SavitribaiPhule Pune University

(Formerly University of Pune)

Three Year B.Sc. Degree Program in Electronic Science

S. Y. B. Sc. Electronic Equipment Maintenance (Vocational)

(Faculty of Science & Technology)

S. Y. B. Sc. Electronic Equipment Maintenance (Vocational)

Choice Based Credit System (CBCS) Syllabus

To be implemented from Academic Year 2020

Preamble: The curriculum has been designed for the fulfilment of the expectations of UGC about vocational course. The present syllabus attempts to satisfy the expectations by including topics demanded by society. It also includes topics that are suitable for new entrepreneurs. It is designed to impart knowledge about commonly used household, consumer and community appliances. Prerequisite for this course is basic understanding of electronics. Upon completion of the course, the students will be able to repair the equipments in society as well as prepare plan about entrepreneurship in the area of electronic equipment maintenance.

Titles of Papers and Scheme of Study Evaluation

(CBCS Pattern)

Structure of S. Y. B. Sc. Electronic Equipment Maintenance

Sem	Paper Code	Paper	Paper title	Credits	Periods/week		Evaluation		
					*L	*P	*CIE	UE	Tot
III	VOC-EEM-231	I	Basic level maintenance of smart phone	2	3		15	35	50
	VOC-EEM-232	II	Smart phone based electronic equipment design	2	3		15	35	50
	VOC-EEM-233	III	Practical course-III	2		4	15	35	50
IV	VOC-EEM-241	I	Basic level maintenance of home and community equipment	2	3		15	35	50
	VOC-EEM-242	II	Computer based electronic equipment design	2	3		15	35	50
	VOC-EEM-243	III	Practical course-IV	2		4	15	35	50

*Abbreviations
L: Lectures/week
P: Practicals/week
CIE: Continuous Internal Examination
UE: University Examination

S. Y. B. Sc. Electronic Equipment Maintenance (Vocational)
(To be implemented from Academic Year 2020)
Paper –I, Semester – III, VOC-EEM-231 (36 lectures)

Title: Basic level maintenance of smart phone

Unit I: Fundamentals of mobile communication   (6 Lectures)

Introduction to cellular communication: cellular concept, cellular system architecture: cell, cluster, frequency reuse, cell splitting and handoff; cellular system components: PSTN, MTSO, antenna (tower), MSU.

Modulation: carrier frequency spectrum for communication, ASK, FSK, PSK, modulation schemes for mobile communication,

Multiple Access: SDMA, FDMA, TDMA, CDMA; generations (1,2,3,4,5), GSM

Satellite system for global mobile communication; Wireless LAN, Recent development

Unit II: Hardware of smart phone   (6 Lectures)

Introduction, Transceiver: Design considerations, representative block diagram.

Components of smart phone: SoC, GPU, Antenna, Memory, Microphone, Loudspeaker, ringer, vibrator motor, Battery, battery charger, Display: TFT-LCD, AMOLED.

Touchscreen: Resistive, Capacitive. Modem, Camera, Bluetooth, Wi-Fi, SD card, GPS, SIM card, SIM socket, Radio, Sensors: proximity, accelerometer, compass, gyroscope, Recent development; Features: range, power, speed.

Unit III: Software of smart phone   (6 Lectures)

Introduction, Operating systems: Android, Function of OS.

Basic facilities of Android phone: Volume control button, Apps for clock, camera, gallery. Texting and calling, adding contacts, mobile data, wi-fi; other popular apps: WhatsApp. Recent development

Unit IV: Smart phone repairing tools and equipments   (6 Lectures)

Introduction: Soldering iron, solder wire, solder paste, flux, desoldering wire, soldering station, PCB holder, multimeter, magnifying lens, hot air blower, screwdriver kit, phone opener, tweezers, dc power supply, battery booster, battery tester, test JIG box, LCD tester, BGA kit, Infrared workstation, ultrasonic cleaner, PCB cleaner

Unit V: Troubleshooting of common faults   (12 Lectures)

Disassembling and assembling, common faults and their troubleshooting: phone running slowly, overheating, poor battery life, storage space, synchronization issues, microSD card not working, cracked screen or immersion in water

Software installation and upgradation; Routine maintenance: protect screen, avoid water and extreme temperature, streamline and update apps, clear cache, use trusted sources, look after battery

Reference Books

1.Principles of Mobile Communication, Gordon L.Stüber, KLUWER ACADEMIC PUBLISHERS, 2nd Edition, New York.

2. Raj Kamal, Mobile Computing, Oxford University Press, USA,2008.

Web sources:

1. Swayam portal of MHRD

2. http://electronics.howstuffworks.com/

S. Y. B. Sc. Electronic Equipment Maintenance (Vocational)
(To be implemented from Academic Year 2020)
Paper –II, Semester –III, VOC-EEM-232 (36 lectures)

Title: Smart Phone based Electronic Equipment design

Unit I : Introduction   (3 Lectures)
Smart phone for real time control of equipments, Block diagram of smart phone based electronic equipment.

Unit II : Use of open source programming languages for equipment design (24 Lectures)
Installation of arduino IDE and android studio softwares.
Arduino programming : Essentials elements of arduino programming language required for microcontroller applications : Arduino basic architecture, program development, first arduino sketch, I/O with arduino, Showing data, Selection structure, iteration structure, Using serial terminal, setting up pins, writing and reading digital pins, analog pins, Measuring with arduino : voltage, current, distance, temperature, light.
Android programming for virtual front panel of equipment: Essentials elements of android programming language required for communicating with microcontroller : Mobile and ubiquitous computing, Introduction to android, android studio, Hello word program, Android UI design, WebView Widget, Android UI design example, android app components, android activity lifecycle and intents, Fragments, machine learning for ubiquitous computing, animation computing, camera, audio, video, sensors, bluetooth, Wi-Fi, Android app for bluetooth controlled On/Off of LED, light dimmer, Voltmeter, Digital multimeter.

Unit III: Case study of equipment design   (9 Lectures)
Home automation, Water pump control, pH meter.

Reference Books:
1. Scientific Arduino Programming, Giovanni Organtini
2. Arduino for Beginners: Essential Skills Every Maker Needs, John Baichtal, Pearson Edu, Inc.
3. Niel Kolban, Kolban's book on ESP32, (2017)
4. Android programming cookbook, Chiryssa Alifery, Exelixis media (2016)
5. Arduino Cookbook, Michael Margolis, O'Reilly

For Android studio:

1. Android Application Development For Dummies, Michael Burton, Donn Felker, 2nd Edition.
2. Android Studio 3.0 Development Essentials – Android 8th Edition Neil Smyth / Payload Media, Inc.
3. http://web.cs.wpi.edu/~emmanuel/courses/cs4518/C17/

SYBSc (Vocational)
Electronic Equipment Maintenance (EEM)
Paper –I, Semester –IV, VOC-EEM-241 (36 lectures)
Title: Basic level maintenance of home and community equipments

Unit I: Water Pump (6 Lectures)

Introduction, working principle, functional block diagram, operating procedure, common Types: AC, DC, submersible pumps; role of microcontroller in control, monitoring and minimum failure safe operation, recent development.
Routine maintenance, Common faults and their troubleshooting

Unit II: Water treatment plant (6 Lectures)

Introduction, working principle, functional block diagram, operating procedure, common Types: drinking, waste, agricultural, role of microcontroller in control, monitoring and minimum failure safe operation, recent development.
Routine maintenance, Common faults and their troubleshooting

Unit III: Washing machine (6 Lectures)

Introduction, working principle, functional block diagram, operating procedure, common types, role of microcontroller in control, monitoring and minimum failure safe operation, recent development.
Routine maintenance, Common faults and their troubleshooting

Unit IV: Elevator (6 Lectures)

Introduction, working principle, functional block diagram, operating procedure, common types, role of microcontroller in control, monitoring and minimum failure safe operation, recent development.
Routine maintenance, Common faults and their troubleshooting

Unit V: Generator (6 Lectures)

Introduction, working principle, functional block diagram, operating procedure, common types, role of microcontroller in control, monitoring and minimum failure safe operation, recent development.
Routine maintenance, Common faults and their troubleshooting

Unit VI: Solar Energy Plant (6 Lectures)

Introduction, working principle, functional block diagram, operating procedure, common types, role of microcontroller in control, monitoring and minimum failure safe operation, recent development.
Routine maintenance, Common faults and their troubleshooting

Reference Books
1. Electronic instruments and systems: Principles, maintenance and troubleshooting by R. G. Gupta,Tata McGraw Hill
2. Modern electronic equipment: Troubleshooting, repair and maintenance by Khandpur, Tata McGraw Hill
3. Electronic fault diagnosis by G. C. Loveday, A. H. Wheeler publishing
Web sources:
1.Swayam portal of MHRD
2.http://electronics.howstuffworks.com/

S. Y. B. Sc. Electronic Equipment Maintenance (Vocational)
(To be implemented from Academic Year 2020)
Paper –II, Semester –IV, VOC-EEM-242 (36 lectures)

Title: Computer based Electronic Equipment design

Unit I: Introduction   **(6 Lectures)**
Computer for real time data analysis, Block diagram of computer based electronic equipment, examples of computer based equipments: spectrophotometer, DTA, ECG.

Unit II: Use of programming language for equipment design: **(12 Lectures)**
Limitations of Arduino programming , Essentials elements of python programming language required for communicating with microcontroller, Using Python with Arduino

Unit III: Open source software   **(6 Lectures)**
Installing the python interpreter software,
Simple Virtual World Using Ultrasonic Sensor

Unit IV: Use of Open source utilities   **(6 Lectures)**
Installing PIP on Windows,
 Installing Matplotlib for Graphing,
 Introduction to Graphing with Matplotlib,
 Measuring Pressure and Temperature with the BMP280 Sensor,
 Installing Drawnow to Allow Live Plotting with Matplotlib,
 Plotting and Graphing Live Data from Arduino with Matplotlib,
 Approximating Changes in Height from Changes in Pressure,
 Calculating Height from Pressure measurements from BMP180 Pressure Sensor.

Unit V: Communication   **(6 Lectures)**
 Introduction to Xbee Radios and Wireless Communication,
 Configuring and Using the Xbee Radios,
 Simple Client Server Configuration over Ethernet,
 Sending and Receiving Data Over Ethernet.

References:
1.Matplotlib for Python Developers, Sandro Tosi, Packt publishing
2. Learning Matplotlib.pdf
Web site : howstuffworks
1. Swayam portal of MHRD
2. http://toptechboy.com/using-python-with-arduino-lessons/

SYBSc (Vocational)
Electronic Equipment Maintenance (EEM)
PAPER III: Practical Course

Objectives

▪ To acquire skills of proper use of the tools, equipment etc.

▪ To acquire skills of circuit assembly and disassembly.

▪ To learn systematic approach to fault location and troubleshooting.

▪ To gain expertise in the use of test equipment.

▪ To gain practice in circuit board tracing and identification of circuit blocks.

▪ To acquire skills of referencing from data-books, operating instruction manuals and other referencing material.

▪ To learn to make efficient use of computers for supporting various laboratory exercises related activities.

▪ To inculcate good, safe and disciplined work practices.

▪ To be aware of the importance of cost effective work practices by avoiding wastages and by recycling of material.

▪ To learn to carry out error assessment and analysis and to learn to draw inferences based on the same.

Group Discussions are recommended for creating a general atmosphere to appreciate and practice the points mentioned here.

Paper –III (Practical Course), Semester – III, VOC-EEM-233

List of Practicals

Section A: (any five)
1. Study of features of smart phone
2. Use and customization of smart phone
3. Study of functions and Apps available in Android phone
4. Disassembling of smart phone and identification of components.
5. Fault detection from the observed symptoms.
6. Replacement of the faulty components
7. Diagnosis of fault in mobile software and its remedy.

Section B: (any five)
1. Study of simple analog electronic equipment
2. Design of BMP280 based digital thermometer using Arduino and LCD
3. Write Arduino program for the blinking of LED using available Android APP
4. Write Arduino program for interfacing of I2C type pressure sensor module
5. Installation of APP development software (e.g. Android studio or similar)
6. Use of above software for the development of simple APP for ON/OFF action of LED
7. Development of APP for the display of temperature
8. Design of IR thermometer using sensor, arduino and Android.

SYBSc (Vocational)
Electronic Equipment Maintenance (EEM)
Paper –III (Practical), Semester – IV, VOC-EEM-243

List of Practicals

Section A: (Any five)
1. Identification of parts of computer based equipment
2. Comparative study of features of smart phone and computer based equipment
3. Simple python language program.
4. Blinking of LED using arduino and python.
5. Graph plotting in python
6. Real time control of some electronic appliance.
7. Real time data analysis.
8. Interfacing of blue tooth module.
9. Interfacing of Xbee module.
10. Interfacing of BMP 280 pressure sensor.
11. Industrial Tour / visit to the equipment maintenance workshop.

Section B: (Any five)
1. Identification of parts of water pump
2. Fault detection from the observed symptoms in water pump.
3. Replacement of the faulty part of water pump.
4. Identification of parts of water purifier.
5. Fault detection from the observed symptoms in water purifier.
6. Replacement of the faulty part of water purifier.
7. Identification of parts of washing machine.
8. Fault detection from the observed symptoms in washing machine.
9. Replacement of the faulty part of washing machine.
10. Identification of parts of generator.
11. Fault detection from the observed symptoms in generator.
12. Preventive maintenance of generator.
13. Identification of parts of solar energy plant.
14. Fault detection from the observed symptoms in solar energy plant.
15. Preventive maintenance of solar energy plant.