



Fergusson College (Autonomous)

Pune

Learning Outcomes-Based Curriculum

for

F. Y. B. Voc.

(Electronic Equipment Maintenance)

With effect from June 2019

Program Outcomes (POs)

F. Y. B. Sc. (Electronic Equipment Maintenance): EEM

Particulars	Course	Paper code	Title of Paper	No. of Credits
F.Y. B.Sc. Semester- I	Course- 1	EEM1101	Components, devices and circuit drawings	2
	Course- 2	EEM1102	Maintenance and troubleshooting - tools and instruments	2
	Course- 3	EEM1103	EEM Practical - I	2
F.Y. B.Sc. Semester- II	Course- 4	EEM1201	PCB design and assembly	2
	Course- 5	EEM1202	Solar thermal and LED lighting system	2
	Course- 6	EEM1203	EEM Practical - II	2

S.Y. B.Sc. (Electronic Equipment Maintenance): EEM

Particulars	Name of Paper	Paper code	Title of Paper	No. of Credits
S.Y. B.Sc. Semester- III	Paper - 1	EEM2301	Maintenance and troubleshooting of Instruments	3
	Paper - 2	EEM2302	Computer Maintenance and troubleshooting	3
	Paper - 3	EEM2303	EEM Practical - III	2
S.Y. B.Sc. Semester- IV	Paper - 1	EEM2401	Consumer products - maintenance and Troubleshooting	3
	Paper - 2	EEM2402	Computer network - Maintenance and troubleshooting	3
	Paper - 3	EEM2403	EEM Practical - IV	2

F.Y. B.Sc. Semester I		
Title of the Course and Course Code	Components, devices and circuit drawings (EEM 1101)	Number of Credits : 02
Course Outcomes (COs) On completion of the course, the students will be able to:		
CO1	Identify different components and devices in electronic systems	
CO2	Articulate reading of circuit drawings and diagrams	
CO3	Associate with functionality and symbols of electronic components and devices	
CO4	Infer the important technical specifications of components and devices	
CO5	Use the data sheets for the components and devices and interpret them	
CO6	Analyze the technical specifications of components and devices	

Unit. No.	Title of Unit and Contents	No. of Lectures
I	Exploring electronic systems and equipments Electronic system and equipment's, electronic circuits, types of printed circuit boards, identification of components, devices and enclosures, reading drawings and diagrams- block diagrams, circuit diagrams, wiring diagrams, front and rear panels Case studies - (a) Consumer Products – Mobile phones, still camera, video Camera, Car audio/video system, Home audio/video system; (b) Test and measuring instruments – power supply, meters, multimeters, signal generators and CRO	10
II	Revealing technical specifications of passive components Functionality, Visual identification, technical specifications and testing: colour codes, device marking schemes and interpretation of information printed on the body of devices and use of data sheets- Resistor, capacitor, inductors, transformers, switches, relays, solenoids, Fuses, connectors, cables, Batteries; Motors (DC), contactor, circuit breakers, MCB, ELCB	18
III	Decoding data sheets of semiconductor devices Semiconductor device numbering, data sheets, absolute maximum rating, reading of data sheets, packages and lead information of Diodes, BJT, JFET, MOSFET, DIAC, TRIAC, UJT, LEDs, LCDs, 7-segment, dot matrix, bar graph, LEDs for lighting, Linear and digital ICs, SMDs	8

Learning Resources:

1. Troubleshooting Electronic Equipment, R. S. Khandpur, Tata Mc Graw Hill Publishing Ltd. (2007)
2. Electronic Instruments and systems: Principles, maintenance and troubleshooting, R. G. Gupta, Tata Mc Graw Hill Publishing Ltd. (2004)

Title of the Course and Course Code	Maintenance and troubleshooting - Tools and Instruments (EEM 1102)	Number of Credits : 02
Course Outcomes (COs) On completion of the course, the students will be able to:		
CO1	Quote the importance of maintenance and troubleshooting.	
CO2	Define terminologies related with maintenance and troubleshooting.	
CO3	Categorize variety of tools and instruments for maintenance and troubleshooting	
CO4	Illustrate the concepts and troubleshooting steps.	
CO5	Implement and select appropriate tools and instruments for maintenance and troubleshooting	
CO6	Demonstrate instruments for troubleshooting.	

Unit. No.	Title of Unit and Contents	No. of .Lectures
I	Maintenance and troubleshooting concepts Maintenance and troubleshooting – 5 Ws and 1H (Why, What, Where, Which, Who and How); Electronic Equipment, Potential Problems, Quality, Terminology and definitions of : Reliability, Failure, Failure Rate, Mean Time between Failures(MTBF), Mean Time to Fail(MTF), Mean Time To Repair(MTR), Maintainability, Availability, Redundancy, Fail Safe Design, Maintenance policy, Stages of Maintenance	8
II	Tools for maintenance and troubleshooting Functionality, types and use - Screwdrivers, cutter, pliers, wire strippers, crimp tools, hex drivers, clamps, drills, drill machines, grinders, hacksaw, Files, punch, tweezers, soldering gun and soldering stations, solder and flux, IC holders, magnifier and microscopes for SMDs, Fasteners and adhesives – screws, self tapping screws and bolts, washers, rivets, Soft tools - adhesives and bonding, glues, epoxies and solvents, lubricants, freeze spray	16
III	Instruments for maintenance and troubleshooting – Idea of test and measuring instruments, Functionality (Principle and understanding front panel), types and use of voltmeters, ammeters, ohm-meters, AMMs, Meggers, DMMs, DFMs, power supplies, signal/function generator, CROs and DSOs	12

Learning Resources:

1. Electronic Instruments and systems: Principles, maintenance and troubleshooting, R. G. Gupta, Tata Mc Graw Hill Publishing Ltd (2004)
2. Practical Electronics: Components and techniques, J. M. Hughes, O'Reilly Media Inc (2015)
3. Troubleshooting Electronic Equipment, R. S. Khandpur, Tata Mc Graw Hill Publishing Ltd (2007)
4. Electronic Instrumentation, H. S. Kalasi, Tata Mc Graw Hill Publishing Ltd (2004)
5. www.howstuffworks.com

Title of the Course and Course Code	EEM Practical – I (EEM1103)	Number of Credits : 02
Course Outcomes (COs) On completion of the course, the students will be able to:		
CO1	Identify various components, devices, instruments and tools for specific application.	
CO2	Illustrate skill of proper use of tools and test and measuring instruments.	
CO3	Articulate skills of referencing from data-books, operating instruction manuals and other referencing material.	
CO4	Organize circuit drawings and block diagrams for a given instrument / equipment.	
CO5	Demonstrate handling of tools and instruments used for component testing and fault findings	
CO6	Standardize method to prepare technical report writing for laboratory exercises.	

List of Experiments

Sr. No.	Group-A: Tools
1.	Identification of various tools for maintenance and troubleshooting
2.	Identification and knowing technical specifications of various passive components
3.	Identification and knowing technical specifications of various semiconductor devices
Group-B: Test and measuring instruments	
4.	Study of analog meters and AMMs
5.	Study of DMM
6.	Study of signal generators and CRO
Group-C: Terminal identification and functional checking using multimeter (use of Operating instructions manual / component datasheet is mandatory)	
7.	Rheostat, Potentiometer And Switches, EM Relay, Transformer, Auto-Transformer (Dimmerstat), Fuses
8.	Diode, Zener, Transistor (At least 3 different packages each) and LEDs(different wattages and colours), LED strips, Neon indicator lamp
9.	DC Sources: Battery (5 Different types), Solar PV cell, Battery Eliminator, CVCC Power Supply.
10.	Preparation of circuit drawings / diagrams (for any two electronic systems)

Any 10 experiments: 8 compulsory + 1 Activity (Equivalent to Two Practicals)

F. Y. B. Sc.(Vocational EEM) Semester-II		
Title of the Course and Course Code	PCB design and assembly (EEM 1201)	Number of Credits : 02
Course Outcomes (COs)		
On completion of the course, the students will be able to:		
CO1	Outline the details of PCB technology.	
CO2	Translate the electronic circuit diagram in layout for circuit, manually.	
CO3	Extend the layout generated using traditional methods up to the layout using CAD methods	
CO4	Implement the artwork or layout to laminates	
CO5	Demonstrate several mechanical operations for generating PCB	
CO6	Compare various effective assembly methods.	

Unit. No.	Title of Unit and Contents	No. of. Lectures
I	Basics of PCBs Need, Classification, Electronics components (discrete, ICs, SMDs) – symbols, dimensions, packages, Connectors and cables.	4
II	Circuit layout and artwork Layout planning and design - Drawings and diagrams, General PCB design considerations, Mechanical design considerations, Electrical considerations, Components placement rules, Layout design Artwork generation and automation - Manual artwork, guidelines for artwork preparations, film master preparations, CAD / CAM tools, design automation	14
III	Preparing PCBs Laminates and types; Image transfer techniques - Cleaning, screen printing, pattern transfer techniques, photo printing; Etching techniques - etching solutions and etching techniques; Mechanical operations - cutting methods, punching, drilling, assembly, soldering	14
IV	PCB technology trends: Multilayer and flexible PCBs	4

Learning Resources:

1. Printed circuits boards, R. S. Khandpur, Tata Mc Graw Hill Publication (2005)
2. Printed circuits handbooks, Clyde F. Coombs and Happy T. Holden, Mc Graw Hill (2016)
3. Printed circuit board: design and technology, Walter Bosshart, Tata McGraw Hill (2008)
4. Printed Circuit boards: Designer's reference: Christopher Robertson, Prentice Hall (2004)

F. Y. B. Sc.(Vocational EEM) Semester-II		
Title of the Course and Course Code	Solar thermal and LED lighting system (EEM1202)	Number of Credits : 02
Course Outcomes (COs)		
On completion of the course, the students will be able to:		
CO1	Identify the importance of solar powered systems	
CO2	Name the necessary power requirements of various electronic systems	
CO3	Characterize solar PV cells and modules and compare with data sheets	
CO4	Implement various LED lighting systems	
CO5	Demonstrate installation and use of solar-LED systems	
CO6	Explain solar, thermal power stations	

Unit No.	Title of Unit and Contents	No. of Lectures
I	Solar energy and photovoltaic The sun, Solar radiations, variations and types, solar geometry, solar radiation measurements, solar energy technologies, Energy requirement of variety of consumer products, Solar cell -Structure, characteristics, Isc, Voc, Pmax, FF, Types, commercially available solar cell technologies Solar panel – Size, orientation, IV characteristics, irradiance data	10
II	Solar - LED lighting LED -Photometry, principles, IV characteristics, Driving LEDs, Driving LEDs with an AC voltage, Power LEDs, LD lamps, Basic LED circuits, Solar LED street lights Solar Lantern and charging station – need, major components, Solar home lighting system - solar panels, Batteries, Controller, inverter, electrical devices, ON grid, OFF grid, Hybrid systems, connecting everything together and installation Commercial Solar LED lighting systems	16
III	Solar Thermal Principle of solar thermal equipment, solar water heater – technology, components, flat plate collector and evacuated tube collector, Solar cooker technology and components	10

Learning Resources:

1. Pico-solar electric systems, John Keane, Routledge, Taylor & Francis Group,(2014)
2. Solar thermal and photovoltaic field engineers training course, The energy and resource institute, New Delhi (www.terin.org,) 2011
3. Fundamentals of Solid state lighting: LEDs, OLEDs, and their applications in illumination and Display, Vinod Kumar Khanna, CRC press (2014)
4. Solar lighting, Ramchandra Pode, Boucar Diouf, Springer (2011)
5. Photovoltaic Design and Installation for dummies, Ryan Mayfield, Wiley Publishing Inc. (2010)

F. Y. B. Sc.(Vocational EEM) Semester-II		
Title of the Course and Course Code	EEM Practical – II (EEM1203)	Number of Credits : 02
Course Outcomes (COs) On completion of the course, the students will be able to:		
CO1	Cite the skills of preparing layout manually	
CO2	Implement circuit layout using CAD package	
CO3	Transfer complete PCB using pattern transfer process and etching	
CO4	Classify solar cells and modules and implement solar-LED lighting system	
CO5	Arrange demonstrations of use of PCB software for PCB making and of the manual PCB making process.	
CO6	Integrate design and demonstration of LED and Solar cell based lighting system.	

List of experiments

Sr. No.	Group - A
1.	Lay out preparation process on graph paper (Art work)
2.	Artwork preparation (Art work) - use of open source PCB making software expected
3.	Process of Transferring layout on copper clad laminate, PCB Etching and Drilling
4.	Soldering and De soldering of Components from given PCB
5.	Hobby Circuit building on bread board, tag board and general purpose board
	Group-B
6.	Characteristics of solar cell and panel
7.	LED lighting systems assembly and testing
8.	Emergency lights / solar lantern assembly and testing
9.	Solar cooker/heater system
10.	Solar power plant - study

Any 10 experiments: 8 compulsory + 1 Activity (Equivalent to Two Practical's)