Program : **Diploma in Biomedical Engineering**	
Course Code : **3249**	Course Title: **Servicing Fundamentals Lab**
Semester : **3**	Credits: **1.5**
Course Category: **Program Core/ Elective/Elective**	
Periods per week: **3 (L:0, T:1, P:3)**	Periods per semester: **45**

Course Objectives:

- To enable students to effectively practice industrial standards and safety precautions.
- To set a firm and solid foundation skills in the use of tools and measuring instruments.
- To instill an interest in maintenance and servicing of electronic equipment.

Course Prerequisites:

Topic	Course code	Course name	Semester
Knowledge of electronic components		Electronics Tinkering Workshop	2
Fundamental knowledge of electronic circuits		Fundamentals of Electrical and Electronics	2
Skill of electrical and electronic circuits assembling and tools		Fundamentals of Electrical and Electronics Lab	2

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Practice housekeeping standards and safety precautions in the industry/shop floor.	8	Applying
CO2	Demonstrate good skill in the use of tools and measuring instruments.	12	Applying
CO3	Set up basic electrical and electronic circuits and test and verify the input and output.	6	Applying
CO4	Dismantle, identify and assemble simple electrical/electronic parts of various electronic appliances.	16	Applying
	Lab Exam	3	

CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3	3		3			
CO3	3	3		3			
CO4		3		3			

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Practice housekeeping standards and safety precautions in the industry/shop floor.**		
M1.01	Practice 5S concepts & its application.	1	Applying
M1.02	Identify safety signs for danger, warning, caution, personal safety messages & other safety signs related to medical field.	1	Applying
M1.03	Use personal protective equipment and Practice elementary first aid.	2	Applying
M1.04	Apply preventive measures for electrical accidents & steps to be taken in such accidents.	2	Applying
M1.05	Manage emergencies - power failure, system failure and fire hazards (use of Fire extinguishers).	2	Applying
CO2	**Demonstrate good skill in the use of tools and measuring instruments.**		
M2.01	Use different hand tools, machine tools and workshop equipment.	2	Applying
M2.02	Test active components, Phase, Neutral and Earth on power socket, AC power, and continuity of wires, meter probes and earth leakage current.	2	Applying
M2.03	Identify different types of wires & cables, standard wire gauge (SWG), different AC mains cables.	1	Applying
M2.04	Repair faulty probes, Crimp the lugs to wire end.	2	Applying

M2.05	Identify the various types of cells / Batteries, output voltage and Ah capacity of given battery, switches (SPST, SPDT, DPST, DPDT, tumbler, push button, toggle, piano switches) and heat sinks, types of relays, fuses etc.	5	Applying
	Lab Exam – I	1½	
CO3	**Set up basic electrical and electronic circuits and test and verify the input and output.**		
M3.01	Differentiate between AC & DC circuits.	1	Understanding
M3.02	Implement simple house wiring circuits, a test lamp and use it to check mains and extension boards.	3	Applying
M3.03	Set up simple electronic circuits - voltage divider, series and parallel networks.	2	Applying
CO4	**Dismantle, identify and Assemble simple electrical/electronic parts of various electronic appliances.**		
M4.01	Identify Static charges, precaution in handling of static sensitive devices, various standards for ESD	1	Understanding
M4.02	Dismantle parts of devices like power supply, fan, mixer grinder, BP apparatus.	4	Applying
M4.03	Assemble and test devices like power supply, BP apparatus.	5	Applying
M4.04	Open Ended Experiments**	6	Applying
	Lab Exam – II	1½	

**** - Suggested Open Ended Projects**

(Not for End Semester Examination but compulsory to be included in Continuous Internal Evaluation. Students can do open ended experiments as a group of 4-5. There is no duplication in experiments between groups. Open ended experiments should include the concepts of circuit testing and troubleshooting)

- Make a panel board using different types of switches for a given application
- Test a battery and verify whether the battery is ready for use or needs
- recharging/replacement.
- Measure the resistance, Voltage, Current through series and parallel connected
- networks using multi meter.
- Assemble and disassemble simple devices.

Text / Reference:

T/R	Book Title/Author
R1	Troubleshooting Electronic Equipment: Includes Repair And Maintenance, Second Edition by Dr R.S. Khandpur
R2	Electrical Technology vol -1 by B.L. Theraja.
R3	Principles of Electrical Engineering and electronics by V.K. Mehta &Rohit Mehta.
R4	Basic Electronics and Linear Circuits by N.N. Bhargava , D.C. Kulshreshtha S.C. Gupta

Online Resources:

Sl.No	Website Link
1	www.nptel.ac.in
2	www.allaboutcircuits.com
3	www.electronicscircuits.com
4	www.electrical4u.com