GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: MAINTENANCE OF ELECTRONICS EQUIPMENT
(COURSE CODE:3361103)

Diploma Programme in which this course is offered	Semester in which offered
Electronics and Communication	Sixth

1. RATIONALE

Equipment with electronic circuitry are increasingly being used in all the Industry and maintenance of them is the essential work for the proper functioning of the complete system. This course will enable the students to develop skills to maintain the basic electronic circuitry used in these equipment, which are employed in Industry and in consumer goods segments. This course will also enable them to fulfill the basic prerequisite for the advance maintenance issues which they will face in the Industry. After learning this course students can also start their own electronic repair workshop as a self-employer.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Maintain the electronic circuits of various equipment.**

3. COURSE OUTCOMES (COs)

The theory should be taught and practical should be undertaken in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domains to demonstrate the following course outcomes:

i. Identify and test various active and passive components.
ii. Handle different types of Electronic measuring Instruments
iii. Diagnose faults in electronics equipments.
iv. Troubleshoot computer hardware and networking
v. Maintain SMPS, UPS, Inverter, solar power system, various analog and digital circuits, internal section of computer system, LED/ LCD TV, Cell phone (Mobile)/ microwave oven etc

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	50
0	0	2	2	00	00	20	30	

Legends: L - Lecture; **T -** Tutorial/Teacher Guided Student Activity; **P -** Practical; **C -** Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. COURSE CONTENT DETAILS

Note: There would not be separate classes for following theory content, this has to be discussed by the faculty while demonstrating practical in the lab**.**

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Concept of Maintenance	1a. Explain the basic steps of electronic equipment maintenance. 1b. Describe the types of maintenance 1c. Select the desired or proper instrument for suitable measurement. 1d. Summarize safety measure before troubleshooting. 1e. Explain troubleshooting procedure, fault analysis and fault location. 1f. Define reliability and its associated parameter. 1g. Identify with specification, commonly used tools. 1h. List dos and don'ts for use and maintenance of tools.	1.1 Maintenance steps and its types 1.2 Preventive, predictive and breakdown maintenance 1.3 Measuring instruments 1.4 Precaution 1.5 Safety measures 1.1 Troubleshooting procedure 1.2 Equipment reliability and its parameter 1.3 Demonstration and use of hand tools: Screw driver, pliers, tweezers, wire stripper, scribers, hacksaw, files, bench vice, drilling machine, drilling bits (0.8, 1.0, 1.2,1.5mm)
Unit – II Testing of Electronic Component	2a.Use data book and hand book to find out the device specifications	2.1 Various parameters of electronic active/passive components using data book
	2b.Identify various connectors. 2c.Describe procedure for testing connectors.	2.2 Search and know various parameters of different types of ICs using data book 2.3Testing of passive components separately or Mounted on PCB like: Resistor, Capacitors Other components :Switches, , Inductors, Relays, Transformers 2.4Fuses, Connectors, Single/three phase MCBs, single phase ELCBs, RJ45 connector
	2d.Identify and test various electronics components. 2e.Describe procedure for testing various electronics components	2.5Testing of all kind of active electronics components separately or Mounted on PCB using DMM or CRO like: Diodes, Transistors, FETs, MOSFET's, SCR, DIAC,TRIAC, Displays using LCD or LED ,TTL and CMOS IC's, Opto electronics components, Crystal
	2f. Describe Soldering and de-soldering process of various types	2.6 Prepare component for soldering , soldering and de soldering using

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	of electrical and electronics components.	soldering stations , concept of machine soldering
Unit – III Testing of Electronic Circuits	3a. Describe procedure for conducting A.C./D.C. voltage measurement and continuity test 3b. Inspect the various solder joints of given circuits 3c. Describe steps for testing of on board passive components 3d. Describe steps for testing of on board active components 3e. Describe steps for testing of on board ICs 3f. List steps for diagnosing faults of nonworking circuit and rectifying it.	3.1 Measurement of A.C. voltage and D.C. voltage using millimeter for the given circuit. 3.2 Continuity test of PCB track, wiring, switch etc. 3.3 Inspection of solder joints, defects of soldered joints in given circuits, familiarizations to rework and repair using multi-meter 3.4 Test the components like resistors, capacitors, inductors etc. connected on given PCB 3.5 Test the components like transistors, diodes etc. connected on given PCB 3.6 Test the ICs connected on given PCB 3.7 Diagnose fault and troubleshoot that in a given electronic circuit
Unit – IV Maintenance of Computer System	4a. List steps for assembling a Computer system 4b. Install operating system software on a Computer system 4c. Install Application software on a Computer system 4d. Uninstall software and reinstall that step by step 4e. Configure Computer to connect in a LAN network environment	4.1 Various parts of computer system and its assembling 4.2 Installation of operating system, application software, antivirus etc. 4.3 Computer system hardware maintenance 4.4 Formatting and maintenance of computer system 4.5 Network installation, IP address setting etc. and its maintenance
Unit – V Maintenance of Home Appliances and Industrial Equipments	5a. Describe common Step of maintenance of various type of home appliances 5b. Describe common Step of maintenance of various type of Industrial equipments 5c. Describe common Step of Maintenance of solar power system 5d. Describe common Step to Troubleshoot mobile	5.1 Maintenance of home appliances like microwave oven, LED/LCD TV, music player, mobile phone, laptop, camera, etc. 5.2 Maintenance of Industrial electronic equipments like …medical equipments, CRO, PLC based instruments. 5.3 Installation of solar power system. 5.4 Mobile hardware.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARK (Theory)

There is no end of the semester theory examination and hence it is not applicable

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical. However, if these practical are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercises (outcomes in psychomotor domain)	Approx. Hours Required
1.	I	Demonstrate use of various hand held tools.	02
2.	II	Test the performance of different passive electronic components (fixed/variable)	04
3.	II	Test the performance of active electronic components like general purpose transistor/FET/MOSFET/SCR/DIAC/TRIAC with DMM and CRO OR Components Tester	06
4.	II	Test the performance of miscellaneous electronics components(transformers ,Loudspeaker, microphone, Relays, Solenoid, Switches, DC Motors, Stepper Motor ,sensors, opto electronics components	06
5.	II	Verify the functionality of TTL and CMOS Digital IC's using IC tester	02
6.	II	Explore datasheet of minimum any five electronics components and analog/ Digital IC's.	02
7.	III	Draw the given regulated power supply circuit/ SMPS (from any television/fridge/ computer system/ laboratory etc)	02
8.	III	Demonstrate steps of installation of online/ Offline UPS..	04
9.	IV	Identify basic sections of a personal computer	02
10.	IV	List the technical specifications of various computer peripherals. (e.g. CPU, Monitor, Keyboard, Mouse, Speaker, Web cam, Printer, Scanner, microphone, speakers, modem, projector etc).	04
11.	IV	Examine different types of motherboards and identify various ports and slots on it.	02
12.	IV	Test the voltage at different output points of SMPS of desktop and laptop computer system	02

S. No.	Unit No.	Practical/Exercises (outcomes in psychomotor domain)	Approx. Hours Required
13.	IV	Troubleshoot the booting process of computer system	02
14.	V	Explore circuit diagram of LED, and LCD TV.	02
15.	V	Demonstrate troubleshooting steps of Laptop for the common fault	02
16.	V	Explore circuit of any home theatre system and prepare its circuit diagram /wiring diagram	02
17.	V	Demonstrate any one the medical equipment troubleshooting steps	02
18.	V	Demonstrate installation Solar power system	02
19.	V	Demonstrate Installation of DTH system	02
20.	V	Demonstrate the steps of maintenance of copier machine	02
21.	V	Practice steps for mobile troubleshooting	02
Total Hours			**54**
Note: Depending upon the availability of resources, perform any of the practical exercises from above list for total of minimum 28 hours so that skills matching with the most of the outcomes of every unit are included.			

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Maintain domestic electronic devices.
ii. Diagnose fault in the non working home appliance and rectify that.
iii. Discuss case study of any fault detection and rectification problem
iv. Maintain the office electronic equipment.
v. Make visit to service centers of gadgets/equipment covered in curriculum and if possible work there for some days on voluntarily basis during holidays.
vi. Search internet websites for DYS (Do Your Self) information for repair of electronic gadgets/equipment or collect manuals for repair and maintenance and try your hands to repair some gadgets/equipment based on that.

9. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

i. Show Video/ Animation film explaining different field applications of PLC, DCS and SCADA.
ii. Prepare a chart related to PLC,DCS and SCADA Hierarchy
iii. Arrange demonstration sessions of maintaining equipment/gadgets in labs by inviting engineers/technicians working in service centers of reputed makes as visiting lecturers for lab sessions
iv. Arrange visit to repair centers of reputed makes of consumer goods/Industrial equipment suppliers.
v. Arrange group discussions on the troubleshooting of electronic equipment issues.
vi. Arrange Seminar on Safety and Maintenance issues (ask students to explore the internet and visit nearby industries to collect information regarding the chosen topic/issue)

10. SUGGESTED LEARNING RESOURCES

A) Books

S. No.	Title of Books	Author	Publication/Year
1.	Troubleshooting and Maintenance of Electronics Equipment	Singh K. Sudeep	Katson Book ,New Delhi ,II edition , Reprint 2014
2.	Troubleshooting Electronic Equipment: Includes Repair and Maintenance, Second Edition	Khandpur R. S.	Tata McGraw-Hill Education, New Delhi ,India , latest edition
3.	Mobile repairing Books	Manohar Lotia	BPB Publication, New Delhi , latest edition
4.	Data Books	National semiconductor	National semiconductor

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B) Major Equipment/Materials with specification

1. CRO (Analog/ DSO),
2. Multimeter (Analog/ Digital)
3. Soldering and Desoldering Station
4. Different types of electronic and electrical cables, connectors, sockets, terminations.
5. Various analog and digital ICs
6. Neon tester 500 V.
7. Screw driver set (set of 5)
8. Insulated combination pliers 150 mm
9. Insulated side cutting pliers 150 mm
10. Long nose pliers 150 mm
11. Soldering iron 25 W. 240 V. with solder materials
12. Electrician knife
13. Tweezers 100mm
14. Soldering Iron Changeable bits 10 W
15. De- soldering pump
16. Crimping tool (pliers)
17. Allen key set (set of 9)
18. Magnifying lenses 75mm with illumination
19. Continuity tester
20. Dual DC regulated 15-0-15 volt, 2 Amp
21. LCR meter (Digital)
22. Signal Generator, 0-100 KHz
23. Battery Charger
24. Digital and Analog IC Tester
25. General purpose PCBs, bread board, MCB , ELCB
26. Clip on ammeter
27. RF Power meter
28. Field strength meter
29. Air Blower (500 Watt)

C. Learning Websites/ Software

i. http:// youtube.com (Repairing of various gazette)
ii. http:// www.computerhope.com/basic.htm
iii. http://computer.howstuffworks.com/computer-hardware-channel.htm
iv. http://www.automationtechnology.de/cms/en/markets-solutions/electronics.html
v. http://www.talkingelectronics.com
vi. www.fixya.com
vii. www.ifixit.com
viii. www.fastrepairguide.com
ix. ww.repairfaq.org

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof**. **S J Chauhan**, HOD (EC) , Government Polytechnic, Rajkot
- **Prof**. **S G Valvi,** Sr. Lecturer , Government Polytechnic for Girls, Surat
- **Prof. B B Renuka,** Sr. Lecturer AVPTI , Rajkot
- **Prof. R G Patankar**, Lecturer Government Polytechnic. Gandhinagar

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Anjali Potnis**, Assistant Professor, Department of Electrical and Electronics Engineering
- **Prof. Joshua Earnest,** Professor, Department of Electrical and Electronics Engineering