INFORMATION TECHNOLOGY & ELECTRONICS SYSTEM MAINTENANCE

COMPETENCY BASED CURRICULUM

(Duration: 2 yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – IT & ITES

सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

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(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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1. Sami InfoTech , Nerul ,Navimumbai
2. ChristioniSharpline Tech Pvt. Ltd, Navi Mumbai.
3. Abvolt India Pvt Ltd, Vikroli Mumbai
4. Global Technologies, Vashi, Navi Mumbai
5. Festo India Pvt. Ltd, Santcruz Mumbai

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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

ITESM trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

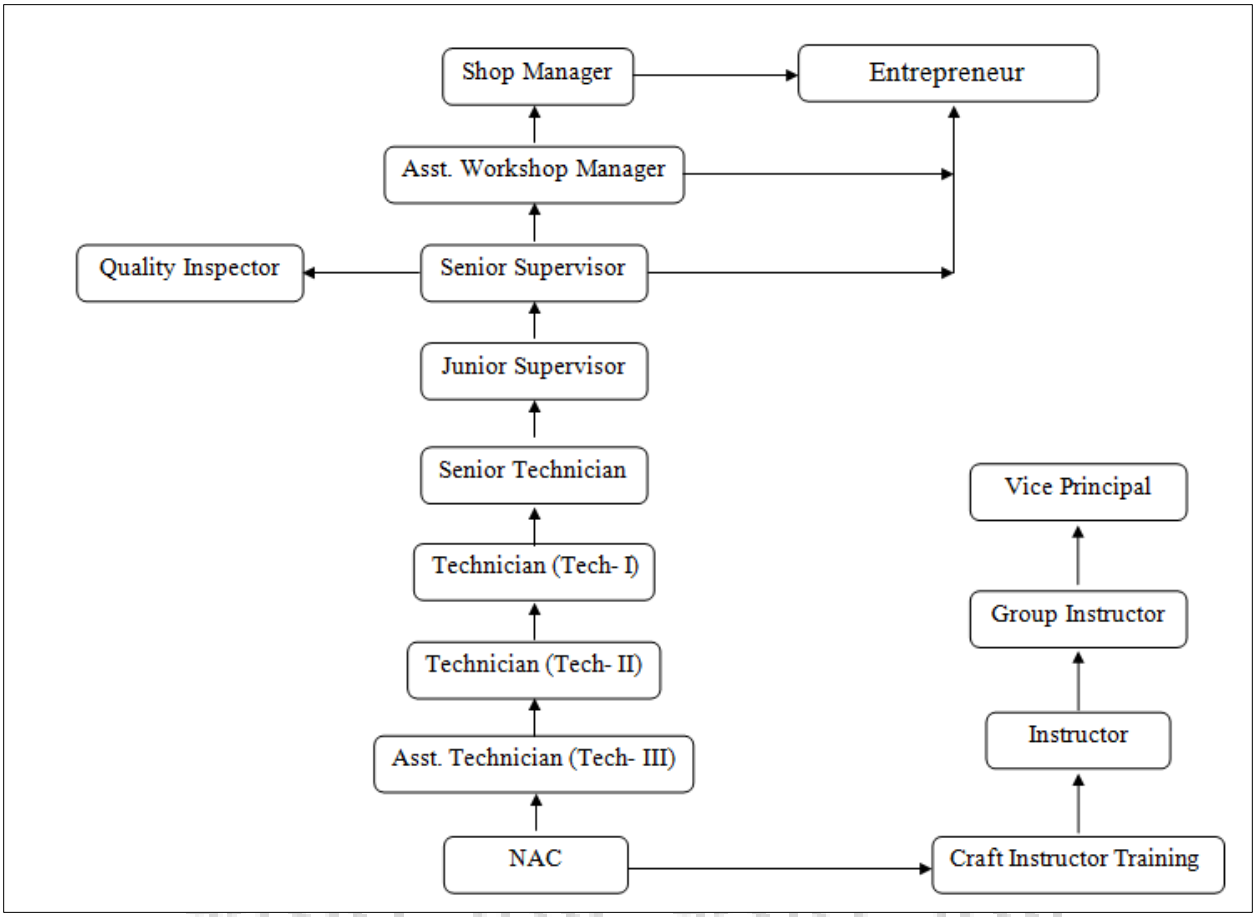
Broadly candidates need to demonstrate that they are able to:

- Install software or hardware
- Maintain and repair equipment / peripherals.
- Troubleshoot different computer issues
- Determine and install appropriate security measures
- Install & Configure advanced computer networks
- Provide technical support on-site or via phone or email
- Install, configure, and maintain common end user application software. May train and provide assistance to end users.
- Troubleshoot software and hardware problems related to Internet applications.
- Assist the information technology administrators with configuration, maintenance and monitoring of access servers, routers, Microsoft and Linux servers and Internet servers including DNS, radius, web, LDAP, e-mail, network monitoring and print servers.
- Assist in preparing, maintaining, and upholding procedures for logging, reporting, and statistically monitoring PC performance.
- Accurately document instances of hardware failure, repair, installation, and removal.
- Assist in developing long-term strategies and capacity planning for meeting future computer hardware needs.
- Support development and implementation of new computer projects and new

hardware installations.

2.2 CAREER PROGRESSION PATHWAYS:

- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*) : -

Total training duration details: -

Time (in months)	**1-3**	**4-12**	**13-15**	**16-24**
Basic Training	**Block– I**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – I**	**------**	**Block – II**

A. Basic Training

For 02 yrs. Course (Engg) :-(**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)
For 01 yr. course (Engg) :-(**Total 03 months:** 03 months in 1st yr.)

S No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course(Engg) :-(**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg) :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course(Engg)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course(Engg)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training

institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NAC will be conducted by NCVT on completion of course as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b)Weightage in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Weightage in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

ITESM personnel are to support and maintain computer systems, desktops, and peripherals. This includes installing, diagnosing, repairing, maintaining, and upgrading all hardware and equipment while ensuring optimal workstation performance. The person will also troubleshoot problem areas in a timely and accurate fashion, and provide end user training and assistance where required. Install, maintain and setup network with computers, printers and other peripheral equipment as well as configure broadband equipment.

Reference NCO-2015: 3114.9900 -Electronics and Telecommunications Engineering Technicians, Other

4. NSQF LEVEL COMPLIANCE

NSQF level for ITESM trade under ATS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. professional knowledge,
c. professional skill,
d. core skill and
e. Responsibility.

The Broad Learning outcome of ITESM trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
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 problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	ITESM
NCO – 2015	3114.9900
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block–I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01 year
CTS trades eligible for ITESM Apprenticeship	1. Electronics Mechanic 2. ITESM

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the ITESM course of 02 years duration under ATS.

Block I & II:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and explain different mathematical calculation & science in the field of study including basic electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, & Mensuration, Trigonometry, Heat & Temperature, graph, Power transmission, Pressure]*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Electrical & electronic symbol]*
4. Select and ascertain measuring instrument and measure dimension of components and record data.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Practice and understand basic electricity concepts.
2. Identify Resistors and Practice Soldering and desoldering.
3. Identify and test Inductors.
4. Identify and test Capacitors and Resonance circuits.
5. Identify and practice diode based circuits.
6. Identify and practice transistor based circuits.

7. Identify and practice special semiconductor devices and circuits.
8. Practice and understand working with DC power supply.
9. Practice and understand working with Digital electronic circuits
10. Identify and connect Battery and combinations.
11. Identify and connect Oscilloscope.
12. Practice and test Transmitter and circuits.

Block – II

13. Create, save and edit Word and spreadsheet files.
14. Identify Hardware in Personal computers
15. Remove, replace and reinstall RAM, ROM, Hard drive, Graphics Card, Fans etc
16. Install Windows
17. Backup Data
18. Handle Hard drive for various functions
19. Work with system utilities
20. Work with Windows update and Device Driver
21. Remove Junk files
22. Identify and practice SMPS
23. Identify, Practice Mother boards
24. Identify and practice Memory chips

NOTE: *Learning outcomes are reflection of total competencies of a trainee and assessment will be carried out as per assessment criteria.*

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1. 1. Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1. 2. Recognize and report all unsafe situations according to site policy.
	1. 3. Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1. 4. Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1. 5. Identify and observe site policies and procedures in regard to illness or accident.
	1. 6. Identify safety alarms accurately.
	1. 7. Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1. 8. Identify and observe site evacuation procedures according to site policy.
	1. 9. Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1. 10. Identify basic first aid and use them under different circumstances.
	1. 11. Identify different fire extinguisher and use the same as per requirement.
	1. 12. Identify environmental pollution & contribute to avoidance of same.
	1. 13. Take opportunities to use energy and materials in an environmentally friendly manner
	1. 14. Avoid waste and dispose waste as per procedure
	1. 15. Recognize different components of 5S and apply the same in the working environment.
2. Understand, explain different mathematical calculation & science in the field of study including basic	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.

electrical and apply in day to day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Mensuration, Trigonometry, Heat & Temperature, graph, Power transmission, Pressure]*	2.2 Measure dimensions as per drawing
	2.3 Use scale/ tapes to measure for fitting to specification.
	2.4 Comply given tolerance.
	2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
	2.7 Explain basic electricity, insulation & earthing.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Electrical & electronic symbol]*	3. 1. Read & interpret the information on drawings and apply in executing practical work.
	3. 2. Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters.
	3. 3. Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments as per tool list.
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
	5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts
6. Explain energy conservation, global warming and pollution and contribute	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment

in day to day work by optimally using available resources.	pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7. 1. Explain personnel finance and entrepreneurship.
	7. 2. Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	7. 3. Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8. 1. Use documents, drawings and recognize hazards in the work site.
	8. 2. Plan workplace/ assembly location with due consideration to operational stipulation
	8. 3. Communicate effectively with others and plan project tasks
	8. 4. Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.

SPECIFIC OUTCOME

Block-I& II (Section:10 in the competency based curriculum)

*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking / Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*

8. SYLLABUS

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1.	1. Importance of trade training, List of tools & Machinery used in the trade. 2. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). 3. First Aid Method and basic training 4. Safety signs for Danger, Warning, caution & personal safety message 5. Preventive measures for electrical accidents & steps to be taken in such accidents. 6. Use of Fire extinguishers 7. Identification of tools &equipments as per desired specifications for marking & sawing.	All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Job area after completion of training. Importance of safety and general precautions observed in the in the industry/shop floor. Introduction of First aid. Operation of electrical mains and electrical safety. Introduction of PPEs. Response to emergencies e.g.; power failure, fire, and system failure. **Importance of housekeeping & good shop floor practices.** Introduction to 5S concept & its application. **Occupational Safety & Health**: Health, Safety and Environment guidelines, legislations & regulations as applicable. Bench vice types, uses, care & maintenance, vice clamps. Measuring standards (English, Metric Units), Linear & angular measurements- their units. Try square, ordinary depth gauge, protractor- description, uses and cares.
2.	8. **Basic concepts of Electricity:** a) Identify specification of types of fuses. Identification and specification of type of switches. b) Identification of meter types and measuring range. c) Construct a simple circuit using AC/DC supply, lamp, fuse and switch. d) Measure circuit voltage and current using voltmeters and ammeters.	a) Concept of current and voltage. AC, DC Supply indicating lamps. Different types of Fuses and their applications. Different types of switches used in electrical and electronic applications. b) Circuit voltage and current. Measuring circuit voltage and current using voltmeters and ammeters. AC and DC meters. c) Measuring instruments, MC, MI type, Ammeter, Voltmeter, Multimeter or measuring voltage and current. Construction, characteristics/ features and specification.

	e) Measure voltage and current using Multi-meter (analog-digital). f) Use Multimeter to check uses, lamps and switches. g) Measure DC and AC power using V-I method and using power meter.	d) Meaning of Circuit and basic electrical circuits. e) Meaning of resistance, continuity and continuity testers. Multimeter for checking continuity.
3.	**9. Resistors. Soldering and De-soldering:** a) Identify different types of resistors from physical appearance. b) Identify resistor value and tolerance using colour code. c) Measuring resistance using Multimeter. d) Soldering and de-soldering techniques, practice using hook-up wires. Soldering resistors on Tag board. e) Verification of Ohms Law and Kirchhoff's Laws. f) Soldering resistors on PCB. De-soldering practice. g) Experiment using P.T.C and NTC resistors. h) Experiment to check VDR's, LDR's. Test Pots, Presets.	a) Classification, characteristics and application of different types of resistors. Carbon film, metal film, wire wound, cermets and surface mounted. b) Colour coding of resistors. Calculating measuring resistance value and its tolerance value. Wattage of resistors, specific resistance and their importance. c) Soft soldering and precautions to be taken for making a good solder joint. Types of solder and need of soldering paste. d) Ohms law and Kirchhoffs Laws. e) Printed circuit boards and its application. f) Temperature dependent resistors and their applications. (PTC and NTC). g) Voltage dependent resistors (VDR). h) Photoelectric effect, Light Dependent resistors. i) Variable resistors, pots, presets, types and application. Log and Linear resistors.
4.	**10. Inductance:** a) Identification of different types of inductors and its specifications. b) Measure inductance using LCR meter. Calculate inductive reactance at different input signal frequencies. c) Demo on self and mutual induction. d) Check step down transformers. e) Rewind a transformer to given specification using winging machine.	a) Definition of inductance. Types of inductors and their application. b) Inductive reactance, measuring inductance and inductive reactance. Meaning of lead, lag. Effect of inductor on power factor. Frequency dependence of inductive reactance. c) Self and Mutual inductance. Coefficient of coupling. d) Transformers. Turns ratio. Transformer winding. Winding machines. e) Transformer losses and efficiency. f) Uses, losses, efficiency type of cores and uses for LF, HF, VHF transformer. g) Transformers used in high frequency

	f) Finding losses and efficiency of given transformers. g) Identifying and testing high frequency transformers used in electronic circuits.	applications.
5.	**11. Capacitance and Resonance circuits:** a) Identify of different types of capacitors from colour code and typographic code. b) Test working condition of capacitor. Measure capacitance using RLC meter. c) Measure capacitive reactance at different frequencies. d) Measure capacitance and capacitive reactance of, capacitors in series and capacitors in parallel. e) Find the resonance frequency of a given Series and parallel resonance circuit.	a) Working principle of capacitors. Electrostatic action, dielectric constant. Unit of capacitance and capacitive reactance. b) Measuring capacitance and capacitive reactance. c) Behaviour of capacitance at different frequencies. d) Capacitors in series and parallel. e) Meaning of Resonance. Application of resonance. Series and parallel resonance circuits.
6.	**12. Electronic Components:** a) Identify terminals of different types of diodes. Record its specifications referring to diode data sheet. b) Plot forward and reverse characteristics of diode Testing working condition of diodes. c) Construct and test a half wave and full wave diode rectifiers. d) Construct and test a Bridge rectifier with and it houtfilter. e) Construct a bridge rectifier with capacitance input filter. f) Draw Zener diode characteristics, Simple voltage regulator using zener diode.	a) Semiconductor, intrinsic and extrinsicsemi conductors, P and N type semiconductor. Development of P.N. junction barrier potential. Effect of temperature. Breakdown voltage. b) Different types of Diodes. Diode terminals. Diode specifications using data book. c) Forward and reverse characteristics of diode. Testing diodes using Multimeter. d) Half wave and Full wave rectifiers using diodes. Transformer requirements. Calculating output DC, ripple factor. e) Bridge rectifier. Calculating output DC, ripple factor. f) Filters for rectifiers. Calculating output DC, ripple factor. g) Zener diode-Its characteristics and Electronic Component symbols, Series circuit, Representation of IR voltage drops. Polarity of IR voltage drops, Total power in series circuits, related exercise application for

		voltage regulation. Calculating the series resistor for required current rating. h) Specifications of a regulated power supply and testing a power supply for its specifications.
7.	***13. Transistor and Amplifiers:*** a) Identify types of transistors based on their physical appearance. Identify the leads of the given assorted types of transistors. b) Quick test given transistors using Multimeter. Identify opens, shorted junctions. c) Wire and find the gain of amplifiers in - CB, CE, CC configurations.	a) Working principle of PNP, Bipolar transistors. Types of transistors and applications. Leads of transistors and their identification. b) Forward and reverse bias of transistor Junction. General values of junction resistances. Quick testing a transistor- using Multimeter. c) Transistor configuration - CB, CE, CC, alpha, beta. Types of Biasing of transistor amplifiers, comparison and applications. Thermal runaway. Steady and Dynamic characteristics. Testing- get frequency response, gain bandwidth product, signal to noise ratio.
8.	**14. Special Semiconductors-FET:** a) Construct and test a JFET amplifier. b) Construct and test a Mos FET application circuit. c) Construct and test a relaxation oscillator using UJT. d) Construct and test an application circuit using SCR. e) Construct and test an application circuit using DIAC. f) Construct and test an application circuit using TRIAC.	a) Field effect transistors, types, working principle, applications. b) Working principle and application of UJT. c) Working principle and application of SCR. d) Working principle and application of TRIAC. e) Working principle and application of DIAC.
9.	**15. Power supply:** a) Practice on identifying and using the controls on a regulated power supply. b) Assemble and test a series regulated power supply. c) Assemble and test a shunt regulated power supply. d) Assemble and test a fixed	a) Unregulated, regulated DC Power supply specifications. Application of different types of power supply for specific application types. b) Series regulator using transistor. Short circuit protection. Overload protection. c) Shunt regulators using transistors. d) Fixed Voltage regulators using IC's. e) Variable voltage regulators using IC's. f) Mains voltage stabilizers. g) Inverters and converters.

	voltage regulator using 3pin IC. e) Assemble and test a variable voltage regulator using IC. f) Assemble a simple inverter and converter for use with emergency lamp. g) Identify the parts and controls of a UPS. Practice switch-on and switch-off procedures.	h) Un-interrupted power supply, types and applications.
10.	**16. Digital Electronics** a) Identify the specifications of given digital IC's referring to data books. b) Verify the truth table of two input OR, NOR, AND, NAND, NOT gates. c) Verify the truth table of XOR and XNOR Gates. d) Realization of different gate type using NAND gates. e) Realization of half adder & full adder using NAND gates. Realization half subtractor and full subtractor using NAND gates. f) Verifying encoder/decoder/multiplexer/ demultplexer IC truth tables. g) Realization and verification of truth table of RS, JK and MS- JK flip-flop. h) Realization and verification of D-flip flop. i) Realization and verification of up & down (sync/async) counter. j) Verification of A/D & D/A converter. k) Realization of shift registers using FF. l) Verification of Right-shift, Left- shift registers.	a) Number systems and conversions. Classification of digital IC's. Use of data book for identification of digital IC's. b) Basic LOGIC GATES and truth table. Boolean algebra. c) Logic families, logic levels, propagation delay. Multiple input gates. d) XOR, XNOR gates and application. e) Simplification of Boolean equations. f) Combinational logic circuits. g) Half adder, full adder, parallel binary adder, half subtractor, full subtractor. h) Commercially available adders/subtractors. i) Comparator, decoders, encoders, multiplexer, demultiplexer. j) Parity generators / checkers. RS Flip -Flop, JK flip-flop, Master- Slave flip-flops. k) Types of triggering and applications. D flip-flops. l) Counters, ripple, synchronous, up-down, scale-n counters. m) Principles of A/D & D/A converter. Commercially available A/D & D/Aconverters. n) Shift registers. Types, applications. o) Commercially available shift registers and applications. p) Conversion of serial data into parallel and vice-versa. q) Concept of Karnaugh Map (K-Map).

	p) Verification of Serial-in-parallel out and parallel in serial out of data. q) Representation of logic function's truth table using K-Map.	
11	**17. Battery:** Familiarize with the lead acid battery, Charging of batteries, Series parallel connection of batteries.	Lead acid cell, its construction and chemical changes during charging and discharging. Battery charging methods. Maintenance free batteries. Lithium cell, Ni-cad cells their construction and applications.
12	**18. Oscilloscope:** a) Identify CRO front panel controls. b) Measure of DC/AC voltages and frequency using CRO. c) Identify the internal parts of a CRO and CRT. d) Calibrate A given CRO	a) Working principle and application. b) Precautions to be taken while measuring voltages using CRO. c) Internal parts of a CRO. Construction and function of CRT and its associated circuitry. a) d)Simple Calibration procedures care and maintenance.
13.	**19. Modulation, Demodulation and Transmitters:** a) Identifying AM signal. Measurement of percentage of modulation using CRO. b) Construct and test a simple Amplitude modulator. c) Construct and test a crystal receiver. Construct and simple Frequency modulator /transmitter. Test transmitter using FM radio.	b) Modulation – types of modulation. AM, FM, PM. Amplitude modulation. Measurement of percentage of modulation. c) AM Transmitter block diagram. Amplitude modulator circuit and working. d) AM receiver block diagram. Principle of an AM demodulator/detector - analysis of crystal receiver. e) Frequency modulation-bandwidth requirement. FM transmitter block diagram. Comparison with AM- advantages of FM over AM. f) FM receiver block diagram. Principle of Demodulation of FM signals. g) Pulse modulation -PAM, PWM and PCM. Demodulators. Advantages and applications.
	Assessment/Examination 03days	

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	**20. Word Processing:** a) Creating and saving document files using Word processing software. b) Formatting text and editing. e) Inserting pictures in documents. f) Creating tables. h) Saving word documents in other formats. i) Setting page and margins; Printing documents. **Spreadsheet Processing:** j) Creating Worksheets using Spreadsheet Software. k) Formatting cells. l) Using formula in cells. m) Graphs and tables. n) Printing spreadsheets.	a) Introduction to word processing and comparison of features. Creating and saving document files using Word processing software. b) Formatting test and editing. c) Setting page and margins. Tabs and indents. e) Inserting pictures in documents. f) Creating tables. h) Saving word documents in other formats. i) Printing documents. j) Introduction to spread sheet. Creating Worksheets using Spreadsheet Software. k) Formatting cells. l) Using formula in cells. m) Graphs and tables. n) Printing spread
2.	**21. Hardware Identification:** • Identify the front and rear panel controls and ports on a PC • Cases • Cooling • Cables & Connectors • Power Supply Connections • Mother board Components and Connections • Mother board CPU (Processor) • RAM (Memory) • Hard Drive Connections • ROM Drives • Graphics Cards	a) Types of I/O devices and portsona standard PC for connecting I/O devices. b) Function of keyboard, brief principle, types, interfaces, connectors, cable. c) Function of Mouse, brief principle, types, interfaces, connectors, cable. d) Function of monitor, brief principle, resolution, size, types, interfaces, connectors, cable. e) Function of Speakers and Mic, brief principle, types, interfaces, connectors, cable. f) Function of serial port, parallel port, brief principle of communication through these ports, types of devices that can be connected, interface standards, connectors, cable.

3.	**22. Hardware Remove-Test-Replace/Install:** • Removing and installing RAM • Removing and installing ROM • Removing and installing a Hard Drive • Removing and installing a Power Supply • Removing and installing a Graphics Card • Install Expansion Cards • Removing and installing Fans • Removing and installing Motherboard • Removing and installing the Processor • Installing a CPU Cooler • Troubleshooting • Checking the Power Switch • Removing the CMOS Battery • Seating Expansion Cards	a) Types of Processors and their specifications (Intel: Celeron, Pentium family, Xeon, dual core, quad core, core 2 duo, i3,i5,i7 and AMD). b) Principle of storing. Bitwise data organization. c) Semiconductor memories, RAM, ROM, PROM, EMPROM, EEPROM, Static and dynamic. d) Concept of track, sector, cylinder. Read write head, head actuator, spindle motor, sensors, PCB. e) HDD, Principle of working of Hard disk drive, cylinder and clusture, types, capacity, standards, interface, jumper setting. Drive components-hard disk platens, and recording media, air filter, read write head, head actuator, spindle motor, circuit board, sensor, features like head parking, head positioning, reliability, performances, shock mounting capacity. f) CMOS setting (restrict to drive settings only). g) Basic blocks of SMPS, description of sample circuit.
4.	**23. Windows Installation:** A walkthrough of installing Windows 7 /10/ latest version. Imaging: create a Windows system image How to Backup/Restore your Windows partition with the bootable image disk Duplicating a partition (creating a multi boot system) A multi boot system: the Windows boot manager vs. an alternative boot manager Setting up a multi boot / dual boot system	a)Types of software. System software-OS, Compiler. b) Application software like MS office. High level, low level language, functions of an operating system. Disk operating system. c) Concept of GUI, Modes of starting on different occasions. d) Desktop, Icon, selecting, choosing, drag and drop. e) My computer, network neighborhood/network places. f) Recycle bin, briefcase, task bar, start menu, tool bar, and menus. g) Properties of files and folders. h) Properties of connected devices. i) Applications under Windows accessories.

		j) Windows Help. k) Finding files, folders, computers. l) Control panel. Installed devices and properties.
5	**24. Data Backup:** • 3 types of media to use when backing up your data, and when each method is appropriate • How to create automated backups to ensure you always have a recent backup • Learn how to manually backup data • How to make an exact copy (clone) of a hard drive **Hardware Troubleshooting:** • The danger in not diagnosing problems First • Learn how to test your RAM • Check your hard drive for errors **PC Cleaning:** • The best cleaning supplies to use • How to increase air flow and increase your computer's lifespan • How to clean your computer	a) Utilities for recovering data from defective/bad hard disks. b) Introduction to removable stoage devices, Bulk data storage devices-magnetic, optical, magneto optical drives, WORM drives. c) CD ROM drives-Technology, Types of CD drives, working principle application. d)Technology, working principle, capacity, media of DAT Drive and back-upprocedures. e)Technology, working principle, capacity, media of DVD ROM drive . f)Technology, working principle, capacity, media of CDWRITER and use different modes of writingona CD. Using of utility for CD writing.
6	**25. Hard Drives:** • Partitioning hard disk (primary and extended partitions) • Hard Drive Failures • How To Troubleshoot a Noisy Hard Drive • How to Format a Hard Drive • How to Completely Erase a Hard Disk Drive • Installation and configuration of storage devices. Integration of PATA and SATA drivers. • Recover emails, files, and data from a crashed hard drive or computer	• What's Inside a Hard Drive? • How Hard Disks Work • Inside: Hard Drive Mother board • Desktop Hard Drive Buyer's Guide • What is RAID? Using Multiple Hard Drives for Performance and Reliability • Partitioning hard disk (primary and extended partitions) • Learn how to prevent your PC from getting malware • All the different types of malware and how they attack your PC • Diagram of a Hard disk, diagram of internal

	Virus Removal: • Installing a modern anti-virus utility • Run a full system scan, Hard Drive scan, selective folder scan. • How to fix your browser from redirecting to other websites (browser hijack) • When utilities don't fix everything, how to manually remove a virus • 2 specific things to disable when trying to get rid of a nasty virus	Components and structure. • Calculation of Hard disk capacity, Read /write time, latency time, seek time. • The difference between Anti-Virus and Anti-Spyware software
7 - 8	**26. System Utilities:** • How to check to see if your hard drive has bad sectors • Fix the master boot record • How to run an in-place installation • Using Task manager and Event Viewer • Using System Monitor and Performance Logs • Configure config.sys file. **User Account Customization:** • How to create and configure user accounts in Windows XP,Vista,7/8/10 • Make Changes to an Account • Changing the storage location of the personal folders • Changing the storage location of installed software • Setting up Parental Controls in Windows XP,Vista,7, 8, 10 • How to Use Fast User Switching in Windows • View Hidden Files and Folders • Lock Down Windows 7 / 8 / 10 With User Account Control • How to Delete User Accounts in Windows	Bad Sectors in Hard disk, Master Boot Record, in-place installation, Registry fixing, performance level check, Shortcut fixing, Fixing Startup process, log, etc. Users and user account. Privileges, scope, permissions etc. Concept of Virtual Machine.
9.	**27. Windows Update & Device Driver:** • How to find your system version in	Version of a software, Service pack, Updating of OS, Different configurations of Computer system and its peripherals,

	Windows, Linux • Installing a service pack • How to perform a Windows Update **Software Installation:** • Installing a software program in windows • How to run a file from MS-DOS • Extracting or uncompressing a compressed file • How to compress or make files into one file • Extracting files from the Windows cabinets • Uninstalling Windows software • Unable to remove a program from Windows Add/Remove programs	Compatible with different hardware/software. Software Installation - Pre-installation -Prerequisites, Install procedure, Rollback or Un-install procedure, Tests. Post-installation -Backup procedure & specifications, Restore procedure, Periodical view check. Awareness of legal aspects of using computers such as copyright, patent etc.
10	***28. Junk File Removal*** • How to Remove Junk Files • How to completely remove "deleted" files • How to clear web browser cache fire fox, IE, chrome, • 5 steps to clean up your computer files • Personalize your Windows XP-based PC ***Linux OS*** • Using a Linux Live CD • Why you want a Linux Live CD • Use Ubuntu Live CD to Backup Files from Your Dead Windows Computer • Using a live CD as your Linux Desktop ***Outlook Configure & Backup*** • Configure outlook • Backup and Restore Outlook • How to restore the Outlook default installation, toolbars and settings • Restore Deleted Items from an Outlook PST-file	Junk files, deleted files, configuration of internet browser. - Introduction to UNIX/LINUX and its structure. - Files and Processes in Linux. - Directory structure of Linux O.S. Outlook - Add and use contacts, Calendar basics, Recall and replace sent messages, Send automatic replies when you're out of the office, The ins and outs of BCC, Use Instant Search to find Calendar items, Use Instant Search to find contacts, Use Instant Search to find messages and text, Add holidays to your calendar, Create or delete a search folder, Import and export v Cards to Outlook contacts, Make the switch to Outlook 2013, Reach out with contact groups (distribution lists), Send or delete an email stuck in your outbox, Take calendars to the next level, Track email with read receipts, Password protect your mailbox, Use rules to manage your email.
11	**29. SMPS:** a. Remove the SMPS from PC cabinet. Identify the types of	a) DC power source to PC. Need for SMPS. Specifications, Rating of SMPS based on type of motherboard and devices used. (AT/ATX,

	output connectors of SMPS. b. Identify output voltages using colour coding. Measure voltage levels. Test power cable and fuse. c. Open and cleaning the cooling fan and other parts. d. Fix the SMPS inside the PC cabinet and test PC. b) Use of Debug Card Post Error & Code, SMPS Tester, PCI slot testing tool.	Micro ATX, mini ATX) b) Colour coding adopted. Types of connectors used. Output voltage levels. Measuring technique. c) Precautions to be taken while cleaning the internal area of SMPS. d) Precautions to be taken while fixing the SMPS inside the cabinet.
12	**30. Mother Board / System board:** a) Remove the mother board from PC cabinet. Identify the main components on the mother board. b) Identify the form factor of the mother board. c) Identify the chipset used. d) Identify the number of slots available for add-in cards (ISA, PCI, AGP). e) Identify the type of processor connector (slot/ socket/ dual). f) Identify the BIOSROM, make, version. g) Identify the jumper settings (if any)on the mother board. h) Identify the types of slots available for memory modules. i) Identify the connectors for Hard disk (IDE) j) Identify the connector for Coml, Com2. k) Identify the connectors for PS/2. l) Identify the connectors for USB. m) Identify the connectors for Game port. n) Identify the connector for parallel port (Centronics). o) Identify the connector for Keyboard (in exclusive lyavailable)	a) Mother board function, types, main components on the mother board and their interconnection. Functional description of mother board, specification and variation. Precautions to be taken before removing the mother board from PC cabinet. b) Form factor of mother board. c) Meaning and function of chipsets. Manufacturers, comparison, importance of quality chip set for performance of PC. d) Bus standards-evolution, speed, latest trends (ISA, PCI, AGP, new trends). e) Types of processor connectors, examples of latest processor connectors, number of pins. f) Function of BIOS, manufacturers of BIOS. g) IDE ports available. Primary, secondary. Number of drives that can be connected. Methods of adding SCSI drives. h) Details of FDD connector on mother board. i) Facility for serial Communication ports on mother board. j) Facility for PS/2Communication ports on mother board. k) Meaning and advantage of USB ports. Facility for USB Communication ports on motherboard. l) Facility for game ports on motherboard. m) Facility for parallel Communication port on mother board. n) Type of connectors in which keyboards

	p) Identify the specifications of the Lithium battery. q) Identify any other special component tavailable on the motherboard. r) Identify the connectors for front panel switches and display.	cabbe used, old type full size DIN connector. o) Need of Lithium battery. Its specifications. Replacement procedure. Effect of removing the battery from mother board. p) Other special components available on mother boards such as integrated devices/drivers,
13	**31. Memory:** a) Identification of different types of memory devices. b) Identification of memory chips. c) Identification of SIMM and DIMM memory modules, number of pins, type.	a) Memory devices, types & principle of storing. Data organization 4 bit, 8 bit, word. b) Semiconductor memories, RAM, ROM, PROM, EMPROM, EEPROM, Static and dynamic. c) Example of memory chips, pin diagram, pin function of popularly used RAM, EPROM, and EEPROM Chips in PC's.
	Assessment/Examination 03days	

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING:

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**Engineering Drawing: Introduction and its importance** - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2.	**Fractions**: Fractions, Decimal fraction, Addition, Subtraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Calculator.	**Drawing Instruments : their uses** Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
3.	**Properties of Material** : properties -Physical & Mechanical, Types – Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous Alloys.	**Lines :** - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
4.	**Average :** Problems of Average. **Ratio & Proportion** : Simple calculation on related problems.	**Drawing of Geometrical Figures:** Drawing practice on: - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	**Mass, Weight and Density**: Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density.	**Dimensioning:** - Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text

6.	**Percentage**: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	**Free hand drawing of** - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
7.	- Forces definition. - Definition and example of compressive, tensile, shear forces, axial and tangential forces. Stress, strain, ultimate strength, factor of safety for MS. **Speed and Velocity**: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation.	**Method of presentation of Engineering Drawing** - Pictorial View - Orthogonal View - Isometric view
8.	**Mensuration:** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle. Volume of solids – cube, cuboids, cylinder and Sphere. Surface area of solids – cube, cuboids, cylinder and Sphere. - Area of cut-out regular surfaces: circle and segment and sector of circle. - Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple solid blocks.	**Symbolic Representation (as per BIS SP:46-2003) of :** - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings
9.	**Algebra** : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables). - Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force.	**Dimensioning practice:** - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance.
10.	**Work, Power and Energy**: work, unit of work, power, unit of power, Horse power, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	**Construction of Geometrical Drawing Figures:** - Polygons and their values of included angles. Conic Sections (Ellipse) **Projections:** - Concept of axes plane and quadrant. - Orthographic projections - Method of first angle and third angle

		projections (definition and difference) - Symbol of 1st angle and 3rd angle projection as per IS specification. Drawing of Orthographic projection from isometric/3D view of blocks

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration : - 30 hrs.)**
1.	**Trigonometry:** Trigonometric ratios, Trigonometric tables. - Finding the value of unknown sides axnd angles of a triangle by Trigonometrical method. - Finding height and distance by trigonometry.	- Machined components; concept of fillet & chamfer; surface finish symbols.
2.	**Friction** and its application in Workshop practice.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
3.	**Heat & Temperature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	- Reading & interpretation of assembly drawing and detailing.
4.	**Basic Electricity**: Introduction, use of electricity, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections – series, parallel, electric power, Horse power, energy, unit of electrical energy. Concept of earthing.	- Reading of drawing. Simple exercises related to missing lines, dimensions and views. How to make queries.
5.	**Heat treatment** – Necessity, different common types of Heat treatment.	- Simple exercises related to trade related symbols. - Solution of NCVT test papers.
6.	**Graph:** - Read images, graphs, diagrams – bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	
7.	**Transmission of power:** By belt, pulleys & gear drive.	
8.	**Concept of pressure** – units of pressure, atmospheric pressure, gauge pressure – gauges used for measuring pressure**.** **Introduction to pneumatics & hydraulics systems.** Solution of NCVT test papers	

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy Duration : 20 Hrs.	Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy Duration : 20 Hrs.	Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet,

	Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills Duration : 15 Hrs. Marks : 07	
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II **Duration – 55 hrs.**	
4. Entrepreneurship Skills Duration : 15 Hrs. Marks : 06	
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation.

	Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity Duration : 10 Hrs. Marks : 05	
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education Duration : 15 Hrs. Marks : 06	
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.

First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation Duration : 05 Hrs. Marks : 03	
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. Quality Tools Duration : 10 Hrs. Marks : 05	
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOBTRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

Block – I

1. Practice and understand basic electricity concepts.
2. Identify Resistors and Practice Soldering and desoldering.
3. Identify and test Inductors.
4. Identify and test Capacitors and Resonance circuits.
5. Identify and practice diode based circuits.
6. Identify and practice transistor based circuits.
7. Identify and practice special semiconductor devices and circuits.
8. Practice and understand working with DC power supply.
9. Practice and understand working with Digital electronic circuits
10. Identify and connect Battery and combinations.
11. Identify and connect Osciloscope.
12. Practice and test Transmitter and circuits.

Block – II

13. Create, save and edit Word and spreadsheet files.
14. Identify Hardware in Personal computers
15. Remove, replace and reinstall RAM, ROM, Hard drive, Graphics Card, Fans etc
16. Install Windows
17. Backup Data
18. Handle Hard drive for various functions
19. Work with system utilities
20. Work with Windows update and Device Driver
21. Remove Junk files
22. Identify and practice SMPS
23. Identify, Practice Mother boards
24. Identify and practice Memory chips

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.

2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

ITESM			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1.	Connecting screwdriver	100 mm	16 nos.
2.	Neon tester	500 V.	16 nos.
3.	Screw driver set	(set of 5)	16 nos.
4.	Insulated combination pliers	150 mm	16 nos.
5.	Insulated side cutting pliers	150 mm	16 nos.
6.	Long nose pliers	150 mm	16 nos.
7.	Soldering iron.	25 W. 240 V	16 nos.
8.	Electrician knife	-	16 nos.
9.	Tweezers	100mm	16 nos.
10.	Digital Multimeter	Handheld, 230V 50 Hz, 10 A and DC V & I	16 nos.
11.	Soldering Iron Changeable bits	15 W	16 nos.
12.	De- soldering pump		16 nos.
B. LIST OF TOOLS REQUIRED			
13.	Crimping tool (pliers)		2 Nos.
14.	Soldering Iron	25W	6 Nos.
15.	Magneto spanner set		2 Nos.
16.	Screw driver	150mm	4 Nos.
17.	Steel rule	150mm	2 Nos.
18.	Scriber straight	150mm	2 Nos.
19.	Soldering Iron	240W	1 Nos.
20.	Allen key set	set of 9	2 Nos.
21.	Tubular box spanner	set of 6nos	1 No
22.	Magnifying lenses	75mm	3 Nos.
23.	Continuity tester		6 Nos.
24.	Soldering iron	10W	6 Nos.
25.	Cold chisel	20mm	1 No.
26.	Scissors	200mm	1 No.
27.	Handsaw	450mm	1 No.

C. TOOLS & EQUIPMENTS: (Computer Hardware: Installation and Maintenance)			
HARDWARE			
28.	Server Computer		01 no
29.	Desktop Computer		10 nos.
30.	Laptop, Notebook		01 each
31.	Intel Mobile Desktop based PC with LCD monitor		01 no
32.	Tablet		02 Nos.
33.	Printers: Laserjet, deskjet, passbook, mfd		01 each
34.	Network Printer		01 no
35.	5KVA online UPS		02 nos.
36.	LAN Cards, Wi-fi LAN Cards		06 nos. each.
37.	LCD/DLP Projector		01 no
38.	Power Meter		02 nos.
39.	Crimping Tools		06 nos.
40.	Computer Toolkits		06 Nos.
41.	Computer Spares:		As required
42.	Motherboards (of different make)		4 nos.
43.	Cabinets		4 nos.
44.	Processors (of different make)		4 nos.
45.	Hard Disk (500 GB or better) different types		4 nos.
46.	Optical Drives		4 nos.
47.	LCD/LED/TFT Monitors		2 nos.
48.	Pen Drives		4 nos.
49.	External Hard disk		2 nos.
50.	External DVD Writer		2 nos.
51.	Keyboards		4 nos.
52.	Mouse		4 nos.
53.	Anti static pads		4 nos.
54.	Anti static wrist wraps		4 nos.
55.	SMPS		4 nos.
56.	Digital Multimeters		10 nos.
57.	Blu-Ray drive and player		2 nos.
58.	External Hard Disk		2 nos.
59.	Digital Camera		2 nos.
60.	HD Display		2 nos.
61.	Network storage		2 nos.
62.	Card Reader		2 nos.
63.	Game video card		2 nos.
64.	Web Cam		2 nos.
65.	Surround sound speakers		2 nos.
66.	Different types of memory cards		2 nos. each

67.	Laptop kits		12 nos.
68.	Laptop spares: Cabinet with display, memory, hard disk, battery pack, keyboard membrane, chargers		As required
69.	SMPS Trainer kit		2 nos.
70.	UPS Trainer kit		2 nos.
71.	Power electronics Trainer kit		2 nos.
72.	Post error debugging card		4 Nos.
73.	SMPS Tester		4 Nos.
74.	PCI slot Testing tool		4 Nos.
SOFTWARE			
75.	Windows Server Operating System		1 license
76.	Windows Operating System		2 licenses
77.	Linux Operating System		2 nos.
78.	Network Management Software		01 No.
79.	MS Office		2 nos.
80.	Anti virus software		2 nos.
81.	Data recovery software		2 nos.
82.	LINUX Server Operating System (Samba / Su-se)		01 No.
83.	Open source Pc Utility / Tweak Software		As available
FURNITURE and Other Equipments			
84.	Computer Tables		10 nos.
85.	Computer Chairs		20 nos.
86.	Printer Table		1 no.
87.	Class room chairs		20 nos.
88.	Air conditioners (optional)		2 nos.
89.	Scanner		1 no
90.	Modem		1 no
91.	Telephone Line		1 no
92.	Broadband Internet connection		1 no
93.	Fire fighting equipments		As required
94.	Hardware and Network Trainer Kit		6 nos.
D.TOOLS & EQUIPMENTS: (Computer Networking)			
HARDWARE			
95.	Wireless Network Adapter		6 nos.
96.	Wireless Access Point		4 nos.
97.	Router		4 nos.
98.	Managed Layer 2 Ethernet Switch 8/16/24 port		2 nos.
99.	Managed Layer 3 Ethernet Switch 8/16/24 port		2 nos.
100.	Network Training System		2 nos.
101.	LAN Protocol Simulation and Analyser Software		2 nos.

102.	Network and Internet security trainer		2 nos.
103.	LAN cable tester		2 nos.
104.	Network cables – UTP		As required
105.	Network Cables – coaxial, flat, ribbon		As required
106.	LAN Cards, wi-fi LAN Card		05 nos. each
107.	Connectors for cables		As required
108.	Power Meter		2 nos.
109.	Media Convertor		4 each
110.	8/16/24 port UTP jack panel		2 nos.
111.	SC Couplers		12 nos.
112.	SC Pigtails		12 nos.
113.	RJ-45 connector		As required
114.	Fluke Meter		2 nos.
115.	Crimping Tools		6 nos.
116.	Switch with POE ports		2 nos.
117.	POE adapters		2 nos.
118.	Network Camera (Outdoor / Indoor)		2 no each
119.	Fibre Optics cable with LC connector		As required
120.	LC connector module		As required
E. RAW MATERIALS:			
HARDWARE			
121.	White Board Marker		1 Dozens
122.	Duster Cloth(2' by 2')		20 Pcs
123.	Cleaning Liquid 500 ml		2 Bottles
124.	Xerox Paper (A4)		As required
125.	Full Scape Paper (White)		1 reams
126.	PCB, solder flux etc& electronic components		As required
127.	Wires, cables Plug sockets switches of various types and other consumables		As required
128.	Resistors, Capacitors, Inductors, Diodes, LED, Transistors, Thyristors, ICs etc.		As required
129.	Spare Transformers and power devices required for servicing SMPS		As required
130.	Various types of Button Cells		As required
131.	Dry Cell		As required
132.	Hand Brush		As required
133.	Silicon grease		As required
134.	Heat sink agent		As required
135.	RAM 512 MB		As required
136.	Cartridges for printer		As required
137.	Optical Mouse P/S2 or USB		As required
138.	P/S2 OR USB Key Board		As required
139.	SMPS		As required

140.	CMOS Battery		As required
141.	3 Pin Power Chord		As required
142.	Cat 5/5e/6 cable		300 meters
143.	Flat Cable		100 meters
144.	Stapler Small		2 pcs
145.	Stapler Big		1 pcs
146.	AAA battery for remote		As required
147.	AA battery for clock		As required
148.	8 GB pen drives		4 Nos
149.	CDs		20 Nos
150.	DVDs		10 Nos.
151.	Wall Clock		1 pcs
152.	Anti static pads		As required
153.	Anti static wrist wraps		As required
154.	Soldering wire and paste		As required
155.	RJ – 45 Connector		As required
156.	Telephone cable		As required
157.	Co-axial cable		As required
158.	RJ-11 connector		As required
159.	BNC connector, T connector, terminator		As required
160.	Keystone jack		As required
161.	Patch / Jack Panel		As required
162.	Patch / Mounting cord		As required
163.	RJ-45 Info outlet with faceplate		As required
164.	RJ-45 I/O Box		As required
165.	RJ – 45 Cable extender		As required
166.	8-port HUB		04 Nos.
167.	LAN Card		04 Nos.
168.	Wi-fi LAN Card both PCI and USB		02 Nos. each
169.	Display Card		02 Nos.
170.	USB to RJ-45 converter		08 Nos.
171.	RJ-45 to USB converter		08 Nos.
172.	USB HDD 500 GB		02 Nos.

Note: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: ITESM

LIST OF TOOLS& EQUIPMENTS FOR -20APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		20+1 set
2.	Set square celluloid 45^o	(250 X 1.5 mm)	20+1 set
3.	Set square celluloid 30^o-60^o	(250 X 1.5 mm)	20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board IS: 1444	(700mm x500 mm)	20+1 set
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1	Drawing Board		20
2	Models : Solid & cut section		as required
3	Drawing Table for trainees		as required
4	Stool for trainees		as required
5	Cupboard (big)		01
6	White Board	(size: 8ft. x 4ft.)	01
7	Trainer's Table		01
8	Trainer's Chair		01

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														