arithmetic Circuits: Half adders, Full adders , Subtractors,
   (ii) Data Processing Circuits: Encoders, Decoders, Multiplexers, De-Multiplexers,

3.Latches and Flip-Flops
   Concept of Latches, Types of Latches, SR latch.
   SR Flip Flop, JK Flip Flop, D Flip flop, T Flip Flop, Flip Flop.

Introduction to counters, Types of counters Asynchronous and Synchronous.

Introduction to shift registers, types of shift registers,

4. Introduction to Display Devices

LED, LCD, 7 segment display

5. Integrated Circuits and Memories

Introduction to IC's, Importance and applications, Linear and Digital IC's. Introduction to SSI, MSI, LSI and VLSI (Terminology & Definitions).

Memory Organisation and Operations, RAM, ROM.

(4.GV.06) Trouble Shooting & Maintenance of Electronics Equipment's -II

1. TV System

Working principle with block diagram of TV transmitter and receiver, Brief description with circuit diagram: TV Tuner, Video IF stage, Sound stage, Picture tube & its associated circuit, Synchronizing circuits, Horizontal & vertical deflection circuits, Remote control of a TV receiver, Idea of bandwidth, blanking and synchronization pulses, modulation scheme, colour transmission.

Cable type TV system, Head end processor, Trunk & cable distribution system with block diagram, Scrambling.

Introduction to LCD and LED TV systems, Introduction to high definition systems. Steps for Fault finding & Analysis.

2. Modern Appliances

Working principle and block diagram of following: Microwave oven, Telephone, Fax machine, Printers, Scanners. Steps for Fault finding & Analysis.

(4.GV.07) IT Tools

I. 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.

II. 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).

III. Work Integrated Learning IT – ISM
   - Identification of Work Areas.
   - Work Experience.

(4.VP.03) IT Tools - Lab

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

(4.VP.04) Digital Electronics – Lab

1. Verification of truth tables for AND, OR, NOT and NAND logic gates. 2. Verification of truth tables for NOR, XOR and XNOR logic gates.
3. Construction and verification of operations of half adder and full adder circuits using basic gates.
4. Construction and verification of operations of half adder and full adder circuits using XOR gates.
5. Construction and verification of operations of full adder and full adder circuits using NAND gates.
6. Construction and verification of operations of half & full Subtractor circuit using basic gates.
7. Construction and verification of operations of half & full Subtractor circuit using XOR gates.
8. Construction and verification of operations of half & full Subtractor circuit using NAND gates.
9. Study and verification of truth tables for 3 line to 8 line decoder.
10. Study and verification of truth tables for 8 line to 3 line and 10 line to 4 line encoder.
11. Study and verification of truth tables for 4:1 MUX using gates 12. Study and verification of truth tables for 1:4 DEMUX using gates.
13. Study and verification of truth tables for 8:1 MUX using IC 74151. 14. Study and verification of truth tables for 1:8 DEMUX using IC 74138.
15. To study and verify the truth table of excess-3 to BCD code converter. 16. To study and verify the truth table of binary to gray code converter.
17. Construction and verification of truth tables for S-R, D and J-K flip flops. 18. Study working of various display devices. (LED, Common anode, Common cathode 7 segment display)
19. Study and verification of truth table for universal shift register. 20. Study the operation of a synchronous counter.

Level 5 (Semester I)

(5.GV.01) Electronic Measurements and Instrumentation-I

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system.

(5.GV.02) Identification of Components, Tools, SOP & Work Instructions-I

1. Main components & modules/ sub-assemblies of electronic equipment
   - Control Panel (System Controller)
   - Keypads
   - Door and Window Contacts
   - Motion Detectors
   - Glass Break Detection
   - Smoke Detectors
   - Heat Sensors
   - Carbon Monoxide Detectors
   - Water Detectors (or Water Bug)
   - Temperature Sensors
   - Capacitance switches / control push buttons & rotary switches

2. Digital Electronics
   - Electronic controls in a common way
   - Counters
   - Flip- flops
   - Logic gates
   - Multiplexers
   - Decoders
3. Concept of Amplification factor, Gain & Signal distortion
4. Protocols like TCP/TP for communication purpose and for digital networks & circuits.

(5.GV.03) Tools, Equipment and Safety Measures-I

1. Cables & Connectors
   - Non-Metallic Sheathed Cable
   - Un grounded & Grounded Power Supply Cable
   - Metallic Sheathed Cable
   - Multi-Conductor Cable
   - Coaxial Cable
   - Unshielded Twisted Pair Cable
   - Shielded twisted pair cable

Ribbon Cable
Armoured & Unarmoured Cable
Twin-Lead Cable
Twin axial Cable
Optical fiber cable
Connectors

2. ESD Clothing
What to wear, how to wear

(5.GV.04) Soldering & De-Soldering of Components-I

1. Soldering & De Soldering of Basic Components
Soldering Tools
Different types of Soldering Guns related to Temperature and wattages, types of tips
Solder materials and their grading
Soldering and De Soldering Stations and their Specifications
Preparing Component for Soldering
PCB Applications
Types of PCB
Soldering Basic Components on PCB
De soldering Basic Components
Safety precautions while Soldering & De soldering
Check for cold continuity of PCB
Identification of loose/dry solder, broken tracks on printed wire assemblies & discrete components mounted circuit boards
Join the broken PCB track and test
De soldering using Pump and wick
Introduction of SMD Components

(5.VP.01) Identification of Components, Tools, SOP & Work Instructions-I - Lab

1. Identification & working of various electronic components
2. Working of testing equipment
3. Measurement using Multimeter & Clamp meter
4. Battery health check-up
5. Measure and test the voltage of given cells.

(5.VP.02) Electronic Measurement and Instrumentation -I (Lab)

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.

Level 5 (Semester II)

(5.GV.05) Electronic Measurements and Instrumentation - II

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter
CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications
Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters

(5.GV.06) Identification of Components, Tools, SOP & Work Instructions-II

1 Introduction to wireless communication
2 Signal Converters
3 Tools & their Uses
- Use of tester to monitor AC Power
- Skin the electrical wires/cables using the wire stripper and cutter
- Main cable for control & electronic circuit wires
- Crimping tools and buses

4 Introduction to measuring equipment's
- Signal generator's
- CRO
- Function Generators
- Frequency Counter
- Logic analyzer
- Spectrum analyzer
- LCRQ Meter

5 Standard Operating Procedures and Work Instructions

- What is SOP and WI
- How to read & follow SOP and WI
- Overall Quality Assurance Plan

(5.GV.07) Tools, Equipment & Safety Measures-II

1. Tools & Equipment
   - Types of tools & equipment required and deployed in manufacturing, installing & servicing
   - Identification and termination process
   - General maintenance of tools/equipment and recalibration of Test equipment
   - General safety and common-sense safety
2. PPE
   - Usage & benefits of PPE

Types & usage of various PPE
Maintenance of PPE

3. Clean Room Environment

Do's and Don't
Shop Floor Discipline

(5.GV.08) Soldering & De-soldering components & Emergency actions

1. Introduction to SMD Components
   Identification of 2, 3, 4 terminal SMD components
   Soldering the SMD components on the PCB
   Make the necessary settings on SMD soldering station to solder various ICs of different packages by choosing proper clamping tools
   Identify various connections and the setup required for SMD soldering station
   De solder the SMD components from the given PCB
   Make the necessary settings on SMD soldering station to de solder various ICs of different packages by choosing proper clamping tools
   Make a panel board using different types of switches for a given application
   Identification of crimping tools for various IC packages
   Reliable Soldering Practices

2. Emergency actions

Minimum Requirements
Reporting Emergencies
Emergency exits
Primary and secondary evacuation routes
Locations of fire extinguishers
Fire alarm pull stations' location
Assembly points
Medical Services

(5.VP.03) Soldering & De-soldering components - II Lab

1. Assemble the product
2. Dis-assemble the product
3. Safety Precautions & emergency plans

(5.VP.04) Electronic Measurement-II Lab

1. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
2. Measurement of phase difference and frequency using CRO (lissajous figure)
3. Measurement of low resistance Kelvin's double bridge.
4. Radio Receiver Measurements

Level 6 (Semester I)

(6.GV.01) Fault Analysis & Repairs

1. Classification of fault
2. Identification of fault
3. Rectification of fault
4. Repairing/Replacing Module
5. Analysis for the different types of equipment's
   Smartphones
   Air Conditioning
   Security systems
   Electronically controlled doors
6. Fault analysis based on hardware and software component
7. Diagnostic and Testing Methods
8. Visual Inspection
9. Earth Continuity Test
10. Insulation Resistance Test

(6.GV.02) Good Manufacturing Concept & Practices – I

TQM (Total Quality Management) & Kaizen
Inventory Management & Logistics in brief
Quality assurance
Checklist
SWOT analysis
Lean Manufacturing
Muda, Mura & Muri – Toyota Production System (TPS)
Spatial considerations & other related concepts

(6.GV.03) Electronics Devices Circuit-I

Unit I
Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism. Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions. Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

(6.GV.04) Electronics System Packaging and Manufacturing

Evolution and Classification of Printed Circuit Boards, Challenges in Modern PCB Design and Manufacture, PCB fabrication methodologies (SSB, DSB and multilayer board), PCB design considerations/ design rules for analog, digital and power applications, Electromagnetic interference in electronic systems and its impact. Analysis of electronic circuit from noise emission point of view (both conducted and radiated emission) cross talk and reflection behavior of the circuit in time domain, Thermal management of electronic devices and systems.

Semiconductor Packages: Single chip packages or modules. (SCM) Commonly used packages and advanced packages; Materials in packages, Current trends in Packaging, Multichip modules (MCM)-types; System-in package (SIP); Packaging roadmaps; Hybrid circuits. Pipe and FIFOs, Shared memory, Sockets

(6.VP.01) Electronic Devices and Circuits Lab

1. Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. Characteristics of Zener diode: V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance.
5. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.

(6.VP.02) Fault Analysis & Repairs - Lab

1. Categorization of faults
   Hardware/Software, User Induced, Component Failures
   L0 to L4 repairs
2. Testing electrical/electronic components in the product
3. Troubleshoot and repair of the faults identified in the product
4. Preventive Maintenance Services

Level 6 (Semester II)

(6.GV.05) Good Manufacturing Concepts & Practices – II

Work Study Concepts
- Method study
- Work measurement
- Sequencing of Operations and timing the flow steps
- Advantages of work study

Team Working
- Forming
- Storming
- Norming
- Performing
- Adjourning

(6.GV.06) Manufacturing & Quality Norms

1. Manufacturing & Quality Norms- keep it differently according to all applications

Manpower Deployment and Operations as per Work Instructions and criticality of the process Understanding how to form each operation and practical training of operation Understanding accept and reject criterion of a particular operation. Practical training of testing/checking each operation

Quality Norms of accept and practical training of electronic equipment's/Devices Acceptance/Rejection training of various defects

2. Manufacturing & Quality Norms – II

Process in packing line-Packing line Operations sequence flow and its importance

Quality Systems - Accept, Reject criterion of various tests at OQA

Training of Assembly of electronic components - Assemble, Check, test electronic components

Various Labels and their Importance - Understanding Labels, Scanning and its importance

Packing of components/devices - Various Stages of packing

Acceptance, Reject and sampling following QA norms - AQL level, Sampling techniques, as per QA sampling accept, reject numbers

(6.GV.06) Good Manufacturing Concepts & Practices – III

1. Good Manufacturing Concepts & Practices - II
   - Brief Introduction
   - Total Quality Management
     - ISO Standards
   - Kaizen

Toyota Production System
Lean Manufacturing
Combination of Inventory
Supply Chain
Quality and Inspection
3 Sigma and 6 Sigma Orientation

(6.GV.07) Electronic Devices and Circuits –II

UNIT I MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small- signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

UNIT II BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

UNIT III Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier. Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator

(6.VP.03) Electronic Devices and Circuits –II Lab

1. Characteristic of BJT: BJT in CE configuration- Graphical measurement of hparameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
2. Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
3. Applications of Op-amp: Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
4. Field Effect Transistors: Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
5. Oscillators: Sinusoidal Oscillatorsa. Wein's bridge oscillator b. phase shift oscillator.

(6.VP.04) Vocational Practical

1. Work study concepts
2. Team work concepts

Level 7 (Semester I)

(7.GV.01) Valuations & Storage

1. Valuation
    - Specific Item cost
    - Weighted average cost
2. Storage
    - Stacking Norms
    - Bin Cards
    - Stores Layout
    - Categorization of Materials
        - Hazardous/Non-Hazardous
        - Imported/Local
        - Assembly/ Parts
        - Consumables
        - Class A/B/C
        - Good/defective

(7.GV.02) Shelf Life, Ware House Operations Management & Material Transactions

1. Shelf Life Management
    - FIFO
    - FILO
    - LIFO
    - LILO
2. Material Transactions
    - Inward
    - Outward
    - Suspense
    - RMA (Return Material Authorization)
    - Insurance

(7.GV.03) Industrial Electronic Product Design

Development Process, Product Planning & Conceptualization, Product Architecture and Industrial Design, Product Manufacturing & Prototyping, Economic Analysis & Managing Projects. Introduction to 3-D printing and Rapid Prototyping

(7.GV.04) Pre-Production Activities

Pre-Production activities
- Layout
- Time Study & Motion Study
- Two Hand Insertion
- Non-value adding activities
- Positioning of Bins
- Line Balancing

(7.VP.01) Pre-Production Activities Lab

Pre-Production activities
Two Hand Insertion
Positioning of Bins

House Keeping 5S

(7.VP.02) Valuations & Storage Lab

Categorization of Raw Material & Consumables
Hazardous/Non-Hazardous
Imported/Local
Assembly/Parts
Class A/B/C
Good/defective

Material Transactions
Inward Outward
Suspense

Level 7 (Semester II)

(7.GV.05) Entrepreneurship/Accounting/Management

1. Introduction
Meaning and Nature of Management, Management Approaches, Processes, Managerial Skills, Tasks and Responsibilities of a Professional Manager.

2. Organizational Structure and Process
Organizational Culture and Climate, Managerial Ethos, Organization Structure & Design, and Managerial Communication.

3. Planning and Controlling
Planning Types and Process, Management by Objectives, Decision-Making Types and Models, Problem Solving Techniques, Controlling: Process and Techniques.

4. Performance Evaluation Techniques:
Introduction to Budgeting and Budgetary Control; Performance Budgeting; Classification of Budget; Standard Costing and Variance Analysis; Balanced Scorecard; Responsibility Accounting.

5. Decision Making Techniques:
Cost Volume Profit Analysis; Management Accounting for Decision Making and Control; EVA and Performance Measurement; Introduction to Activity Base Costing, Targeting Costing, Life Cycle Costing; Uniform Costing.

Or

Course Contents:

1. Entrepreneurship: Concept and Definitions; Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneurs; Entrepreneur; Manager Vs. Entrepreneur.

2. Opportunity / Identification and Product Selection: Entrepreneurial Opportunity Search and Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information.

3. Small Enterprises and Enterprise Launching Formalities : Definition of Small Scale; Rationale; Objective; Scope; Role of SSI in Economic Development of India; SSI; Registration; NOC from Pollution Board; Machinery and Equipment Selection; Project Report Preparation; Specimen of Project Report; Project Planning and Scheduling using Networking Techniques of PERT / CPM; Methods of Project Appraisal.

4. Role of Support Institutions and Management of Small Business : Director of Industries; DIC; SIDO; SIDBI; Small NISBUD; Industries Development Corporation (SIDC); SISI; NSIC; State Financial Corporation SIC; Marketing Management; Production Management; Finance Management; Human Resource Management; Export Marketing; Case Studies- At least 4 (four) in whole course.