Industrial Training Institute
ICTSM

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

COMPETENCY BASED CURRICULUM

INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5

SECTOR – IT & ITES

Industrial Training Institute

Directorate General of Training

Skill India
कौशल भारत - कुशल भारत

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INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE

(Engineering Trade)

(Revised in 2018)
Version: 1.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
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1. COURSE INFORMATION

During the two-year duration of Information & Communication Technology System Maintenance trade, a candidate is trained on Professional Skill, Professional Knowledge, Engineering Drawing, Workshop Calculation & Science and Employability Skill. In addition to this, a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered related to the trade are categorized in four semesters each of six months duration. The semester wise course coverage is categorized as below:

1st Semester – In this semester, the trainee learns about safety and environment, use of fire extinguishers. They learns to work with various basic Electrical Components, perform all functions of Resistors and Soldering, De-soldering practice, able to recognize different types of Inductors, measure Inductance and uses of Transformer. They know about Capacitor, measure Capacitance and find resonance value of a circuit. Testing and use of Diode to construct basic Electronic components. Recognize different types of Transistors and use it as Amplifiers in electronic circuit. Construct and test of an application circuit using different types of Semiconductors. Assemble and test various Power Supply circuit. Construct all digital circuit using logic gates and verify truth table. Familiarize charging of acid battery and verify connections. Verify internal parts of CRO and use it to measure voltage, frequency, modulation of modulator/ transmitter. Working with some important Mechanical, Electrical & Electronics Accessories used in information communication system.

2nd Semester – In this semester, the candidate will be able to achieve the skill to work with Word Processing and Spreadsheet Software. Trainees are able to assemble and replace hardware components of Desktop Computer. Installation of Operating System and all other application software. Customization of Operating System and maintenance of system application software. Assemble and replace hardware components of Laptop PC. Replace/ install SMPS and troubleshoot its faults. Familiarize and upgrading various components of Motherboard. Recognize different types of memory devices, chips and its structure.

3rd Semester – In this semester, trainee learns about installation and customization of Linux operating system. Installation of Printer, Scanner and troubleshoot their faults. Replace/ install Display Driver Card and servicing, configuration of various display unit. Replace/ install Sound Card and set properties to adjust sound quality. Maintenance and servicing of UPS. Installation and configuration of Modem, System Resources, Add on Cards, Cables & Connectors. Upgrading, maintenance and troubleshooting of PC. Assemble, replace and troubleshooting various parts of Tablet/ Smart Devices. Browsing internet and work with Cloud Computing.

4th Semester – In this semester, the candidate will be able to set up and configure Networking System using various network devices. Sharing and controlling resource and Internet connection

through network. Implement Network Security to protect from various attacks on networking. Installation and basic configuration of Windows Server. Installation, configuration of DNS, Routing and user account customization. Configuration of Server and managing Server Network security and Infrastructure. Installation and basic configuration of Linux server.

2. TRAINING SYSTEM

2.1 GENERAL

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

The "Information & Communication Technology System Maintenance" trade under CTS is one of the significant trades as no similar courses are available in the vocational system to cater this area. The course is of two years (04 semester) duration. It mainly consists of trade (skills and knowledge) and Core area (Workshop Calculation & Science, Engineering Drawing and Employability Skills). After passing out of the training program, the trainee is awarded National Trade Certificate (NTC) by NCVT which is recognized worldwide.

Trainee broadly needs to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
- Perform tasks with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job, and repair & maintenance work.
- Check the system specification and application software as per requirement of the design of job.
- Document the technical parameters in tabulation sheet related to the task undertaken.

2.2 CAREER PROGRESSION PATHWAYS:

- Can join Apprenticeship programs in different types of industries leading to a National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.

2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two-year (04 semesters): -

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	2266
2	Professional Knowledge (Trade Theory)	528
3	Workshop Calculation & Science	176
4	Engineering Drawing	264
5	Employability Skills	110
6	Library & Extracurricular Activities	176
7	Project Work	320
8	Revision & Examination	320
	Total	**4160**

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of the course and at the end of the training program as notified by the Government of India (GoI) from time to time. The employability skills will be tested in the first two semesters itself.

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 has to maintain an 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 NTC will be conducted by NCVT at the end of each semester as per the guideline of Government 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 the basis for setting question papers for final assessment. The examiner during final examination will also check** the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percentage for practical is 60% & minimum pass percentage of theory subjects is 40%. For the purposes of determining the overall result, 25% weightage is applied to the result of each semester examination.

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 the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the 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 examining 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 should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • Below 70% tolerance dimension achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.

practices	• A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 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 achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

ICT Engineer; is responsible for installing and ensuring uptime of the assigned ICT node/network segment, by undertaking preventive maintenance and fault management activities. The ICT Engineer is also responsible for performing upgrades, capacity augmentation, configuration changes and Point Interconnect testing with minimal disruption of services. The ICT or Information and Communication Technology equipment are NodeB/eNodeB, IP and TDM transmission equipment, IP and Packet Core switch, Cloud and Data Centre equipment

ICT Technician; is responsible to maintain the ICT nodes/installations live on 24x7 basis, observe and repair Level-1 faults/issues in installed ICT equipment at site, carry out specified preventive and corrective maintenance procedures and report relevant network incidents to the supervisor in time for information as well as response. ICT or Information and Communication Technology refers to NodeB/ eNodeB, IP and TDM transmission equipment, IP and Packet Core switch, Cloud and Data Centre equipment.

Computer System Hardware Analyst/Hardware Engineer; data processing requirements to plan data processing systems that provide system capabilities required for projected workloads and plans layout and installation of new system or modification of existing system. Confers with Data Processing and Project Managers to obtain information on limitations and capabilities of existing system and capabilities required for data processing projects and projected work load. Evaluates factors such as number of departments serviced by data processing equipment, reporting formats required, volume of transactions, time requirements and cost constraints, and need for security and access restrictions to determine hardware configurations. Analyses information to determine, recommend, and plan layout for type of computers and peripheral equipment, or modifications to existing equipment and system, that will provide capability for proposed project or work load, efficient operation, and effective use of allotted space. May enter data into computer terminal to store, retrieve, and manipulate data for analysis of system capabilities and requirements. May specify power supply requirements and configuration. May recommend purchase of equipment to control dust, temperature, and humidity in area of system installation. May specialize in one area of system application or in one type or make of equipment. May train users to use new or modified equipment. May monitor functioning of equipment to ensure system operates in conformance with specifications.

System Analysts; analyses user requirements, procedures, and problems to automate processing or to improve existing computer system. Confers with personnel of organizational units involved to analyse current operational procedures, identify problems, and learn specific input and output requirements, such as forms of data input, how data is to be summarised, and formats for reports. Writes detailed description of user needs, programme functions, and steps required to develop or modify computer programme. Reviews computer system capabilities, workflow, and scheduling limitations to determine if requested programme or programme change is possible within existing system. Studies existing information processing systems to evaluate effectiveness and develops new systems to improve production or workflow as required. Prepares workflow charts and diagrams to specify in detail operations to be performed by equipment and computer programmes and operations to be performed by

personnel in system. Conducts studies pertaining to development of new information systems to meet current and projected needs. Plans and prepares technical reports, memoranda, and instructional manuals as documentation of programme development. Upgrades system and corrects errors to maintain system after implementation. May assist COMPUTER PROGRAMMER in resolution of work problems related to flow charts, project specifications or programming. May prepare time and cost estimates for completing projects. May direct and co-ordinate work of others to develop, test, install, and modify programs.

Data Communication Analyst/Network Administrator; researches, tests, evaluates, and recommends data communications hardware and software: Identifies areas of operation which need upgraded equipment, such as modems, fibre optic cables and telephone wires. Conducts survey to determine user needs. Reads technical manuals and brochures to determine equipment which meets establishment requirements. Visits vendors to learn about available products or services. Tests and evaluates hardware and software to determine efficiency, reliability, and compatibility with existing system, using equipment such as computer terminal and modem. Analyses test data and recommends hardware or software for purchase. Develops and writes procedures for installation, use, and solving problems of communications hardware and software. Monitors system performance. Trains users in use of equipment. Assists users to identify and solve data communication problems. May write technical specifications to send to vendors for bid. May oversee or assist in the installation of communications hardware. May perform minor equipment repairs.

Reference NCO-2015:

a) 3114.0801 - ICT Engineer
b) 3114.0802 - ICT Technician
c) 2523.0200 - Computer System Hardware Analyst/Hardware Engineer
d) 2511.0100 - System Analysts
e) 2523.0100 - Data Communication Analyst/Network Administrator

4. GENERAL INFORMATION

Name of the Trade	Information & Communication Technology System Maintenance
NCO - 2015	3114.0801, 3114.0802, 2523.0200, 2511.0100, 2523.0100
NSQF Level	Level – 5
Duration of Craftsmen Training	Two years (Four semesters each of six months duration)
Entry Qualification	Passed 10th Class examination under 10+2 system of education with Science and Mathematics.
Unit Strength (No. Of Student)	20 (Max. supernumeraries seats: 6)
Space Norms	70 Sq. m
Power Norms	3.45 KW
Instructors Qualification for:	
1. Information & Communication Technology System Maintenance Trade	Graduate in Engineering / Technology in Computer Science/ IT/ Electronics & Communication from Recognized university with one year expreience in the relevant field. **OR** Post Graduate in Computer Science /Computer Application/ IT/ Electronics from Recognized university with one year expreience in the relevant field. **OR** Bachelor in Computer Science / Computer Application / IT OR NIELIT A Level from Recognized university with two years expreience in the relevant field. **OR** Three year Diploma from recognized Board / Institution in Computer Science / IT/ Electronics & Communication from recognized board of education with two years expreience in the relevant field. **OR** NTC/ NAC passed in "Information & Communication Technology System Maintenance" trade with three years post qualification experience in the relevant field. ***Desirable:*** Preference will be given to a candidate with CITS (Craft Instructor Training Scheme) in relevant trade. ***Note:*** ***Out of two Instructors required for the unit of 2 (1+1), one must***

	have Degree/Diploma and other must have NTC/NAC qualifications.
2. Workshop Calculation & Science	Degree in Engineering with one year experience. **OR** Diploma in Engineering with two years experience. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
3. Engineering Drawing	Degree in Engineering with one year experience. **OR** Diploma in Engineering with two years experience. **OR** NTC / NAC in the Draughtsman (Mechanical) with three years experience. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
4. Employability Skill	MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGT institutes. **AND** Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above. **OR** Existing Social Studies Instructors duly trained in Employability Skills from DGT institutes.
List of Tools and Equipment	As per Annexure – I

Distribution of training on hourly basis: (Indicative only)

Total hours /week	Trade practical	Trade theory	Work shop Cal. & Sc.	Engg. Drawing	Employability skills	Extra-curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

5. NSQF LEVEL COMPLIANCE

NSQF level for **Information & Communication Technology System Maintenance** trade under CTS: **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
e. Responsibility

The broad Learning outcome of **Information & Communication Technology System Maintenance** trade under CTS 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 work and learning.

6. LEARNING/ ASSESSABLE OUTCOME

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

6.1 GENERIC LEARNING OUTCOME

1. Apply safe working practices.
2. Comply with environment regulation and housekeeping.
3. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
4. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
5. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
6. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.

6.2 SPECIFIC LEARNING OUTCOME

Semester – I

7. Identify various basic Electrical Components and perform measurement of current, voltage using multimeter.
8. Perform all functions of Resistors and Soldering, De-soldering practice.
9. Recognize different types of Inductors, measure Inductance and uses of Transformer.
10. Measure Capacitance and find resonance value of a circuit.
11. Testing and use of Diode to construct basic Electronic components.
12. Recognize different types of Transistors and use it as Amplifiers in electronic circuit.
13. Construct and test of an application circuit using different types of Semiconductors.
14. Assemble and test various Power Supply circuit.
15. Construct all digital circuit using logic gates and verify truth table.
16. Familiarize charging of acid battery and verify connections.
17. Verify internal parts of CRO and use it to measure voltage, frequency, modulation of modulator/ transmitter.
18. Working with some important Mechanical, Electrical & Electronics Accessories used in information communication system.

Semester – II

19. Perform all the functions of Word Processing and Spreadsheet Software.
20. Assemble and replace hardware components of Desktop Computer.
21. Installation of Operating System and all other application software.
22. Customization of Operating System and maintenance of system application software.
23. Assemble and replace hardware components of Laptop PC.
24. Replace/ install SMPS and troubleshoot its faults.
25. Familiarize and upgrading various components of Motherboard.
26. Recognize different types of memory devices, chips and its structure.

Semester – III

27. Installation and customization of Linux operating system.
28. Installation of Printer, Scanner and troubleshoot their faults.
29. Replace/ install Display Driver Card and servicing, configuration of various display unit.
30. Replace/ install Sound Card and set properties to adjust sound quality.
31. Perform maintenance and servicing of UPS.
32. Installation and configuration of Modem, System Resources, Add on Cards, Cables & Connectors.
33. Upgrading, maintenance and troubleshooting of PC.
34. Assemble, replace and troubleshooting various parts of Tablet/ Smart Devices.
35. Browsing internet and work with Cloud Computing.

Semester – IV

36. Setting up and configuring Networking System using various network devices.
37. Sharing and controlling resource and Internet connection through network.
38. Implement Network Security to protect from various attacks on networking.
39. Installation and basic configuration of Windows Server.
40. Installation, configuration of DNS, Routing and user account customization.
41. Configuration of Server and managing Server Network security and Infrastructure.
42. Installation and basic configuration of Linux server.

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
1. Apply safe working practices.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.
	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 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.
2. Comply with environment regulation and housekeeping.	2.1 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.
	2.2 Deploy environmental protection legislation & regulations
	2.3 Take opportunities to use energy and materials in an environmentally friendly manner
	2.4 Avoid waste and dispose waste as per procedure
	2.5 Recognize different components of 5S and apply the same in the working environment.
3. Work in a team, understand and practice	3.1 Obtain sources of information and recognize information.
	3.2 Use and draw up technical drawings and documents.

soft skills, technical English to communicate with required clarity.	3.3 Use documents and technical regulations and occupationally related provisions.
	3.4 Conduct appropriate and target oriented discussions with higher authority and within the team.
	3.5 Present facts and circumstances, possible solutions & use English special terminology.
	3.6 Resolve disputes within the team
	3.7 Conduct written communication.
4. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	4.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation.
	4.2 Their applications will also be assessed during execution of assessable outcome.
5. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	5.1 Semester examination to test knowledge on energy conservation, global warming and pollution.
	5.2 Their applications will also be assessed during execution of assessable outcome.
6. Explain entrepreneurship and manage/ organize related task in day to day work for personal & societal growth.	6.1 Semester examination to test knowledge on entrepreneurship.
	6.2 It's applications will also be assessed during execution of assessable outcome.

SPEICIFIC LEARNING OUTCOME	
LEARNING/ ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
Semester – I	
7. Identify various basic Electrical Components and perform measurement of current, voltage using multimeter.	7.1 Construct a simple circuit using AC/ DC supply, lamp, fuse and switch.
	7.2 Measure voltage and current using Multi-meter (analog-digital).
	7.3 Measure DC and AC power using V-I method and using power meter.
8. Perform all functions of Resistors and Soldering, De-soldering practice.	8.1 Identify resistor value and tolerance using colour code.
	8.2 Measuring resistance using multimeter.
	8.3 Soldering and de-soldering techniques, practice using hook-up wires. Soldering resistors on Tag board.
	8.4 Verification of Ohms Law and Kirchhoff's Laws.
9. Recognize different types of Inductors, measure Inductance and uses of Transformer.	9.1 Measure inductance using LCR meter. Calculate inductive reactance at different input signal frequencies.
	9.2 Demo on self and mutual induction.
	9.3 Rewind a transformer to given specification using winging machine.
	9.4 Identifying and testing high frequency transformers used in electronic circuits.
10. Measure Capacitance and find resonance value of a circuit.	10.1 Test working condition of capacitor. Measure capacitance using RLC meter.
	10.2 Measure capacitive reactance at different frequencies.
	10.3 Measure capacitance and capacitive reactance of, capacitors in series and capacitors in parallel.
	10.4 Find the resonance frequency of a given Series and parallel resonance circuit.
11. Testing and use of Diode to construct basic Electronic components.	12.1 Plot forward and reverse characteristics of diode Testing working condition of diodes.
	12.2 Construct and test a half wave and full wave diode rectifiers.
	12.3 Construct a bridge rectifier with capacitance input filter.
	12.4 Draw Zener diode characteristics, Simple voltage regulator using zener diode.
12. Recognize different types of Transistors and use it as Amplifiers	12.1 Identify types of transistors based on their physical appearance. Identify the leads of the given assorted types of transistors.
	12.2 Quick test given transistors using Multimeter. Identify opens,

in electronic circuit.	shorted junctions.
	12.3 Wire and find the gain of amplifiers in - CB, CE, CC configurations.
13. Construct and test of an application circuit using different types of Semiconductors.	13.1 Construct and test a JFET amplifier.
	13.2 Construct and test a MosFET application circuit.
	13.3 Construct and test an application circuit using SCR.
	13.4 Construct and test an application circuit using TRIAC.
14. Assemble and test various Power Supply circuit.	14.1 Assemble and test a series regulated power supply.
	14.2 Assemble and test a fixed voltage regulator using 3pin IC.
	14.3 Assemble and test a variable voltage regulator using IC.
	14.4 Identify the parts and controls of a UPS. Practice switch-on and switch-off procedures.
15. Construct all digital circuit using logic gates and verify truth table.	15.1 Verify the truth table of two input OR, NOR, AND, NAND, NOT gates.
	15.2 Realization of different gate type using NAND gates.
	15.3 Verifying encoder/ decoder/ multiplexer/ demultplexer IC truth tables.
	15.4 Verification of Serial-in-parallel out and parallel in serial out of data.
16. Familiarize charging of acid battery and verify connections.	16.1 Familiarize with the lead acid battery, Charging of batteries, Series parallel connection of batteries.
17. Verify internal parts of CRO and use it to measure voltage, frequency, modulation of modulator/ transmitter.	17.1 Measure of DC/AC voltages and frequency using CRO.
	17.2 Identify the internal parts of a CRO and CRT.
	17.3 Identifying AM signal. Measurement of percentage of modulation using CRO.
	17.4 Construct and test a simple Frequency modulator / transmitter. Test transmitter using FM radio.
18. Working with some important Mechanical, Electrical & Electronics Accessories used in information communication system.	18.1 Working with Gears, Belts, Stepper Motor, Drive.
	18.2 Identification and Testing of Sensors.
	18.3 Identification of different advanced Intel microprocessor chips.
Semester – II	
19. Perform all the functions of Word	19.1 Creating and saving document files using Word processing software.

Processing and Spreadsheet Software.	19.2 Setting page and margins. Tabs and indents.
	19.3 Creating Worksheets using Spreadsheet Software.
	19.4 Using formula in cells.
20. Assemble and replace hardware components of Desktop Computer.	20.1 Removing RAM.
	20.2 Removing a ROM Drive.
	20.3 Removing a Video Card.
	20.4 Removing the Motherboard.
	20.5 Removing the Processor.
	20.6 Removing the CMOS Battery.
21. Installation of Operating System and all other application software.	21.1 A walkthrough of installing Windows.
	21.2 A multi-boot system: the Windows boot manager vs. an alternative boot manager.
	21.3 Installing a service pack.
	21.4 Extracting or uncompressing a compressed file.
	21.5 How To Update Drivers in Windows.
	21.6 How to Repair Corrupted Files Problems.
	21.7 How to clear web browser cache Firefox, Internet Explorer, Chrome.
	21.8 Use Ubuntu Live CD to Backup Files from Your Dead Windows Computer.
	21.9 Restore Deleted Items from an Outlook PST-file.
22. Customization of Operating System and maintenance of system application software.	22.1 How to create automated backups to ensure you always have a recent backup.
	22.2 Check your hard drive for errors.
	22.3 How to increase airflow and increase your computer's lifespan.
	22.4 Partitioning hard disk (primary and extended partitions).
	22.5 How to run a full system scan.
	22.6 Using Task manager and Event Viewer.
	22.7 Changing the storage location of installed software.
23. Assemble and replace hardware components of Laptop PC.	23.1 Assembling and disassembling a Laptop.
	23.2 Replacing different parts of laptops.
	23.3 Upgrading RAM, HDD and other parts.
	23.4 Testing, fault finding and troubleshooting techniques.
	23.5 POST codes and their meaning, fixing of problems based on codes.
	23.6 Enabling support for SATA technology. Installation of OS using SATA technology drivers.
24. Replace/ install SMPS and troubleshoot its faults.	24.1 Remove the SMPS from PC cabinet. Identify the types of output connectors of SMPS.
	24.2 Open and cleaning the cooling fan and other parts.
	24.3 Fix the SMPS inside the PC cabinet and test PC.

	24.4 Use of Debug Card Post Error & Code, SMPS Tester, PCI slot testing tool.
25. Familiarize and upgrading various components of Motherboard.	25.1 Remove the mother board from PC cabinet. Identify the main components on the motherboard.
	25.2 Identify the chipset used.
	25.3 Identify the type of processor connector (slot/ socket/ dual).
	25.4 Identify the connector for COM1, Com2.
	25.5 Replace the weak/ dead battery on the mother board.
	25.6 Replacing/ upgrading Processor.
26. Recognize different types of memory devices, chips and its structure.	26.1 Identification of different types of memory devices.
	26.2 Identification of SIMM and DIMM memory modules, number of pins, type.
Semester – III	
27. Installation and customization of Linux operating system.	27.1 Installing UNIX/ LINUX.
	27.2 Adding new users, software, material components.
	27.3 Making back-up copies of the index and files.
28. Installation of Printer, Scanner and troubleshoot their faults.	28.1 Installing a printer and carrying self- test.
	28.2 Refilling ribbon tape of DMP.
	28.3 Removing and cleaning printer head.
	28.4 Tracing the control board and identifying defective components. Servicing of control board.
	28.5 Scanner - Installation, configuration, using Automatic Document Feeder (ADF), OCR.
	28.6 Network Scanner - Installation and configuration.
	28.7 Troubleshooting of Scanner.
	28.8 Multifunction Printer - Installation, Replacing supplies and spares, troubleshooting.
29. Replace/ install Display Driver Card and servicing, configuration of various display unit.	29.1 Remove the display driver card and identify the main components and connectors on the display driver card.
	29.2 Change the exiting display card with a different card given and install.
	29.3 Servicing of monitors, changing fuses, adjusting colors, brightness and contrast. Setting resolution, loading drivers. Checking and replacing components on the PCB. Checking and adjusting LCD Monitors.
	29.4 Install, configure and operate LCD Projector.
30. Replace/ install Sound	30.1 Identify the specifications of the installed sound card in the PC.

Card and set properties to adjust sound quality.	30.2 Remove the sound card from PC and identify the main components on the card.
	30.3 Change the existing sound card with a different card given and install.
	30.4 Connect the speaker and microphone, adjust the controls for better quality sound and testing.
31. Perform maintenance and servicing of UPS.	31.1 Identify the specifications of UPS.
	31.2 Measurement of Input/ output voltage/ current levels, battery charge level.
	31.3 Test UPS as per specification. Verification of back-up time.
	31.4 Servicing of UPS by simulating more likely faults and systematic approach to identify and rectify them.
32. Installation and configuration of Modem, System Resources, Add on Cards, Cables & Connectors.	32.1 Installation and configuration of different types of Modem e.g. DSL, ADSL, Data Card, Dongle etc.
	32.2 Practice on setting IRQ, DMA, Memory Address, I/O address, Resource Conflict, Plug & Play.
	32.3 AGP, PCI Express, TV Tuner Card, DVR card, Video Capture, SCSI. USB, NIC, Fire wire, Card reader, network storage, Game video card, Camera etc.
33. Upgrading, maintenance and troubleshooting of PC.	33.1 Rectify the windows start-up problem by reinsertion or replacement.
	33.2 Rectify the virus protection utility problem by reinsertion or replacement.
	33.3 Mother board, Memory, CPU, Graphic Card, BIOS up-gradation, Additional features, Updating of System Software & Application Software (Requirement & How to update).
	33.4 Pen Drive U3 format, Zip Drive, Tape Drive, USB External Drive (HDD, CD/ DVD writer), Types, capacity, interface connector, write protection, Troubleshooting, Interface, Installation, casing for external drive.
	33.5 Running diagnostics program to identify the health and defects of a PC. Check system performance using third party utilities. Use benchmarking utilities to benchmark systems.
	33.6 Troubleshooting defects related to Keyboard and its related ports loose connections, replacing cable, replacing keys (DIN, PS/2, USB).
	33.7 Troubleshooting defects related to HDD, (practice of replacing motor, head, PCB among faulty drives) cable and connector.
	33.8 Troubleshooting defects related to RAM memory modules.
34. Assemble, replace and	34.1 Assembling & disassembling of different types of tablets/ Smart

troubleshooting various parts of Tablet/ Smart Devices.	Devices.
	34.2 Replacing of faulty parts.
	34.3 Practice Advanced troubleshooting techniques.
	34.4 Upgrading operating systems.
35. Browsing internet and work with Cloud Computing.	35.1 Practice web browsing using popular web browsing software, Configuring web browser.
	35.2 Sending document/ softcopy by email, activating spell checking, using address book, Handling SPAM, Removal of Cookies.
	35.3 Work with Cloud services.
Semester – IV	
36. Setting up and configuring Networking System using various network devices.	36.1 Familiarization with various Network devices, Connectors and Cables.
	36.2 Crimping practice with straight and cross CAT 5 cables.
	36.3 Punching practice in IO Box and patch panel.
	36.4 Create cabling in a lab with HUB/ Switch and IO Boxes and patch panel.
	36.5 Installing & Configuring a Peer-to-Peer Network using Windows Software.
	36.6 Connecting computers with Network with Drop cable and using Wi-Fi configuration.
	36.7 Basic Programmable switch Configuration Spanning Tree Protocol (STP).
	36.8 Installation and Configuration of TCP/ IP Protocol.
	36.9 Setup and configure a Virtual LAN.
	36.10 Practice on configuring DHCP.
37. Sharing and controlling resource and Internet connection through network.	37.1 Sharing Resource and Advance Sharing Setting.
	37.2 Exposure and using Internet. Setting E-mail accounts. Conferencing.
	37.3 Setting up of basic collaboration tool like NetMeeting for activities like chat, application sharing, remote desktop access and control, VoIP.
38. Implement Network Security to protect from various attacks on networking.	38.1 Setting up basic protection using public keys and MAC address filters.
	38.2 Troubleshooting wired and wireless network.
	38.3 Practice on firewall technologies to secure the network perimeter.
	38.4 Wi-Fi configuration to implement security considerations.
39. Installation and basic configuration of Windows Server.	39.1 Install and configure Windows Server.
	39.2 Install and Configure Active Directory.
	39.3 Implementing AD Services.

40. Installation, configuration of DNS, Routing and user account customization.	40.1 Installing and Configuring DNS Services - Setup Name resolution – Host names, NetBIOS names. - Installing DNS Server.
	40.2 Installing and Configuring DHCP Services - DHCP Server Configuration. - Setting up of DHCP, Routing and remote access.
	40.3 Configuring Remote Access Authentication Protocol.
	40.4 Managing TCP/ IP Routing.
	40.5 Implement AGDLP Process.
	40.6 Planning and Maintaining Group Policies - Configuring User Environment.
41. Configuration of Server and managing Server Network security, Infrastructure.	41.1 Configure a server as web server.
	41.2 Implementing Backup and Recovery.
	41.3 Security Baseline Settings and Templates.
	41.4 Configuring Protocol Security.
	41.5 Monitor Network Traffic.
	41.6 Troubleshoot Server Services.
42. Installation and basic configuration of Linux server.	42.1 Install Linux Server.
	42.2 Create public and data directory.
	42.3 Telnet installation and configuration.

SYLLABUS – INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE			
FIRST SEMESTER – 06 Months			
Week No.	**Reference Learning Outcome**	**Professional Skills with Indicative hrs**	**Professional Knowledge**
1	Apply safe working practices.	***Familiarization with the Institute and Safety*** 1. Visits to workshops, labs, office, stores etc., of the institute. (5 hrs) 2. Demonstration of safety precaution. (5 hrs) 3. Demo of first aid practice. (5 hrs) 4. Demo of artificial respiration and practice. (5 hrs) 5. Demo of electrical safety precautions. (5 hrs)	• Punctuality and Discipline expected of trainees. Course duration, methodology and structure of the training program. • About the institute and infrastructure. • Safety in moving and shifting heavy and delicate equipments. • First aid. • Artificial respiration. • Electrical safety.
2	Identify various basic Electrical Components and perform measurement of current, voltage using multimeter.	***Basic concepts of Electricity*** 6. Identify specification of types of fuses. Identification and specification of type of switches. (3 hrs) 7. Identification of meter types and measuring range. (3 hrs) 8. Construct a simple circuit using AC/ DC supply, lamp, fuse and switch. (4 hrs) 9. Measure circuit voltage and current using voltmeters and ammeters. (3 hrs) 10. Measure voltage and current using Multi-meter (analog-digital). (4 hrs) 11. Use Multimeter to check fuses, lamps and switches. (4 hrs) 12. Measure DC and AC power using V-I method and using power meter. (4 hrs)	• Concept of current and voltage. AC, DC Supply indicating lamps. Different types of Fuses and their applications. Different types of connectors used in electrical and electronic applications. Different types of switches used in electrical and electronic applications. • Circuit voltage and current. Measuring circuit voltage and current using voltmeters and ammeters. AC and DC meters. • Measuring instruments, MC, MI type, Ammeter, Voltmeter, Multimeter for measuring voltage and current. Construction, characteristics/ features and specification. Digital Multimeter. • Meaning of Circuit and basic electrical circuits. • Meaning of resistance,

			continuity and continuity testers. Multimeter for checking continuity. • Concept of Power and measurement using V&I meter and Power meter.
3-4	Perform all functions of Resistors and Soldering, De-soldering practice.	***Resistors. Soldering and De-soldering*** 13. Identify different types of resistors from physical appearance. (4 hrs) 14. Identify resistor value and tolerance using colour code. (4 hrs) 15. Measuring resistance using Multimeter. (4 hrs) 16. Soldering and de-soldering techniques, practice using hook-up wires. Soldering resistors on Tag board. (4 hrs) 17. Verification of Ohms Law and Kirchhoff's Laws. (5 hrs) 18. Soldering resistors on PCB. (5 hrs) 19. De-soldering practice. (5 hrs) 20. Experiment using P.T.C and NTC resistors. (5 hrs) 21. Experiment to check VDR's. (5 hrs) 22. Experiment to check LDR's. (5 hrs) 23. Test Pots, Presets. (4 hrs)	• Classification, characteristics and application of different types of resistors.-carbon film, metal film, wire wound, cermets and surface mounted. • Colour coding of resistors. Calculating Imeasuring resistance value and its tolerance value. Wattage of resistors, specific resistance and their importance. • Resistors in series and parallel. • Soft soldering and precautions to be taken for making a good solder joint. Types of solder and need of soldering paste. • Ohms law and Kirchhoff's Laws. • Printed circuit boards and its application. • De-soldering tools. • Temperature dependent resistors and their applications.(PTC and NTC) . • Voltage dependent resistors (VDR). • Photoelectric effect, Light Dependent resistors. • Variable resistors, pots, presets, types and application. Log and Linear resistors.
5-6	Recognize different types of Inductors, measure Inductance and uses of	***Inductance*** 24. Identification of different types of inductors and its specifications. (5 hrs) 25. Measure inductance using LCR meter. Calculate inductive reactance at different input signal frequencies.	• Definition of inductance. Properties. Types of inductors and their application. • Inductive reactance, measuring inductance and inductive reactance. Meaning of lead, lag. Effect of inductor on power

	Transformer.	(8 hrs) 26. Demo on self and mutual induction. (7 hrs) 27. Check step down transformers. (8 hrs) 28. Rewind a transformer to given specification using winging machine. (7 hrs) 29. Finding losses and efficiency of given transformers. (8 hrs) 30. Identifying and testing high frequency transformers used in electronic circuits. (7 hrs)	factor. Frequency dependence of inductive reactance. • Self and Mutual inductance. Coefficient of coupling. • Transformers. Turns ratio. Transformer winding. Winding machines. • Transformer losses and efficiency. • Uses, losses, efficiency type of cores and uses for LF, HF, VHF transformer. • Transformers used in high frequency applications.
7-8	Measure Capacitance and find resonance value of a circuit.	***Capacitance and Resonance circuits*** 31. Identify of different types of capacitors from colour code and typographic code. (5 hrs) 32. Test working condition of capacitor. Measure capacitance using RLC meter. (8 hrs) 33. Measure capacitive reactance at different frequencies. (12 hrs) 34. Measure capacitance and capacitive reactance of, capacitors in series and capacitors in parallel. (12 hrs) 35. Find the resonance frequency of a given Series and parallel resonance circuit. (13 hrs)	• Working principle of capacitors. Electrostatic action, dielectric constant. Unit of capacitance and capacitive reactance. Types of Capacitors-electrolytic, ceramic, polyester, tantalum, mica, surface mounted. Colour coding, and tolerance. • Measuring capacitance and capacitive reactance. • Behaviour of capacitance at different frequencies. • Capacitors in series and parallel. • Meaning of Resonance. Application of resonance. Series and parallel resonance circuits.
9-10	Testing and use of Diode to construct basic Electronic components.	***Electronic Components*** 36. Identify terminals of different types of diodes. Record its specifications referring to diode data sheet. (5 hrs) 37. Plot forward and reverse characteristics of diode Testing working condition of diodes. (7 hrs) 38. Construct and test a half wave and full wave diode rectifiers. (9 hrs) 39. Construct and test a Bridge rectifier with and without filter. (9 hrs) 40. Construct a bridge rectifier with capacitance input filter. (10 hrs)	• Semiconductor, intrinsic and extrinsic semi conductors, P and N type semiconductor. Development of P.N. junction barrier potential. Effect of temperature. Breakdown voltage. • Different types of Diodes. Diode terminals. Diode specifications using data book. • Forward and reverse characteristics of diode. Testing diodes using Multimeter.

		41. Draw Zener diode characteristics, Simple voltage regulator using zener diode. (10 hrs)	• Half wave and Full wave rectifiers using diodes. Transformer requirements. Calculating output DC, ripple factor. • Bridge rectifier. Calculating output DC, ripple factor. • Filters for rectifiers. Calculating output DC, ripple factor. • Zener diode-Its characteristics and application for voltage regulation. Calculating the series resistor for required current rating. • Specifications of a regulated power supply and testing a power supply for its specifications.
11-12	Recognize different types of Transistors and use it as Amplifiers in electronic circuit.	***Transistor and Amplifiers*** 42. Identify types of transistors based on their physical appearance. Identify the leads of the given assorted types of transistors. (15 hrs) 43. Quick test given transistors using Multimeter. Identify opens, shorted junctions. (15 hrs) 44. Wire and find the gain of amplifiers in - CB, CE, CC configurations. (20 hrs)	• Working principle of PNP, Bipolar transistors. Types of transistors and applications. Leads of transistors and their identification. • Forward and reverse bias of transistor Junction. General values of junction resistances. Quick testing a transistor-using Multimeter. • 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.
13-14	Construct and test of an application circuit using different types of Semiconductors.	***Special Semiconductors- FET*** 45. Construct and test a JFET amplifier. (8 hrs) 46. Construct and test a MosFET application circuit. (8 hrs) 47. Construct and test a relaxation oscillator using UJT. (8 hrs)	• Field effect transistors, types, working principle, applications. • Working principle and application of UJT. • Working principle and application of SCR. • Working principle and

		48. Construct and test an application circuit using SCR. (8 hrs) 49. Construct and test an application circuit using DIAC. (8 hrs) 50. Construct and test an application circuit using TRIAC. (10 hrs)	application of TRIAC. • Working principle and application of DIAC.
15-16	Assemble and test various Power Supply circuit.	***Power supply*** 51. Practice on identifying and using the controls on a regulated power supply. (5 hrs) 52. Assemble and test a series regulated power supply. (7 hrs) 53. Assemble and test a shunt regulated power supply. (7 hrs) 54. Assemble and test a fixed voltage regulator using 3pin IC. (7 hrs) 55. Assemble and test a variable voltage regulator using IC. (8 hrs) 56. Assemble a simple inverter and converter for use with emergency lamp. (8 hrs) 57. Identify the parts and controls of a UPS. Practice switch-on and switch-off procedures. (8 hrs)	• Unregulated, regulated DC Power supply specifications. Application of different types of power supply for specific application types. • Series regulator using transistor. Short circuit protection. Overload protection. • Shunt regulators using transistors. • Fixed Voltage regulators using IC's. • Variable voltage regulators using IC's. • Mains voltage stabilizers. • Inverters and converters. • Un-interrupted power supply, types and applications.
17-18	Construct all digital circuit using logic gates and verify truth table.	***Digital Electronics*** 58. Identify the specifications of given digital IC's referring to data books. (2 hrs) 59. Verify the truth table of two input OR, NOR, AND, NAND, NOT gates. (3 hrs) 60. Verify of truth table of multiple input logic gates. (3 hrs) 61. Verify the truth table of XOR and XNOR Gates. (3 hrs) 62. Realization of different gate type using NAND gates. (3 hrs) 63. Verification of Boolean laws. (3 hrs) 64. Realization of half adder & full adder using NAND gates. Realization half subtractor and full subtractor using NAND gates. (3 hrs) 65. Verification of truth table of 7483-	• Number systems and conversions. Classification of digital IC's. Use of data book for identification of digital IC's. • Basic LOGIC GATES and truth table. Boolean algebra. • Logic families, logic levels, propagation delay. Multiple input gates. • XOR, XNOR gates and application. • Simplification of Boolean equations. • Combinational logic circuits. g) Half adder, full adder, parallel binary adder, half subtractor, full subtractor. • Commercially available adders/ subtractors.

		4bit adder. (3 hrs) 66. Verifying encoder/ decoder/ multiplexer/ demultplexer IC truth tables. (3 hrs) 67. Realization and verification of truth table of RS, JK and MS- JK flip-flop. (3 hrs) 68. Realization and verification of D-flip flop. (3 hrs) 69. Realization and verification of up & down (sync/async) counter. (3 hrs) 70. Verification of A/D & D/A converter. (3 hrs) 71. Realization of shift registers using FF. (3 hrs) 72. Verification of Right-shift, Left- shift registers. (3 hrs) 73. Verification of Serial-in-parallel out and parallel in serial out of data. (3 hrs) 74. Representation of logic function's truth table using K-Map. (3 hrs)	• Comparator, decoders, encoders, multiplexer, demultiplexer. • Parity generators / checkers. RS Flip - Flop, JK flip-flop, Master-Slave flip-flops. • Types of triggering and applications. D flip-flops. • Counters, ripple, synchronous, up-down, scale-n counters. • Principles of A/D & D/A converter. Commercially available A/D & D/A converters. Applications. • Shift registers. Types, applications. • Commercially available shift registers and applications. • Conversion of serial data into parallel and vice-versa. • Concept of Karnaugh Map (K-Map).
19	Familiarize charging of acid battery and verify connections.	***Battery*** 75. Familiarize with the lead acid battery, Charging of batteries, Series parallel connection of batteries. (25 hrs)	• 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.
20	Verify internal parts of CRO and use it to measure voltage, frequency, modulation of modulator/ transmitter.	***Oscilloscope*** 76. Identify CRO front panel controls. (6 hrs) 77. Measure of DC/AC voltages and frequency using CRO. (6 hrs) 78. Identify the internal parts of a CRO and CRT. (6 hrs) 79. Calibrate a given CRO. (7 hrs)	• Working principle and application. • Precautions to be taken while measuring voltages using CRO. • Internal parts of a CRO. Construction and function of CRT and its associated circuitry. • Simple Calibration procedures care and maintenance.
21	Verify internal parts of CRO and use it to measure voltage, frequency, modulation of	***Modulation, Demodulation and transmitters*** 80. Identifying AM signal. Measurement of percentage of modulation using CRO. (6 hrs) 81. Construct and test a simple	• Modulation - types of modulation. AM, FM, PM. Amplitude modulation. Measurement of percentage of modulation. • AM Transmitter block diagram.

	modulator/ transmitter.	Amplitude modulator. (6 hrs) 82. Construct and test a crystal receiver. (6 hrs) 83. Construct and test a simple Frequency modulator / transmitter. Test transmitter using FM radio. (7 hrs)	Amplitude modulator circuit and working. • AM receiver block diagram. Principle of an AM demodulator/detector - analysis of crystal receiver. • Frequency modulation- bandwidth requirement. FM transmitter block diagram. Comparison with AM- advantages of FM over AM. • FM receiver block diagram. Principle of Demodulation of FM signals. • Pulse modulation - PAM, PWM and PCM. Demodulators. Advantages and applications.
22	Working with some important Mechanical, Electrical & Electronics Accessories used in information communication system.	***Other Mechanical, Electrical & Electronics Accessories*** 84. Working with Gears, Belts, Stepper Motor, Drive. (5 hrs) 85. Identification and Testing of Sensors. (5 hrs) 86. Working with Relays. (5 hrs) 87. Identification of different advanced Intel microprocessor chips. (5 hrs) 88. Identification of different advanced microprocessor chips other than from Intel. (5 hrs)	• Basics of gears, Belts, Stepper Motor, Drive. • Sensors, its types and working principles. • Relays, types and its working principles. • Introduction to Microprocessor, Pentium processor architecture basics. • Timing Circuits, Electronic Display (7 segment, LED, LCD, Plasma, LED matrix.
23-24	***Industrial Visit/ Project Work*** ***Broad Areas:*** a) Create a regulated power supply. b) Create amplifier using transistor. c) Create a bridge rectifier. d) AC to DC converter. e) Battery Charger.		
25	**Revision**		
26	**Examination**		

NOTE: -

1. *Some of the sample project works (indicative only) are given against each semester.*

2. *Instructor may design their own project and also inputs from local industry may be taken for designing such new project.*
3. *The project should broadly covered maximum skills in the particular trade and must involve some problem solving skill. Emphasis should be on Teamwork: Knowing the power of synergy/ collaboration, Work to be assigned in a group (Group of at least 4 trainees). The group should demonstrate Planning, Execution, Contribution and application of Learning. They need to submit Project report.*
4. *If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce components/ sub-assemblies in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.*
5. *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of work related to Marine fitting, alignment of pump-motor, fitting of pipes & tubes, assembling jobs, maintenance work, etc., may be shown to the trainees to give a feel of actual work and their future assignment.*

SYLLABUS – INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE			
SECOND SEMESTER – 06 Months			
Week No.	**Ref. Learning Outcome**	**Professional Skills with Indicative hrs**	**Professional Knowledge**
27	Perform all the functions of Word Processing and Spreadsheet Software.	***Word Processing*** 89. Creating and saving document files using Word processing software. (3 hrs) 90. Formatting text and editing. (2 hrs) 91. Setting page and margins. Tabs and indents. (3 hrs) 92. Creating multicolumn documents. (3 hrs) 93. Inserting pictures in documents. (2 hrs) 94. Creating tables. (2 hrs) 95. Creating different types of documents. (3 hrs) 96. Saving word documents in other formats. (2 hrs) 97. Mail merge. (3 hrs) 98. Printing documents. (2 hrs)	• Introduction to Word processing and comparison of features. Creating and saving document files using Word processing software. • Formatting test and editing. • Setting page and margins. Tabs and indents. • Creating multicolumn documents. • Inserting pictures in documents. • Creating tables. • Creating different types of documents. • Saving word documents in other formats. • Mail merge. • Printing documents.
28	Perform all the functions of Word Processing and Spreadsheet Software.	***Spreadsheet Software*** 99. Creating Worksheets using Spreadsheet Software. (3 hrs) 100. Formatting cells. (3 hrs) 101. Using formula in cells. (3 hrs) 102. Creating simple spreadsheet for an application. (3 hrs) 103. Creating relation between sheets. (3 hrs) 104. Graphs and tables. (3 hrs) 105. Advanced features. (4 hrs) 106. Printing spread sheets. (3 hrs)	• Introduction to spread sheet. • Creating Worksheets using Spreadsheet Software. • Formatting cells. • Using formula in cells. • Creating simple spreadsheet for an application. • Creating relation between sheets. Graphs and tables. • Advanced features. • Printing spread sheets.
29	Assemble and replace hardware components of Desktop Computer.	***DeskTop : PC Repair Safety*** 107. Important Safety Basics. (2 hrs) 108. Identification, specification and application of basic hand tools. (2 hrs) 109. How to handle components to ensure their longevity. (2 hrs)	• Introduction to computers, classification, generations, applications. Basic blocks of a digital computer. • Hand Tools Basics and Specifications. • Types of cabinets, relation with

		110. What one shouldn't wear while working inside a computer. (1 hr) 111. The danger of static electricity. (1 hr) 112. How to protect a PC from lightning strikes and power outages. (2 hrs) ***Hardware Identification*** 113. Identify the front and rear panel controls and ports on a PC. (1 hr) 114. Cases. (1 hr) 115. Cooling. (1 hr) 116. Cables & Connectors. (1 hr) 117. Power Supplies. (1 hr) 118. Power Supply Connections. (1 hr) 119. Motherboard Connections. (1 hr) 120. Motherboard Components. (1 hr) 121. CPU (Processor). (1 hr) 122. RAM (Memory). (1 hr) 123. Hard Drive Connections. (1 hr) 124. Mechanical vs. Solid State Drives. (1 hr) 125. ROM Drives. (1 hr) 126. Video Cards. (1 hr) 127. Sound Cards. (1 hr)	motherboard form factor. Precautions to be taken while opening and closing PC cabinet. • Main devices, components, cards, boards inside a PC (to card or device level only). • Types and specifications of the cables and connectors used for interconnecting the devices, boards, cards, components inside a PC. • Precautions to be taken while removing and/ or re-connecting cables inside a PC. • Types of I/O devices and ports on a standard PC for connecting I/O devices. • Function of keyboard, brief principle, types, interfaces, connectors, cable. • Function of Mouse, brief principle, types, interfaces, connectors, cable. • Function of monitor, brief principle, resolution, size, types, interfaces, connectors, cable. • Function of Speakers and Mic., brief principle, types, interfaces, connectors, cable. • Function of serial port, parallel port, brief principle of communication through these ports, types of devices that can be connected, interface standards, connectors, cable. • Precaution to be taken while connecting/ removing connectors from PC ports. Method of ensuring firm connection.
30-32	Assemble and replace hardware components of	***Hardware: Remove – Test – Replace/ Install*** 128. Removing RAM. (3 hrs) 129. Installing RAM. (3 hrs) 130. Removing a ROM Drive. (3 hrs)	• Types of Processors and their specifications (Intel: Celeron, P4 family, Xeon, dual core, quad core, core 2 duo, i3,i5,i7 and AMD).

	Desktop Computer.	131. Installing a ROM Drive. (4 hrs) 132. Removing a Hard Drive. (3 hrs) 133. Installing a Hard Drive. (4 hrs) 134. Removing a Power Supply. (3 hrs) 135. Installing a Power Supply. (3 hrs) 136. Removing a Video Card. (3 hrs) 137. Installing a Video Card. (3 hrs) 138. Install Expansion Cards. (3 hrs) 139. Removing Fans. (3 hrs) 140. Installing Fans. (3 hrs) 141. Removing the Motherboard. (3 hrs) 142. Installing the Motherboard. (5 hrs) 143. Removing the Processor. (3 hrs) 144. Installing the Processor. (5 hrs) 145. Installing a CPU Cooler. (4 hrs) 146. Troubleshooting. (5 hrs) 147. Checking the Power Switch. (3 hrs) 148. Removing the CMOS Battery. (3 hrs) 149. Seating Expansion Cards. (3 hrs)	• Memory devices, types, principle of storing. Data organization 4 bit, 8 bit, word. • Semi-conductor memories, RAM, ROM, PROM, EMPROM, EEPROM, Static and dynamic. • Example of memory chips, pin diagram, pin function. • Concept of track, sector, cylinder. FD Drive components- read write head, head actuator, spindle motor, sensors, PCB. • Precaution and care to be taken while dismantling Drives. • Drive bay, sizes, types of drives that can be fitted. Precautions to be taken while removing drive bay from PC. • HDD, advantages, Principle of working of Hard disk drive, cylinder and clusture, types, capacity, popular brands, 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. HDD interface IDE, SCSI-I/2/3 comparative study. Latest trends in interface technology in PC and server HDD interface. • Precautions to be taken while fitting drives into bays and bay inside PC cabinet. • CMOS setting (restrict to drive settings only). • Meaning and need for using

			Scan disk and defrag. • Basic blocks of SMPS, description of sample circuit.
33	Installation of Operating System and all other application software.	***Windows Installation*** 150. A walkthrough of installing Windows. (2 hrs) 151. A walkthrough of installing Windows XP. (2 hrs) 152. Imaging: create a Windows system image. (3 hrs) 153. How to Backup/ Restore your Windows partition with the bootable image disk. (3 hrs) 154. Duplicating a partition (creating a multi-boot system). (3 hrs) 155. A multi-boot system: the Windows boot manager vs. an alternative boot manager. (3 hrs) 156. Setting up a multi-boot/ dual-boot system. (3 hrs) 157. Dual Boot Ubuntu and Windows. (3 hrs) 158. Windows XP registry tweaks. (3 hrs)	• Types of software. System software-OS, Compiler. • Application software like MS office. High Level, low level language, Computer application scientific industrial and business. Functions of an operating system. Disk operating system. • Concept of GUI, Modes of starting on different occasions. • Desktop, Icon, selecting, choosing, drag and drop. • My computer, network neighborhood/ network places. • Recycle bin, briefcase, task bar, start menu, tool bar, and menus. • Windows Explorer. • Properties of files and folders. • Executing application programs. • Properties of connected devices. • Applications under windows accessories. • Windows Help. • Finding files, folders, computers. • Control panel. Installed devices and properties.
34	Customization of Operating System and maintenance of system application software.	***Data Backup*** 159. 3 types of media to use when backing up your data, and when each method is appropriate. (2 hrs) 160. How to create automated backups to ensure you always have a recent backup. (2 hrs) 161. Learn how to manually backup data. (2 hrs) 162. How to make an exact copy (clone) of a hard drive. (2 hrs)	• Utilities for recovering data from defective/bad hard disks. • Introduction to removable storage devices, Bulk data storage devices-magnetic, optical, magneto optical drives, WORM drives. • CD ROM drives- Technology, Types of CD drives, working principle application. • Technology, working principle, capacity, media of DAT

		Hardware Troubleshooting 163. The danger in not diagnosing problems first. (3 hrs) 164. Learn how to test your RAM. (4 hrs) 165. Check your hard drive for errors. (4 hrs) ***PC Cleaning*** 166. The best cleaning supplies to use. (2 hrs) 167. How to increase airflow and increase your computer's lifespan. (2 hrs) 168. How to clean your computer. (2 hrs)	Drive and back-up procedures. • Technology, working principle, capacity, media of DVD ROM drive. • Technology, working principle, capacity, media of CD WRITER and use different modes of writing on a CD. Using of utility for CD writing.
35	Customization of Operating System and maintenance of system application software.	***Hard Drives*** 169. Partitioning hard disk (primary and extended partitions). (2 hrs) 170. Hard Drive Failures. (2 hrs) 171. How To Troubleshoot a Noisy Hard Drive. (2 hrs) 172. How to Format a Hard Drive. (2 hrs) 173. How to Completely Erase a Hard Disk Drive. (2 hrs) 174. Installation and configuration of storage devices. Integration of PATA and SATA drivers. (3 hrs) 175. Recover emails, files, and data from a crashed hard drive or computer. (2 hrs) ***Virus Removal*** 176. How to run a full system scan. (1 hr) 177. How to fix your browser from redirecting to other websites (browser hijack). (1 hr) 178. Using a modern anti-virus utility. (2 hrs) 179. When utilities don't fix everything, how to manually remove a virus. (2 hrs) 180. 2 specific things to disable when trying to get rid of a nasty virus. (2 hrs) 181. 2 special utilities that work wonders. (2 hrs)	• What's Inside a Hard Drive? • How Hard Disks Work. • Inside: Hard Drive Motherboard. • 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. • The difference between Anti-Virus and Anti-Spyware software.
36	Customization	***System Utilities***	• Bad Sectors in Hard disk, Master

	of Operating System and maintenance of system application software.	182. How to check to see if your hard drive has bad sectors. (1 hr) 183. Fix the master boot record. (2 hrs) 184. How to run an in-place installation. (1 hr) 185. Using Task manager and Event Viewer. (2 hrs) 186. Using System Monitor and Performance Logs. (2 hrs) 187. Configure config.sys file. (2 hrs) ***User Account Customization*** 188. How to create and configure user accounts in Windows XP, Vista, 7/8. (2 hrs) 189. Make Changes to an Account. (2 hrs) 190. Changing the storage location of the personal folders. (1 hr) 191. Changing the storage location of installed software. (1 hr) 192. Setting up Parental Controls in Windows XP,Vista,7, 8. (2 hrs) 193. How to Use Fast User Switching in Windows. (2 hrs) 194. View Hidden Files and Folders. (1 hr) 195. Lock Down Windows 7 / 8 With User Account Control. (2 hrs) 196. How to Delete User Accounts in Windows. (2 hrs)	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.
37	Installation of Operating System and all other application software.	***Windows Update & Device Driver*** 197. How to find your system version in Windows, Linux. (2 hrs) 198. Installing a service pack. (3 hrs) 199. How to perform a Windows Update. (2 hrs) ***Software Installation*** 200. Installing a software program in windows. (3 hrs) 201. How to run a file from MS-DOS. (3 hrs) 202. Extracting or uncompressing a compressed file. (2 hrs) 203. How to compress or make files into one file. (2 hrs)	• Version of a software, Service pack, Updating of OS, Different configurations of Computer system and its peripherals, 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

		204. Extracting files from the Windows cabinets. (2 hrs) 205. Uninstalling Windows software. (3 hrs) 206. Unable to remove a program from Windows Add/ Remove programs. (3 hrs)	check. • Awareness of legal aspects of using computers such as copyright, patent etc.
38	Installation of Operating System and all other application software.	***Installing Hardware Drivers*** 207. How To Update Drivers in Windows. (1 hr) 208. How To Roll Back a Driver in Windows. (2 hrs) 209. Familiarization with Device manager. (2 hrs) 210. Interfacing with cellphone, tablet PC, synchronization of contacts. (2 hrs) ***Windows Utilities*** 211. How to Repair Corrupted Files Problems. (2 hrs) 212. How to check for corrupted files. (2 hrs) 213. Restore your machine back to normal. (2 hrs) 214. Hard disk is filling up, what should one do? (2 hrs) 215. Where's the disk space? (2 hrs) 216. Top 15 Ways to Speed Up the Computer. (2 hrs) 217. How to Automatically Clean and Organize the Desktop, Downloads, and Other Folders. (2 hrs) 218. 5 Simple Rules To Keep Files Organized. (2 hrs) 219. 5 Reasons - Computer Is Running Slow. (2 hrs)	• What is a Driver? • What hardware device drivers should be updated? • What is a Device manager? • Computer Maintenance Tips and Tricks to Backup, Scan and Clean. • Power on self test, Peripheral diagnostics, general purpose diagnostics, Operating system diagnostics. • Hardware boot process, Windows boot process.
39	Installation of Operating System and all other application software.	***Junk File Removal*** 220. How to Remove Junk Files. (1 hr) 221. How to completely remove "deleted" files. (1 hr) 222. How to clear web browser cache Firefox, Internet Explorer, Chrome. (1 hr) 223. 5 steps to clean up your computer files. (1 hr)	• 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

		224. Personalize your Windows XP-based PC. (1 hr) ***Linux OS*** 225. Using a Linux Live CD. (4 hrs) 226. Why you want a Linux Live CD. (4 hrs) 227. Use Ubuntu Live CD to Backup Files from Your Dead Windows Computer. (4 hrs) 228. Using a live CD as your Linux Desktop. (4 hrs) ***Outlook Configure & Backup*** 229. Configure outlook. (1 hr) 230. Backup and Restore Outlook. (1 hr) 231. How to restore the Outlook default installation, toolbars and settings. (1 hr) 232. Restore Deleted Items from an Outlook PST-file. (1 hr)	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 vCards 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.
40-42	Assemble and replace hardware components of Laptop PC.	***Laptop PCs*** 233. Identification of laptop sections and connectors. (5 hrs) 234. Assembling and disassembling a Laptop. (10 hrs) 235. Checking of various parts of a laptop. (5 hrs) 236. Checking of batteries and adaptors. (5 hrs) 237. Replacing different parts of laptops. (8 hrs) 238. Upgrading RAM, HDD and other parts. (7 hrs) 239. Testing, fault finding and troubleshooting techniques. (7 hrs) 240. POST codes and their meaning, fixing of problems based on codes. (7 hrs) 241. Enabling support for SATA technology. Installation of OS using SATA technology drivers. (7 hrs) 242. Laptop troubleshooting. (7 hrs) 243. Latest Tools & Gadgets For Desktop/ Laptop Repairs. (7 hrs)	• Introduction of laptop and comparison of various Laptops. • Block diagram of laptop & description of all its sections. • Study of parts of a laptop. • Input system: Touchpad, Trackball, Track point, Docking station, Upgrade memory, hard disk, replacing battery, Configuring wireless internet in a laptop. • Latest Tools & Gadgets For Desktop/ Laptop Repairs.

43-44	Replace/ install SMPS and troubleshoot its faults.	***SMPS*** 244. Remove the SMPS from PC cabinet. Identify the types of output connectors of SMPS. (10 hrs) 245. Identify output voltages using colour coding. Measure voltage levels. Test power cable and fuse. (10 hrs) 246. Open and cleaning the cooling fan and other parts. (10 hrs) 247. Fix the SMPS inside the PC cabinet and test PC. (10 hrs) 248. Use of Debug Card Post Error & Code, SMPS Tester, PCI slot testing tool. (10 hrs)	• DC power source to PC. Need for SMPS. Specifications. Rating of SMPS based on type of motherboard and devices used. (AT/ ATX, Micro ATX, mini ATX). • Color coding adopted. Types of connectors used. Output voltage levels. Measuring technique. • Precautions to be taken while cleaning the internal area of SMPS. • Precautions to be taken while fixing the SMPS inside the cabinet.
45-46	Familiarize and upgrading various components of Motherboard.	***Motherboard/ System board*** 249. Remove the mother board from PC cabinet. Identify the main components on the motherboard. (3 hrs) 250. Identify the form factor of the mother board. (2 hrs) 251. Identify the chipset used. (2 hrs) 252. Identify the number of slots available for add-in cards (ISA, PCI, AGP). (2 hrs) 253. Identify the type of processor connector (slot/ socket/ dual). (2 hrs) 254. Identify the BIOSROM, make, version. (3 hrs) 255. Identify the jumper settings (if any) on the mother board. (2 hrs) 256. Identify the types of slots available for memory modules. (3 hrs) 257. Identify the connectors for Hard disk (IDE). (3 hrs) 258. Identify the connector for FDD. (2 hrs) 259. Identify the connector for COM1, Com2. (3 hrs) 260. Identify the connectors for PS/2. (3 hrs) 261. Identify the connectors for USB. (3 hrs) 262. Identify the connectors for Game port. (3 hrs)	• 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. • Form factor of mother board. • Meaning and function of chips sets. Manufacturers, comparison, importance of quality chip set for performance of PC. • Bus standards-evolution, speed, latest trends (ISA, PCI, AGP, new trends). • Types of processor connectors, examples of latest processor connectors, number of pins. f) Function of BIOS, manufacturers of BIOS. • IDE ports available .Primary, secondary. Number of drives that can be connected. Methods of adding SCSI drives. • Details of FDD connector on mother board. • Facility for serial Communication ports on mother

		263. Identify the connector for parallel port (Centronics). (3 hrs) 264. Identify the connector for Keyboard (in exclusively available). (3 hrs) 265. Identify the specifications of the Lithium battery. (3 hrs) 266. Identify any other special component available on the mother board. (3 hrs) 267. Identify the connectors for front panel switches and display. (2 hrs)	board. • Facility for PS/2 Communication ports on mother board. • Meaning and advantage of USB ports. Facility for USB Communication ports on mother board. • Facility for game ports on mother board. • Facility for parallel Communication port on mother board. • Type of connectors in which keyboards cab be used, old type full size DIN connector. • Need of Lithium battery. Its specifications. Replacement procedure. Effect of removing the battery from mother board. • Other special components available on mother boards such as integrated devices/ drivers.
47	Familiarize and upgrading various components of Motherboard.	***Possible upgrading/ changing components on the mother board*** 268. Replace the weak/ dead battery on the mother board. (5 hrs) 269. Replace/ upgrade RAM memory modules. (5 hrs) 270. Replacing/ upgrading Processor. (5 hrs) 271. Carryout Jumper setting on mother board. (5 hrs) 272. Changing CMOS set-up and setting system level password. (5 hrs)	• Effect of weak/ dead battery on PC performance. Identifying weak/ dead battery. Precautions to be taken before replacing the battery. Setting to be done after replacing the battery. • Organization of RAM, types of RAM's, Module types, pins, replacement procedure and precautions. Compatibility of memory modules to the motherboard. • Type of processors, generation, features, speed, popular manufacturers. Advantages and possibility of upgrading Processor of a PC. Motherboard/ Chipset/ speed/ connector/ power/other compatibility criteria for upgrading processor. • Precautions to be taken while removing and placing processor in sockets and slots.

			• Types of jumper settings on motherboard. Its functions and effects. • CMOS set-up features. Need and procedure for changing the CMOS set-up. Updating Flash BIOS.
48	Recognize different types of memory devices, chips and its structure.	***Memory*** 273. Identification of different types of memory devices. (8 hrs) 274. Identification of memory chips. (8 hrs) 275. Identification of SIMM and DIMM memory modules, number of pins, type. (9 hrs)	• Memory devices, types & principle of storing. Data organization 4 bit, 8 bit, word. • Semiconductor memories, RAM, ROM, PROM,EMPROM, EEPROM, Static and dynamic. • Example of memory chips, pin diagram, pin function of popularly used RAM, EPROM, and EEPROM Chips in PC's.
49-50	**Industrial Visit/ Project Work** **Broad Areas:** a) Disassemble a given Desktop / Laptop PC totally following the safety precautions. b) Reassemble the Desktop / Laptop PC and test for its satisfactory performance. c) Install Operating System and necessary driver, taking backup and restore system. d) Rectify a defective system and make it as smooth working system. e) Troubleshoot / Repair /Replace an SMPS/RAM. f) Check Hard disk error, partition, format different types of Hard disk drives.		
51	**Revision**		
52	**Examination**		

Note: -

1. *Some of the sample project works (indicative only) are given against each semester.*
2. *Instructor may design their own project and also inputs from local industry may be taken for designing such new project.*
3. *The project should broadly covered maximum skills in the particular trade and must involve some problem solving skill. Emphasis should be on Teamwork: Knowing the power of synergy/ collaboration, Work to be assigned in a group (Group of at least 4 trainees). The group should demonstrate Planning, Execution, Contribution and application of Learning. They need to submit Project report.*
4. *If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce components/ sub-assemblies in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.*

5. *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of industry* on *Marine Fitting jobs* and *maintenance work, etc., may be shown to the trainees to give a feel of Industry and their future assignment.*

SYLLABUS – INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE			
THIRD SEMESTER – 06 Months			
Week No.	**Ref. Learning Outcome**	**Professional Skills with Indicative hrs**	**Professional Knowledge**
53-54	Installation and customization of Linux operating system.	***Linux operating system*** 276. Installing UNIX/ LINUX. (10 hrs) 277. Preparing functional system UNIX/ LINUX. (10 hrs) 278. Adding new users, software, material components. (10 hrs) 279. Making back-up copies of the index and files. (10 hrs) 280. Dealing with the files and indexes. (10 hrs)	• Basic Linux commands. • Linux file system, The Shell, Users and file permissions, VI editor, X window system, Filter Commands, Processes, Shell Scripting.
55-56	Installation of Printer, Scanner and troubleshoot their faults.	***Printers & Plotters*** 281. Testing front panel controls. Interface pins, cables, measurement of voltages and waveforms. (2 hrs) 282. Installing a printer and carrying self- test. (2 hrs) 283. Replacing ribbon in a DMP. (1 hr) 284. Refilling ribbon tape of DMP. (2 hrs) 285. Testing and rectifying defective cable. (2 hrs) 286. Removing and cleaning printer head. (1 hr) 287. Replacing a new printer head. (2 hrs) 288. Testing and servicing Printer power supply. (2 hrs) 289. Changing rollers and other mechanical parts. (2 hrs) 290. Tracing the control board and identifying defective components. Servicing of control board. (2 hrs) 291. Replacement of toner cartridge of laser printers. (2 hrs) 292. Refilling toner cartridge of laser printers. (2 hrs) 293. Drum cleaning and replacement	• Types of printers, Dot Matrix printer's laser printer, Ink jet printer, line printer. Block diagram and function of each unit head assembly, carriage, and paper feed mechanism. Front panel controls and interfaces. Pin details of interface port. • Installation of a printer driver. And self-test. • Ribbon types used. • Refilling of ribbons. • Printer cable testing defects, effect and servicing. • Printer head, types, cleaning procedures. • Precaution to be taken while removing and replacing printer head assembly. • Pinter power supply, circuit analysis, defects, servicing. Circuit, function, probable defects, servicing. • Carriage motor assembly, paper feed assembly, sensors. Procedure for dismantling and replacing mechanical parts.

		in of laser printers. (2 hrs) 294. Testing and servicing Printer power supply of laser printers. (2 hrs) 295. Changing mechanical parts of laser printers. (2 hrs) 296. Tracing the control board circuit and identifying defective components. Servicing of control board of laser printers. (2 hrs) 297. Replacement of ink cartridge of desk jet/ inkjet printers. (2 hrs) 298. Refilling ink cartridge of desk jet/ inkjet printers. (2 hrs) 299. Drum cleaning and replacement in desk jet/ inkjet printers. (2 hrs) 300. Testing and servicing Printer power supply of desk jet/inkjet printers. (2 hrs) 301. Changing mechanical parts of desk jet/inkjet printers. (2 hrs) 302. Tracing the control board and identifying defective components. Servicing of control board of deskjet/ inkjet printers. (2 hrs) 303. Connecting and using high speed line printers. (2 hrs) 304. Replacing spares of line printers. (2 hrs) 305. Self-test procedures in printers. (2 hrs) 306. Use of diagnostics software for serving printers. (2 hrs)	• Printer control board, circuit, function, probable defects, servicing. • Working principle of LASER printer. • Toner cartridge, types, replacing toner cartridges • Refilling toner cartridges, equipment available for refilling and procedure. • Printer drum, function, cleaning and replacing procedure. • Power supply in laser printers, circuit, defects, servicing. • Mechanical parts and sensors on laser printer, function, replacement procedure. • Control board(s) in laser printer, circuit diagram, defects and servicing procedure. • Working principle of Inkjet/ Deskjet printers. Type of ink used and replacement of ink cartridge. • Refilling of ink, equipment available, quality of refilled cartridges. • Printer drum, function, cleaning and replacing procedure. • Power supply in inkjet printers, circuit, defects, servicing. • Mechanical parts and sensors on inkjet printer, function. • Working principle of Plotter and its common faults.
57-58	Installation of Printer, Scanner and troubleshoot their faults.	***Scanner & MFD*** 307. Scanner - Installation, configuration, using Automatic Document Feeder (ADF), OCR. (6 hrs) 308. Barcode Scanner - Installation and configuration. (6 hrs) 309. Network Scanner - Installation and configuration. (6 hrs) 310. Troubleshooting of Scanner. (6	• Working principles of Network Scanner. • Working principles of Multifunction Printer. • Working principles of Passbook printer. • Working principles of High Speed Printer. • Working principles of Line Printer. • Working principles of Network

		hrs) 311. Multifunction Printer - Installation, Replacing supplies and spares, troubleshooting. (8 hrs) 312. Passbook Printer - Installation, calibration, configuration & troubleshooting. Replacement of Supplies and maintenance. (6 hrs) 313. Network Printer – Installation and configuration, troubleshooting. (6 hrs) 314. How to update the flash of Motherboard, printer, scanner and modem etc. (6 hrs)	Printer. • Working principles of Print Server.
59-60	Replace/ install Display Driver Card and servicing, configuration of various display unit.	***Monitor, Display Card and Driver*** 315. Identify the type of monitor connected to PC. Specifications, front panel controls and settings. (6 hrs) 316. Identify the specifications of the display driver card installed in the PC. (6 hrs) 317. Remove the display driver card and identify the main components and connectors on the display driver card. (6 hrs) 318. Replace the display driver card and re-install. (before practicing this skill set, the already installed driver should be removed from device manager). (6 hrs) 319. Change the exiting display card with a different card given and install. (6 hrs) 320. Servicing of monitors, changing fuses, adjusting colors, brightness and contrast. Setting resolution, loading drivers. Checking and replacing components on the PCB. Checking and adjusting LCD Monitors. (8 hrs) 321. Install, configure and operate LCD Projector. (6 hrs) 322. Install and Configure Touch Pad.	• Types of monitor, Monochrome and color, CGA, EGA, VGA, SVGA, Digital Analogue, interlaced non-interlaced. Specifications and Comparison of Monitors. Front panel controls brightness, contrast, and horizontal and vertical height settings. • Display cards, bus standards, types CGA, EGA VGA, SVGA, AGP, memory and drivers. • Main components and connectors on display cards, display controller IC, RAM chips and dual port feature principle of working and use of display memory. • Installing display drivers, setting features. • Information required before changing the display driver card and precautions to be taken while installing a display driver card. • LCD and TFT Monitors. • Understanding the difference between flat screens and CRT display systems. • Understanding the displays memory and its effect on quality and performance.

		(6 hrs)	• Working principle of LCD Projector, its specification, configuration and common faults. • Working Principle of Touch Pad.
61-62	Replace/ install Sound Card and set properties to adjust sound quality.	***Sound Card*** 323. Identify the specifications of the installed sound card in the PC. (6 hrs) 324. Identify and adjust the playback and recording properties of sound card/ driver. (6 hrs) 325. Remove the sound card from PC and identify the main components on the card. (6 hrs) 326. Replace the card and reinstall the sound card and set properties. (7 hrs) 327. Change the existing sound card with a different card given and install. (6 hrs) 328. Connect the speaker and microphone, adjust the controls for better quality sound and testing. (7 hrs) 329. Interconnect laptop to a multimedia projector and carryout adjustments. (6 hrs) 330. Replace battery pack in laptops and carryout general maintenance. (6 hrs)	• Specifications of sound card 16/32 bit stereo moNo. • Frequency response, sound files format, compression and decompression. • Principle of working and functional units of sound card. • Installation procedure of sound cards. Setting playback and recording features. • Main components on a sound card and its working. • Properties and specification of sound cards. • Information and resources required before installation of sound card. • Type of speaker and microphone, frequency response, control adjustments, cable and connectors of speaker. • Laptops, advantages, essential difference in construction, additional features, PCMCIA cards. • General maintenance procedures and replacement of battery.
63-64	Perform maintenance and servicing of UPS.	***UPS*** 331. Identify the specifications of UPS. (6 hrs) 332. Switch-on and Switch-off procedure of UPS. (6 hrs) 333. Measurement of Input/ output voltage/ current levels, battery charge level. (6 hrs) 334. Identifying status of UPS from front panel indicators. (6 hrs) 335. Carryout routine maintenance of battery, battery terminals, loose	• Study of typical working UPS circuit, explanation of each stage involved. Voltage, current, frequency and KVA specifications. • Controls of different type of UPS: On-line, Off- line, Line interactive etc. • Typical circuit blocks. • Routine maintenance of battery and UPS. • Back-up time, its dependence on battery, load and its calculations.

		contacts etc. (6 hrs) 336. Test UPS as per specification. Verification of back-up time. (6 hrs) 337. Circuit tracing and fault finding practice. (6 hrs) 338. Servicing of UPS by simulating more likely faults and systematic approach to identify and rectify them. (8 hrs)	• Possible problems in UPS, fault finding procedures. • Simulated faults and serving of UPS.
65-66	Installation and configuration of Modem, System Resources, Add on Cards, Cables & Connectors.	***Modem*** 339. Installation and configuration of different types of Modem e.g. DSL, ADSL, Data Card, Dongle etc. (15 hrs) ***System Resources*** 340. Practice on setting IRQ, DMA, Memory Address, I/O address, Resource Conflict, Plug & Play. (15 hrs) ***Practice on Add on Cards, Cables & Connectors*** 341. AGP, PCI Express, TV Tuner Card, DVR card, Video Capture, SCSI. USB, NIC, Fire wire, Card reader, network storage, Game video card, Camera etc. (20 hrs)	• Modem Fundamentals. • Band width, baud rate, wireless communication, synchronous/ asynchronous transmission. • IRQ, DMA, Memory Address, I/O address, Resource Conflict, Plug & Play Concept. • Different latest Add on Cards - (Identification in terms of I/O slot and connectors).
67	Upgrading, maintenance and troubleshooting of PC.	***POST Code*** 342. Rectify the serial, parallel and USB problem by reinsertion or replacement. (3 hrs) 343. Rectify the printer's problem by reinsertion or replacement. (3 hrs) 344. Rectify the MODEM problem by reinsertion or replacement. (3 hrs) 345. Rectify the windows start-up problem by reinsertion or replacement. (4 hrs) 346. Rectify the illegal operational problem by reinsertion or replacement. (3 hrs)	• Recognize POST error message code as an indication of a serial, parallel and USB problem. • Recognize POST error message code as an indication of a printer's problem. • Recognize POST error message code as an indication of a MODEM problem. • Recognize POST error message code as an indication of a windows start-up problem. • Recognize POST error message code as an indication of an illegal operational problem. • Recognize POST error message

		347. Rectify the virus protection utility problem by reinsertion or replacement. (3 hrs) 348. Rectify the networks problem by reinsertion or replacement. (3 hrs) 349. Rectify the external devises problem by reinsertion or replacement. (3 hrs)	code as an indication of a virus protection utility problem. • Recognize POST error message code as an indication of a networks problem. • Recognize POST error message code as an indication of an external devises problem.
68-69	Upgrading, maintenance and troubleshooting of PC.	***Upgrading of System*** 350. Mother board, Memory, CPU, Graphic Card, BIOS up-gradation, Additional features, Updating of System Software & Application Software (Requirement & How to update). (30 hrs) ***Practice on Backup Drives*** 351. Pen Drive U3 format, Zip Drive, Tape Drive, USB External Drive (HDD, CD/ DVD writer), Types, capacity, interface connector, write protection, Troubleshooting, Interface, Installation, casing for external drive. (20 hrs)	• Understand the limitation of a PC and scope for upgrading. • Understand technical specifications for PC upgrading. • Introduction to removable storage devices, Bulk data storage devices magnetic, optical, magneto optical drives, WORM drives. • Minor repairs and maintenance of CD ROM drives. • Technology, working principle, capacity, and media of ZIP drives. • Important parts and functions of a ZIP drive. • Minor repairs and maintenance of ZIP drive. • Important parts and functions of DAT drive. • Minor repairs and maintenance of DAT drive. • Important parts and functions of DVD ROM drive. • Minor repair works on a DVD ROM drive. • Minor repair works on a CD WRITER. • Technology, working principle, capacity, and media of Magneto-Optical Disk (MOD) drives. Applications. • Important parts and functions of MOD drive. • Minor repair works on MOD. • Latest trends in backup devices/

			media.
70-71	Upgrading, maintenance and troubleshooting of PC.	***Maintenance and Troubleshooting of PC*** 352. Running diagnostics program to identify the health and defects of a PC. Check system performance using third party utilities. Use benchmarking utilities to benchmark systems. (3 hrs) 353. Identify the defect in PC from the audible and observable symptoms such as beep sounds, post messages. Hanged keyboard, erratic display etc., and corrective action. (3 hrs) 354. Tracing the circuit of a KB. (3 hrs) 355. Troubleshooting defects related to Keyboard and its related ports loose connections, replacing cable, replacing keys (DIN, PS/2, USB). (3 hrs) 356. Trouble shooting defects related to Mouse and its related ports loose connections, replacing cable, replacing roller and sensing elements. (COM, PS/2, USB). (3 hrs) 357. Study of interface cable connector, replacing of subassemblies of Light pen, scanner, digitizer. (3 hrs) 358. Troubleshooting defects related to HDD, (practice of replacing motor, head, PCB among faulty drives) cable and connector. (4 hrs) 359. Troubleshooting defects related to CD ROM Drive, Attempting for replacement and adjustments) cable and connector. (4 hrs) 360. Troubleshooting defects related Ports to Jumper setting. (4 hrs) 361. Troubleshooting defects related to Processor. (4 hrs)	• Safety precautions in handling PC, sub-assemblies and components, Important points to be considered while purchasing and replacing components. Concept of Preventive and corrective maintenance. Tools required, Active & Passive Maintenance, Maintenance scheduling. Need of diagnostics program. Features, limitations. Examples of commonly used diagnostic programs. • Probable defects in PC. Localizing faults through its observable visual or audio symptoms and possible methods for rectification/ servicing. Understanding serviceability of component. Economy in repair/ replacement. • Block diagram of a KB, function of controller, LED driver Sample circuit. • Defects related to Keyboard and its related ports (DIN, PS/2, USB) Discontinuity in cable, and bad keys. Servicing procedure. • Defects related to Mouse and its related ports (COM, PS/2, USB) and servicing procedure. • Working principle, electro mechanical circuits of Light pen scanner and digitizer. • Defects and symptoms related to HDD and its cable, connector and servicing procedure. • Defects related to CD ROM Drive jamming of mechanical assembly mal function of control circuit, and its cable, connector and servicing procedure. • Defects related to Ports jumper

		362. Troubleshooting defects related to RAM memory modules. (4 hrs) 363. Troubleshooting defects related BIOS. (4 hrs) 364. Troubleshooting defects related to CMOS setup. (4 hrs) 365. Troubleshooting defects related to Battery. (4 hrs)	setting on motherboard and servicing procedure. • Defects related to processor, its socket, cooling and servicing procedure. • Defects related to RAM memory module connector and servicing procedure. • Defects related to BIOS, upgrading and servicing procedure. • Defects related to CMOS, COMS setup and servicing procedure. • Defects related to battery and servicing procedure.
72-73	Assemble, replace and troubleshooting various parts of Tablet/ Smart Devices.	***Tablet/ Smart Devices*** 366. Assembling & disassembling of different types of tablets/ Smart Devices. (5 hrs) 367. Testing of various parts with multimeter. (4 hrs) 368. Replacing of faulty parts. (4 hrs) 369. Fault finding & troubleshooting. (4 hrs) 370. Practice Advanced troubleshooting techniques. (5 hrs) 371. Flashing of various brands of tablets/ smart devices. (4 hrs) 372. Upgrading operating systems. (4 hrs) 373. Formatting of virus affected devices. (4 hrs) 374. Unlocking of handsets through codes and software. (4 hrs) 375. Troubleshooting settings faults. (4 hrs) 376. Working with iOS, Android, Ice-cream sandwich, Jellybeans. (4 hrs) 377. Installation of Phone Gap framework. (4 hrs)	• Circuit Board/ Motherboard Introduction. • Study of parts of a tablet PC/ smart devices. • Testing of various parts with multimeter. • Steps of repairing various hardware problems. • Advanced troubleshooting techniques. • Introduction of various software faults. • Flashing of various brands of tablets / smart devices. • Upgrading operating systems. • Locking & Unlocking of handsets. • Concept of iOS, Android, Ice-cream sandwich, jellybeans. • Concept of Phone Gap.
74	Browsing internet and work with Cloud Computing.	***Internet and Web Browser*** 378. Practice web browsing using popular web browsing software,	*Internet and Web Browser* • World wide web and website. • Web Browsing and popular web

		Configuring web browser. (1 hr) 379. Search for content using popular search engines. (1 hr) 380. Use favourite folder for browsing quickly. (2 hrs) 381. Downloading & Printing Webpages. (2 hrs) 382. Using e-mail – Opening & configuring email client, mailbox: inbox and outbox, Creating and sending e-mail, Replying to an e-mail message, Forwarding and e-mail message, Sorting and searching emails. (2 hrs) 383. Sending document/ softcopy by email, activating spell checking, using address book, Handling SPAM, Removal of Cookies. (2 hrs) ***Cloud Computing*** 384. Work with Cloud services. (15 hrs)	browsing software. • Introduction to Search Engines, Popular Search engines. • Concept of Favorites Folder. • What is an Electronic Mail? • Email Addressing, BCC and CC, Inbox, Outbox, Address book, SPAM. *Cloud Computing* • Introduction to Cloud Computing, how to access Cloud service providers & to create an account. *IT Act & Law* • Introduction to Cyber Security. • Introduction to Cyber Laws & IT Act. • Importance of privacy and techniques to manage it.
75-76	**Industrial Visit/ Project work** **Broad Areas:** a) Troubleshoot / Repair/ Replace a faulty Printer/ Scanner/ UPS/ MFD/ VDU/ Add-on card/ Spares, b) Installation & configuration of LINUX, Configure Outlook, Setting/ Configuring Tablet/ Android etc.		
77	**Revision**		
78	**Examination**		

Note: -

1. *Some of the sample project works (indicative only) are given against each semester.*
2. *Instructor may design their own project and also inputs from local industry may be taken for designing such new project.*
3. *The project should broadly covered maximum skills in the particular trade and must involve some problem solving skill. Emphasis should be on Teamwork: Knowing the power of synergy/ collaboration, Work to be assigned in a group (Group of at least 4 trainees). The group should demonstrate Planning, Execution, Contribution and application of Learning. They need to submit Project report.*

4. *If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce components/ sub-assemblies in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.*
5. *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of industry on machine fitting, alignment of pump-motor, fitting of pipes & tubes, assembling jobs, maintenance work, etc., may be shown to the trainees to give a feel of Industry and their future assignment.*

SYLLABUS – INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE			
FOURTH SEMESTER – 06 Months			
Week No.	**Ref. Learning Outcome**	**Professional Skills with Indicative hrs**	**Professional Knowledge**
79	Setting up and configuring Networking System using various network devices.	***Components of the Computer Network*** 385. Familiarization with various Network devices, Connectors and Cables. (10 hrs) 386. Understanding the Layout of network. (15 hrs)	• Introduction to Computer Networks – Advantages of Networking, Peer-to-Peer and Client/Server Network. • Network Topologies – Star, Ring, Bus, Tree, Mesh, Hybrid. • Type of Networks – Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN). • Internet, Ethernet, Wi-Fi, Bluetooth, Mobile Networking, Wire and wireless Networking. • Difference between Intranet and Internet.
80-81	Setting up and configuring Networking System using various network devices.	***Crimping & Punching*** 387. Crimping practice with straight and cross CAT 5 cables. (15 hrs) 388. Punching practice in IO Box and patch panel. (15 hrs) 389. Crimping and making cables. (20 hrs)	• Communication Media & Connectors – Unshielded twisted-pair (UTP), shielded twisted-pair (STP), Fiber Optics and coaxial cable: RJ-45, RJ-11, BNC. • Understanding color codes of CAT5 cable. 568A and 568B convention.
82	Setting up and configuring Networking System using various network devices.	***Cabling*** 390. Create cabling in a lab with HUB/ Switch and IO Boxes and patch panel. (20 hrs) 391. Fitting Switch Rack. (5 hrs)	• Introduction to Data Communication – Analog and Digital Signals, Simplex, Half-Duplex and Full-Duplex transmission mode.
83	Setting up and configuring Networking System using various network devices.	***Install & configure a Network*** 392. Installing & Configuring a Peer-to-Peer Network using Windows Software. (15 hrs) 393. Making cables by crimping. (5 hrs) 394. Connect computers using Bluetooth. (5 hrs)	• OSI Model - The functions of different layers in OSI model.
84-85	Setting up and	***Configuration of Data communication equipments***	• Network Components – Modems, Firewall, Hubs, Bridges, Routers,

	configuring Networking System using various network devices.	395. Connecting computers with Network with Drop cable and using Wi-Fi configuration. (10 hrs) 396. Basic Programmable switch Configuration Spanning Tree Protocol (STP). (10 hrs) 397. Command Line Interface. (10 hrs) 398. IP Routing Process. (10 hrs) 399. Verifying Configuration. (10 hrs)	Gateways, Repeaters, Transceivers, Switches, Access point, etc. – their types, functions, advantages and applications. • IP Routing in Network RIP IGRP
86	Setting up and configuring Networking System using various network devices.	***IP Addressing & TCP/ IP*** 400. IP addressing technique (IP4/ IP6) and Subnetting and Supernetting the network. (6 hrs) 401. Installation and Configuration of TCP/ IP Protocol. (6 hrs) 402. Practice TCP/ IP Utilities: PING, IPCONFIG, HOSTNAME, ROUTE, TRACERT etc. (6 hrs) 403. Setup and configure a Virtual LAN. (7 hrs)	• Protocols, TCP/IP, FTP, Telnet etc. • Theory on Setting IP Address(IP4/ IP6) & Subnet Mask, Classes of IP Addressing. • Overview of Virtual LAN. • VLAN Memberships. • Identifying VLAN. • Trunking - VLAN Trunk Protocol (VTP). • Concept of Translator Gateways.
87	Setting up and configuring Networking System using various network devices.	***Other Network Protocols*** 404. Working with SMTP, TELNET, FTP, HTTP, SNMP, LDAP etc. (15 hrs) 405. Practice on configuring DHCP. (10 hrs)	• Simple Mail Transfer Protocol (SMTP), Telnet, File Transfer Protocol (FTP), Hyper Text Transfer Protocol (HTTP), Simple Network Management Protocol (SNMP). • LDAP (Lightweight Directory Access Protocol). • Network Security. • Concept of Dynamic Host Control Protocol.
88	Sharing and controlling resource and Internet connection through network.	***Sharing Resource & Internet connection*** 406. Sharing Resource and Advance Sharing Setting. (5 hrs) 407. Installing Proxy Server. (5 hrs) 408. Exposure and using Internet. Setting E-mail accounts. Conferencing. (5 hrs) 409. Installing and Configuring Internet. (5 hrs) 410. Connection on a PC using Broadband or Dongle. (5 hrs)	• Concept of Internet. • Architecture of Internet. • DNS Server. • Internet Access Techniques, ISPs and examples (Broadband/ Dialup/ WiFi). • Concept of Social Networking Sites, Video Calling & Conferencing. • Concept of Virus and its Protection using Anti-Virus, UTM and Firewall.
89	Implement Network Security to protect from various attacks on networking.	***Network Protection and troubleshooting*** 411. Setting up basic protection using public keys and MAC address filters. (10 hrs)	• Collaborating using wired and wireless networks, Protecting a Network, Network performance study and enhancement.

		412. Integrate wired with wireless network. (5 hrs) 413. Power over Ethernet (PoE). (5 hrs) 414. Troubleshooting wired and wireless network. (5 hrs)	
90	Sharing and controlling resource and Internet connection through network.	***Control & monitoring of network devices*** 415. Setting up of basic collaboration tool like NetMeeting for activities like chat, application sharing, remote desktop access and control, VoIP. (15 hrs) 416. Setup IP camera for basic surveillance scenario, logging and monitoring of devices/ locations. (10 hrs)	• Surveillance using network devices, collaboration on network for team optimization and support activities. • Remote management of devices.
91	Implement Network Security to protect from various attacks on networking.	***Network Security*** 417. Practice on firewall technologies to secure the network perimeter. (10 hrs) 418. Practice LAN security considerations and implement endpoint and Layer 2 security features. (10 hrs) 419. Wi-Fi configuration to implement security considerations. (5 hrs)	• Modern Network Security Threats and the basics of securing a network. • Secure Administrative Access, LAN security considerations. • Network Security Devices. • Cryptography. • Wi-Fi security considerations.
92	Installation and basic configuration of Windows Server.	***Server Installation & Basic Configuration*** 420. Identify Server Hardware. (5 hrs) 421. Install and configure Windows Server. (5 hrs) 422. Install and Configure Active Directory. (5 hrs) 423. Implementing AD Services. (5 hrs) 424. Configuration of broadband modem and sharing internet connection. (5 hrs)	• Server concepts, Server Hardware, Installation steps, configuration of server. • Concept of Active Directory. • ADS Overview, ADS Database, Active Directory Namespace, Logical & Physical Elements of AD.
93-94	Installation, configuration of DNS, Routing and user account customization.	***Install & configure DNS*** 425. Installing and Configuring DNS Services - Setup Name resolution – Host names, NetBIOS names. - Installing DNS Server. - Configuring DNS Zones, DNS Clients, Delegating Zones.	• Concept of DNS. • Name resolution – Host names, NetBIOS names. • DNS Overview. • DHCP Overview. • DHCP Clients and Leases.

		- Testing DNS with nslookup, dnscmd and dnslint. (25 hrs) 426. Installing and Configuring DHCP Services - DHCP Server Configuration. - Setting up of DHCP, Routing and remote access. (25 hrs)	
95	Installation, configuration of DNS, Routing and user account customization.	***Routing and Remote Access*** 427. Configuring RRAS. (5 hrs) 428. VPN implementation. (5 hrs) 429. Configuring Remote Access Authentication Protocol. (5 hrs) 430. Configuring RRAS Policies. (2 hrs) 431. Configuring IAS. (3 hrs) 432. Managing TCP/ IP Routing. (5 hrs)	• Remote Access Overview. • VPN Concepts. • Remote Access Authentication Protocol. • RRAS Policies. • IAS. • TCP/ IP Routing.
96	Installation, configuration of DNS, Routing and user account customization.	***Planning and Implementing User and Group Strategies*** 433. Adding Account. (2 hrs) 434. Implement AGDLP Process. (5 hrs) 435. Implement User Authentication Strategy. (5 hrs) 436. Planning and Implementing OU Structure. (3 hrs) 437. Planning and Maintaining Group Policies - Configuring User Environment. (5 hrs) 438. Configuring Computer Security. (5 hrs)	• Concept of User and Group. • Planning Security Group Strategy. • AGDLP Process. • Planning User Authentication Strategy. • Planning OU Structure. • Planning a Group Policy Strategy. • Deploying Software Through GPO.
97	Configuration of Server and managing Server Network security, Infrastructure.	***Server Configuration & Backup*** 439. Configure a server as web server. (15 hrs) 440. Configuring Mailbox Servers. (5 hrs) 441. Implementing Backup and Recovery. (5 hrs)	• Introduction to Web Server • Introduction to Messaging Services. • Concept of Backup and Recovery of Server.
98	Configuration of Server and managing Server Network security, Infrastructure.	***Managing Server Network Security*** 442. Security Baseline Settings and Templates. (5 hrs) 443. Configuring Audit Policy. (5 hrs) 444. Monitoring and Troubleshoot Network protocol. (5 hrs) 445. Configuring Protocol Security. (5 hrs) 446. Planning security for Wireless Network. (5 hrs)	• Security Baseline and Templates. • Audit Policy. • Understanding IPSec. • Protocol Security. • Planning security for Wireless Network.
99	Configuration of	***Maintaining Network Infrastructure***	• Managing Network Traffic

	Server and managing Server Network security, Infrastructure.	447. Monitor Network Traffic. (5 hrs) 448. Troubleshoot Internet Connectivity. (10 hrs) 449. Troubleshoot Server Services. (5 hrs) 450. Use Linux Network Tools to check/ maintain/ Manage Network. (5 hrs)	• Types of Problems of Internet Connectivity. • Types and working of Server Services.
100	Installation and basic configuration of Linux server.	***Linux Server installation and configuration*** 451. Install Linux Server. (5 hrs) 452. Create new user and group. (2 hrs) 453. Create public and data directory. (2 hrs) 454. Create an lmlhosts file. (3 hrs) 455. Check host file. (2 hrs) 456. Secure and run SWAT. (3 hrs) 457. Filter ports. (3 hrs) 458. Telnet installation and configuration. (5 hrs)	• Configuration Plan. • Public and data directory. • Host file. • SWAT. • Password Authentication. • Telnet.
101-102	**Industrial Visit/ Project Work** **Broad Areas:** a) Setting up a LAN of at least 3 PCs using HUB/ Switch and structured cabling. b) Configuration of Switch/ Router, Setup a wireless LAN with security features, Invoking Network security. c) Installation & configuration Windows server. d) Installation & configuration of LINUX Server.		
103	**Revision**		
104	**Examination**		

NOTE:-

1. *Some of the sample project/ field works (indicative only) are given against each semester.*
2. *Instructor may design their own project/ field work and also inputs from local industry may be taken for designing such new project.*
3. *The project should broadly covered maximum skills in the particular trade and must involve some problem solving skill. Emphasis should be on Teamwork: Knowing the power of synergy/ collaboration, Work to be assigned in a group (Group of at least 4 trainees). The group should demonstrate Planning, Execution, Contribution and application of Learning. They need to submit Project report.*

4. *If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce components/ sub-assemblies in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.*
5. *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of both conventional & system generated, may be shown to the trainees to give a feel of Industry and their future assignment.*

9.1 CORE SKILL – WORKSHOP CALCULATION & SCIENCE

S No.	Workshop Calculation	Workshop Science
1st Semester		
1	**Unit:** Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**Material Science**: 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 metals, Non-Ferrous Alloys.
2	**Fractions**: Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.	**Mass .Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.
3	**Square Root**: Square and Square Root, method of finding out square roots, Simple problem using calculator. **Ratio & Proportion** : Simple calculation on related problems.	**Speed and Velocity:** Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.
4	**Percentage**: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	**Work, Power and Energy:** work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.
2nd Semester		
1	**Algebra**: Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**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.
2	**Mensuration:** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere.	**Basic Electricity:** Introduction, use of electricity, how electricity is produced, 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.
3	**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric	**Levers and Simple Machines:** levers and its types. Simple Machines, Effort and

	tables.	Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.
3rd Semester		
1	**Indices:** Laws of indices related problems. Quadratic Equation: Introduction, solution of simple Quadratic equation and related problems.	**Elasticity:** Stress, strain, Modulus of elasticity, elastic limit, Hooks law, young's modulus.
2	Solution of simple A.C. circuit with R.L.C. Calculation of power factor etc.	**Material:** Introduction, types and properties. Uses of Conducting, Semi-conducting and insulating materials.
3	**A.C Waveform Calculation:** Calculation of r.m.s, average, instantaneous value, peak value. Peak to peak value, Frequency and wavelength calculation and their relationship.	**Magnetism:** Magnetic material, magnetic field, flux density, magnetic moment, m.m.f. Reluctance, permeability, susceptibility, electromagnet, solenoid and its practical applications.
4	**Series and Parallel Connection of Electrical and Electronic components:** 1. Calculation Series and parallel connection of Resistors. 2. Calculation Series and parallel connection of Capacitors. 3. Calculation Series and parallel connection of Inductors. 4. Calculation Series and parallel connection of Batteries. 5. Conversion of power flow to H.P. 6. Calculation of KVA.	**Pressure:** Pneumatic pressure, PSI, bar, atmospheric pressure, pressure gauge and absolute pressure.
4th Semester		
1	**Network:** Calculation of Network, Speed, Bandwidth, Baud Rate IP Addressing and Subneting Mask calculation DSL speed calculation.	**Quality Control:** Quality control standard in workshop, concept of 5s and Kaizen.
2	**Mobile Billing:** Calculation of Mobile billing and internet billing.	**Wi-Fi:** Standard of Wi-Fi Network. Antenna and its type.
3	**Simple and Compound Interest:** Calculation of SI and Compound interest, percentage gain, Profit and Loss calculation.	**Data Encryption:** Encryption and Decryption technique.
4	**Data Communication:** Communication Technique, CSMA/CD.	**Cyber Security:** Rules of Cyber Security

9.2 CORE SKILL - ENGINEERING DRAWING

S No.	CONTENTS
1st Semester	
1	Engineering Drawing: Introduction and its importance • Relationship to other technical drawing types • Conventions • Viewing of engineering drawing sheets. • Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2	Drawing Instruments : their Standard and 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	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	Drawing of Geometrical Figures: • Definition, nomenclature and practice of angle measurement and its types, method of bisecting. • Triangle - different types • Rectangle, Square, Rhombus, Parallelogram. • Circle and its elements.
5	Lettering and Numbering as per BIS SP46-2003: - • Single Stroke, Double Stroke, inclined, Upper case and Lower case.
6	Dimensioning: • Definition, types and methods of dimensioning (functional, nonfunctional and auxiliary) • Types of arrowhead • Leader Line with text
7	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.
8	Sizes and Layout of Drawing Sheets: • Basic principle of Sheet Size • Designation of sizes • Selection of sizes • Title Block, its position and content

	• Borders and Frames (Orientation marks and graduations) • Grid Reference • Item Reference on Drawing Sheet (Item List)
9	Method of presentation of Engineering Drawing • Pictorial View • Orthogonal View • Isometric view
10	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
2nd Semester	
1	Construction of Scales and diagonal scale.
2	Practice of Lettering and Title Block.
3	Dimensioning practice: • Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) • Symbols preceding the value of dimension and dimensional tolerance. • Text of dimension of repeated features, equidistance elements, circumferential objects.
4	Construction of Geometrical Drawing Figures: • Different Polygons and their values of included angles. Inscribed and Circumscribed polygons. • Conic Sections (Ellipse & Parabola)
5	Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.
6	Free Hand sketch of hand tools and measuring tools used in respective trades.
7	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.
8	Drawing of Orthographic projection from isometric/3D view of blocks.
9	Orthographic Drawing of simple fastener (Rivet, Bolts, Nuts & Screw).
10	Drawing details of two simple mating blocks and assembled view.
3rd Semester	
1	**Free Hand Sketching:** Tools used in Computer maintenance such as Crimping tools, Punching tools, Soldering iron etc.
2	**Block Diagrams:** Personal Computer, Monitor using CRT (Cathode Ray Tube) , LCD (Liquid Crystal Display) and LED (Light Emitting Diode), Scanner, UPS (Uninterrupted Power Supply), SMPS(Switch Mode

	Power Supply), Printers(Inkjet, Deskjet & Laser).
3	**Layout Diagrams:** Cables, Connectors, Expansion Cards, CPU, CPU Sockets, Motherboard.
4	**Polarity Diagram:** Different types of computer RAM Modules.
5	**Pin layout:** Different types of cables & connectors used in computer system, & associated peripheral & network.
4th Semester	
1	**Block Diagrams:** Network Topologies, OSI Model, TCP/IP Suite, Client-Server Network, Network Devices-Modem, Router, Switch, Repeater.
2	**Internal View:** Mobile, Laptop, Tablet PC.
3	**Conceptual Diagrams:** Bluetooth, Wi-Fi, Network Security, Internetworking, connection with LCD/LED Projector with computer.
4	**Internal Connections:** Lab Network, Method of connecting Network devices, LAN setup using Modem.
5	**Internet Setup Diagram:** • Networking Block diagram of computers with different network components. • Free hand sketches of straight & cross cables used in networking. • Setup diagram of modem-based internet connection. • Setup diagram of Wi-Fi Internet connection.

9.3 CORE SKILL – EMPLOYABILITY SKILL

1st Semester	
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
2nd Semester	
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.

LIST OF TOOLS & EQUIPMENT			
INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE (For batch of 20 candidates)			
S No	**Name of the Tool & Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Connecting screwdriver	100 mm	21 Nos.
2.	Neon tester	500 V	21 Nos.
3.	Screw driver set	set of 5	21 Nos.
4.	Insulated combination pliers	150 mm	21 Nos.
5.	Insulated side cutting pliers	150 mm	21 Nos.
6.	Long nose pliers	150 mm	21 Nos.
7.	Soldering iron	25 W. 240 V	21 Nos.
8.	Electrician knife		21 Nos.
9.	Tweezers	100 mm	21 Nos.
10.	Digital Multimeter		21 Nos.
11.	Soldering Iron Changeable bits	15 W	21 Nos.
12.	De- soldering pump		21 Nos.
B. LIST OF TOOLS REQUIRED			
13.	Crimping tool (pliers)		2 Nos.
14.	Soldering Iron	25 W	6 Nos.
15.	Magneto spanner set		2 Nos.
16.	Screw driver	150 mm	4 Nos.
17.	Steel rule	150 mm	2 Nos.
18.	Scriber straight	150 mm	2 Nos.
19.	Soldering Iron	240 W	1 Nos.
20.	Allen key set	set of 9	2 Nos.
21.	Tubular box spanner	set of 6	1 No.
22.	Magnifying lenses	75 mm	3 Nos.
23.	Continuity tester		6 Nos.
24.	Soldering iron	10 W	6 Nos.
25.	Cold chisel	20 mm	1 No.
26.	Scissors	200 mm	1 No.
27.	Handsaw	450 mm	1 No.
C. TOOLS & EQUIPMENTS (Computer Hardware: Installation and Maintenance)			
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.	Online UPS	5 KVA	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 different types	500 GB or higher	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.
D. 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 availabe
E. 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		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.
F. TOOLS & EQUIPMENTS (Computer Networking)			
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		2 Nos.

	Software		
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.	UTP jack panel	8/16/24 port	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
Note: - All the tools and equipment are to be procured as per BIS specification.			

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
S. 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 are 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:			

S No.	**Maximum Marks (Total 100 Marks)**		**15** Safety Consciousness	**5** Workplace Hygiene	**10** Attendance/ Punctuality	**5** Ability to Follow Manuals/ Written Instructions	**10** Application of Knowledge	**10** Skills to Handle Tools & Equipment	**5** Economical Use of Materials	**10** Speed in Doing Work	**15** Quality in Workmanship	**15** VIVA	**Total Internal Assessment Marks**	**Result (Y/N)**
	Candidate Name	**Father's/Mother's Name**												
1														
2														