

Third – Year Curriculum Syllabus for
B.Voc. Degree Programme in
Electronics Manufacturing Services

(DrBabasahebAmbedkar Technological University, Lonere)

Semester V

Sr.No	Course Code	Name of the Course	Teaching scheme			Evaluation Scheme			Credits	Total Marks			
			L	T	P	IA	MSE	ESE					
General Education													
Theory													
1	BVEMC501	Embedded System	3	0	0	25	0	25	3	50			
2	BVEMC502	UPS and Inverter Technician	3	0	0	25	0	25	3	50			
3	BVEMC503	Solar and LED Technician	3	0	0	25	0	25	3	50			
4	BVEMC 504	Industrial Electronic Product Design	3	0	0	25	0	25	3	50			
Total									12	200			
Skill Components													
Lab/Practical													
5	BVEML505	Embedded System – Lab	0	0	1	25	0	25	1.5	50			
6	BVEML506	Pre-Production, Valuations and Storage – Lab	0	0	1	25	0	25	1.5	50			
On-Job-Training (OJT)/Qualification Packs (Any One)													
Evaluation Scheme													
						IA	ESE						
7	BVEME517	Embedded Software Engineer (ELE/Q1501)	50						150			15	200
8	BVEME528	Incoming QC Technician (ELE/Q4401)											
9	BVEME539	Assembly Supervisor (ELE/Q6305)											
Total									30	500			

Semester

V

Syllabus

Subject Name: Embedded System		
Course Code : BVEMC501		Semester: V
Weekly Teaching Hours: TH: 03 Tut: 00		Scheme of Marking TH: 25 , IA: 25 , Total: 50
TH Exam Duration: 01 Hours		Scheme of Marking PR: --
Credit: 3		
Content		Hours
Unit – I	Embedded System	06
	Block Diagram of Embedded System with hardware components, Harvard and Von-neumen Architecture, RISC and CISC Processor, Features of 8051, AVR, PIC and ARM microcontroller with their applications, Characteristics embedded system : Processor Power, Memory, Operating System, Reliability, Performance, Power Consumption, NRE Cost, Unit Cost, Flexibility, Time-to-Prototype, Time-to-market, maintainability, correctness and safety. Classification of Embedded System: small scale, medium scale, sophisticated, stand-alone, reactive/real time (Soft and Hard Real Time).	
Unit – II	Programming using Embedded C	06
	Programming with Embedded C: Arithmetic and Logical Operations, Data Transfer with memory and port, decision control and looping, Timer/Counter program using “Embedded C”, for 8051/AVR/ARM microcontroller. Serial Communication program using “Embedded C” for 8051/AVR/ARM microcontroller. Interrupt control program using “Embedded C” 8051/AVR/ARM microcontroller.	
Unit – III	Communication Standards and Protocols	06
	Modes of data communication: Serial, Parallel, Asynchronous and Synchronous communication. Serial Communication standards: RS232 (MAX232 as a bidirectional level converter), I2C, USB, SPI, SSP and CAN etc. Parallel Communication standards: PCI, PCI-X etc. Features of advanced serial protocol : IrDA, Bluetooth, Zigbee etc.	
Unit – IV	Interfacing I/O Devices	06
	Interfacing I/O and special devices to 8051/AVR/ARM microcontroller : LED, LCD, Relays, 7-Segment Display, Multiplex 7-Segment Display, Key, Push button, Matrix keyboard, Stepper Motor, DC Motor, 8 bit ADC/DAC (0808/0809), Temperature Sensor (LM35 and DS18B20).	
Unit – V	Real Time Operating System	08
	Comparison and applications of General Purpose and Real Time Operating System. Characteristics of RTOS: Consistency, Reliability, Scalability, Performance, Predictability. Functions of RTOS: Task Management (i.e. Inter Task Communication and Multitasking), Scheduling algorithms, Resource allocation in interrupt handling. Functions of RTOS: Watchdog Timer and Semaphore. Deadlock : Reason of occurrence, Handling of deadlock detection, prevention, ignoring	

Books		
Name of Authors	Title of the Book	Publisher
Pal, Ajit	Microcontroller Principle and Application	PHI, New Delhi, 2014, ISBN : 9788120343924
Deshmukh, Ajay	Microcontroller Theory and Application	McGraw Hill Education, New Delhi, 2011, ISBN : 9780070585959
Rajkamal	Microcontroller Architecture Programming, Interfacing and System Design	Pearson Education India, Delhi, 2012, ISBN : 9788131759905
David E. Simon	The Embedded Software Primer	Addison-Wesley, Delhi, ISBN : 9780201615692

Subject Name: UPS and Inverter Technician		
Course Code : BVEMC502	Semester: V	
Weekly Teaching Hours: TH: 03 Tut: 00	Scheme of Marking TH: 25 , IA: 25 , Total: 50	
TH Exam Duration: 01 Hours	Scheme of Marking PR: --	
Credit: 3		
Content		Hours
Unit – I	Understand the requirement of customer	09
	To be competent, the user/ individual must be able to: Fix appointment with customer to visit the site based on the complaint registered /Installation schedule. Greet the customer and confirm the problem registered. Be polite and patient when interacting with customer. Check the warranty status or annual maintenance contract and anticipate the faults to carry the right tools and parts. Communicate problem effectively in order to secure customer's confidence. Ensure 100% customer satisfaction and positive feedback. Record zero customer complaints post service. Avoid repeat problems post service. Ascertain customer location in order to make the route plan for the day. Prepare most optimum route plan to complete daily target visits. Identify the purpose of customer visit like purchase of accessories, product enquiry and complaints. Understand customer complaints and deliver optimal solution.	
Unit – II	Installation the UPS/Inverter	09
	Functionalities of the UPS/inverter and procedures to make settings. Basic electrical and mechanical modules of various industrial electronic products. Circuit design of the type and model of product. Etiquette to be followed at customer's premises precautions to be taken while handling field calls and dealing with customers. Relevant reference sheets, manuals and documents to carry in the field. Functioning of the appliance and its various modules. UPS communication interface and wiring procedures. Identification of various status indicators on the control panel of the equipment. Daily, monthly and annual maintenance procedures of the equipment and battery maintenance. Used battery recycling procedure. Revision of electricity such as ohms law, difference between ac and dc, calculation of energy consumption of appliances, understanding of domestic wiring, understanding of series and parallel connections. Troubleshooting knowledge with respect to UPS/inverters. Hazards, their causes and prevention/personal safety. Frequently occurring faults such as blown fuse, dead battery etc. Components/modules of the UPS/inverter and their price. Removing packaging and checking accessories. Placing and wiring the UPS/Inverter.	
Unit – III	Fault Diagnosis	09
	Modes in which the UPS operates and the different LED and alarm statuses. To detect basic electrical faults such defective power cord, connector or internal wiring defect, short/ loose/open contacts, blown fuse. To identify the problem of dead battery and replacement procedure for the same. To identify failure of inverter circuit or inverter driver and to replace any inverter component or the inverter driver. To detect defects in the cooling fan and to defect faults due to surrounding temperature being higher than allowed operation range. To identify	

	reasons for improper. Functioning of charger board, boost circuit, PFC components or BUS circuit and to replace the identified dysfunctional module. To identify failed resistors and damaged photo couplers in the IGBT driver module resulting in replacement of the module. To identify fault in the charger module if the UPS works on bypass mode normally, but cannot start up completely. To diagnose fault in the SPS module if the equipment does not work in spite of being connected to the input power source	
Unit – IV	Repair Dysfunctional UPS/Inverter	09
	Diagnose the fault based on customer interaction and initial inspection. Remove protective panels since the voltage present is potentially lethal. Check the air filters and monitor system parameters from the control panel. Carry out basic tests such as power supply inspection, volt ampere test and earth test power supply etc. Separate and inspect every module of the unit if the fault is not identified through basic tests. Send to factory for in depth diagnosis, if problem remains un-identified at site. Replace component at location, if the fault identified is because of damage of components such as fuse or battery. Remove and replace the faulty module with a functional one, either on a second visit or as pre-identified and collected from the service centre, if the problem is at the PCB level or components that cannot be replaced at site. Reassemble the unit and make all power and communication wirings. Switch on power supply and confirm that unit is functioning. Check that all the modules of the unit work as per specifications. Demonstrate and confirm functionality of the unit with customer. Identify the problem modules accurately such as the power supply, battery, PCB etc.	

Reference Link

1. <https://www.mrright.in/ideas/appliances/inverter/common-inverter-problems-solutions/>
2. <https://unifiedpowerusa.com/7-common-causes-ups-failure/>
3. <https://www.homemade-circuits.com/how-inverter-functions-how-to-repair/>

Subject Name: Solar and LED Technician		
Course Code : BVEMC503		Semester: V
Weekly Teaching Hours: TH: 03 Tut: 00		Scheme of Marking TH: 25 , IA: 25 , Total: 50
TH Exam Duration: 01 Hours		Scheme of Marking PR: --
Credit: 3		
Content		Hours
Unit – I	Basic of Solar	06
	Awareness of renewable energy resources. Need of solar power and its application. Understanding of solar power generation System. Understanding of fundamental of Solar PV Cells. Knowledge of parameters of Solar PV Panels. Use of different types of Solar PV Panels. Use and handling procedure of Solar PV Panels. Effect of environment in generation of electricity through solar PV modules. Check output of Solar Panels on different angles through multimeter. Components of Solar PV Systems and their use.	
Unit – II	Basic of LED	06
	Understand Basics of LED & its parameters. Knowledge about CCT & CRI. Awareness about LED Power Source. Importance of Thermal Management in LED lighting products. Awareness about Optical Management of LED Luminary. Awareness about LED Luminary Assembly. Awareness about LED Driver.	
Unit – III	Installation of Solar Based LED	06
	How to Prepare the work area for installation of solar led light. Necessity of earthing systems arrangements and requirements. Understanding of methods and tools used to fix the solar led light system. Awareness of various types of Building materials used in roof structures, ground structures, interior and exterior of customer’s premises. Ability to select the appropriate type of mounting system and conditions suitable for the required LED Lighting. Able to terminate the wiring correctly in line with manufacturer’s instructions, operational and regulatory requirements. Able to fix Solar LED Lightings with safely. Able to know the post installation activities like:- leave the work area in clean and safe condition, handover the complete work to the customer as per company policies, etc.	
Unit – IV	Repair Solar Based LED	08
	Self and organization correctly, and state the purpose of your visit to the customer. Work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. Obtain appropriate work order from responsible authority and confirm the type of system fault from the job specifications given. Identify and obtain resources and materials needed for the type of work in accordance with organizational standards and procedures. Able to remove and replace faulty components using approved methods without causing damage. Ability to report any unprecedented problems identified in the work to responsible authority and seek advice on how to resolve them.	

Unit – V	Health and Safety practices in electrical and electronics work	08
	Proper use of Personal Protective Equipment's. Identify job-site hazardous work and state possible causes of risk or accident at workplace. Inspect for faults, setup and safely use scaffolds, elevated platforms and ladders. Use the appropriate fire extinguishers on different types of wires correctly. Administer appropriate first aid to victims where required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc. Awareness about all health and safety procedures of the company.	

Reference Link

1. <https://www.streetlights-solar.com/what-are-the-processes-behind-manufacturing-a-solar-light.html>
2. https://www.led-professional.com/downloads/LpR_08_free_95469.pdf
1. http://tesi.cab.unipd.it/43814/1/The_solar_LED_street_light.pdf

Subject Name:Industrial Electronic Product Design		
Course Code : BVEMC504	Course Code : BVEMC503	
Weekly Teaching Hours: TH: 03 Tut: 00	Weekly Teaching Hours: TH: 03 Tut: 00	
TH Exam Duration: 01 Hours	TH Exam Duration: 01 Hours	
Credit: 3	Credit: 3	
Content		Hours
Unit – I	Development Process	06
	Stages : Product Maturity (i.e. Product Conceptualization and Design), Product Development (i.e. Prototype and Testing), New Product Introduction (i.e. Pre-Production and Quality Assurance) and Product Launch (i.e. Mass Production and Product Upgradation). Introduction to 3-D printing and Rapid Prototyping. Product Planning & Conceptualization, Product Architecture and Industrial Design, Product Manufacturing & Prototyping, Economic Analysis & Managing Projects. Introduction to 3-D printing and Rapid Prototyping.	
Unit – II	Pre-Production Activities	06
	Layout, Time Study& Motion Study, Two Hand Insertion, Non-value adding activities, Positioning of Bins, Line Balancing	
Unit – II	Electronic Components Storage	06
	Stacking Norms, Bin Cards, Stores Layout, Categorization of Materials : Hazardous/Non-Hazardous, Imported/Local, Assembly/ Parts, Consumables, Class A/B/C, Good/defective	
Unit – IV	Electronic Components Shelf Life Management	06
	What is Shelf Management. Rule of Electronic Store Management. FIFO, FILO, LIFO, LILO.	
Unit – V	Electronic Components Material Transaction	06
	Inward, Outward, Suspense, RMA (Return Material Authorization), Insurance	
Books		
Name of Authors	Title of the Book	Publisher
G. Pahl and W. Beitz	Engineering Design	The Design Council, London, UK
M.K. Giridharan	Electrical System Design	MK
P.Gopalakrishnan	Handbook of material Management	Prentice Hall India Learning Private Limited
Gwynne Richards	Ware House Management	Kogen page
Edward H. Frazelle	World-Class Warehousing and Material Handling	McGraw Hill Professional, 2001

Reference Link

1. <http://blog.idonethis.com/how-to-do-a-time-and-motion-study-to-make-real-change/>

Subject Name: Embedded System – Lab

Course Code : BVEML505	Semester: V
Weekly Practical: PR: 01 Tut: 00	Scheme of Marking TH: --
TH Exam Duration: --	Scheme of Marking PR: 25 , IA: 25 , Total: 50
Credit: 1.5	

List of Practical

1. Identify the pins of 8051 and AVR Microcontroller.
2. Identify the features of ARM Microcontroller on the basis of IC number.
3. Software Installation of Integrated Development Environment (IDE) (i.e. MiroProC / Keil) tool for developing “Embedded C” program.
4. Execute “C Language” program to perform following arithmetic operations on 8-bit data: addition, subtraction, multiplication and division.
5. Execute “C Language” program to perform following arithmetic operations on 8-bit data: addition, subtraction.
6. Develop and Test the “C” program to perform data transfer from source to destination (Use Internal Data memory location).
7. Interface RS232 connector to PC using MAX232 IC.
8. Develop and test the “C” program to turn on LED (S) with Key (S) press.
9. Interface 89C51/AVR microcontroller and write the “C” program to display number from 0 to 9 on 7-Segment with specified delay.
10. Interface 89C51/AVR microcontroller and write the “C” program to display string on 16x2 LCD display.
11. Interface 89C51/AVR microcontroller and write the “C” program to read key from 4x4 matrix keyboard on LCD Display.
12. Interface 89C51/AVR microcontroller and write the “C” program to convert analog to digital form using given 8 Bit ADC and store the converted digital data in memory.
13. Interface 89C51/AVR microcontroller and write the “C” program to generate square and saw tooth waveform using given 8 Bit DAC.
14. Interface 89C51/AVR microcontroller and write the “C” program to rotate stepper motor with different speeds in clockwise and counter clockwise direction.
15. Interface 89C51/AVR microcontroller and write the “C” program to observe the real time status of Triangular Waveform Generated using DAC (use MiroProC / Keil).

Subject Name: Pre-Production, Valuations and Storage – Lab	
Course Code : BVEML506	Semester: V
Weekly Practical: PR: 01 Tut: 00	Scheme of Marking TH: --
TH Exam Duration: --	Scheme of Marking PR: 25 , IA: 25 , Total: 50
Credit: 1.5	
List of Practical	
<ol style="list-style-type: none"> 1. Case Study of Categorization of Raw Material and Consumable (Refer :Hazardous/Non-Hazardous, Imported/Local, Assembly/ Parts, Consumables, Class A/B/C, Good/defective). 2. Case Study of Material Transaction (Refer : Inward, Outward, Suspense). 3. Case Study of House Keeping by referring 5S. 	

Group GTM3 of Qualifier Packs

Subject Name: Embedded Software Engineer (ELE/Q1501)	
Course Code : BVEME517	Semester: V
Weekly Skilling Hours: PR: 24 Tut: 00	Scheme of Marking TH: 00 , IA: 00 , Total: 00
PR Exam Duration: 06 Hours	Scheme of Marking PR: 150 , IA: 50 , Total: 200
Credit: 15	Choose any one from specified Group GTM3 of Qualification Packs
Syllabus for this qualifier Pack is available on http://essc-india.org/assets/qp-embedded_software_engineer.pdf	

Subject Name: Incoming QC Technician (ELE/Q4401)	
Course Code : BVEME528	Semester: V
Weekly Skilling Hours: PR: 24 Tut: 00	Scheme of Marking TH: 00 , IA: 00 , Total: 00
PR Exam Duration: 06 Hours	Scheme of Marking PR: 150 , IA: 50 , Total: 200
Credit: 15	Choose any one from specified Group GTM3 of Qualification Packs
Syllabus for this qualifier Pack is available on https://www.nqr.gov.in/sites/default/files/QP-Incoming%20QC%20Technician.pdf	

Subject Name: Assembly Supervisor (ELE/Q6305)	
Course Code : BVEME539	Semester: V
Weekly Skilling Hours: PR: 24 Tut: 00	Scheme of Marking TH: 00 , IA: 00 , Total: 00
PR Exam Duration: 06 Hours	Scheme of Marking PR: 150 , IA: 50 , Total: 200
Credit: 15	Choose any one from specified Group GTM3 of Qualification Packs
Syllabus for this qualifier Pack is available on https://www.nqr.gov.in/sites/default/files/QP-Assembly%20Supervisor.pdf	

*Skill Practical assessment will be done rules/ procedure of respective Skill Sector Council of India

Semester

VI

Syllabus

Subject Name: Entrepreneurship Development	
Course Code : BVEMC601	Semester: VI
Weekly Teaching Hours: TH: 03 Tut: 1	Scheme of Marking TH: 80 , IA: 20 , Total: 100
TH Exam Duration: 03 Hours	Scheme of Marking PR: --
Credit: 3	

Content		Hours
Unit – I	Entrepreneurship	09
	Concept and Definitions; Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneurs; Entrepreneur; Manager Vs. Entrepreneur.	
Unit – II	Opportunity / Identification and Product Selection	09
	Entrepreneurial Opportunity Search and Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information.	
Unit – III	Small Enterprises and Enterprise Launching Formalities	09
	Definition of Small Scale; Rationale; Objective; Scope; Role of SSI in Economic Development of India; SSI; Registration; NOC from Pollution Board; Machinery and Equipment Selection; Project Report Preparation; Specimen of Project Report; Project Planning and Scheduling using Networking Techniques of PERT / CPM; Methods of Project Appraisal.	
Unit – IV	Role of Support Institutions and Management of Small Business	09
	Director of Industries; DIC; SIDO; SIDBI; Small Industries Development Corporation (SIDC); SISI; NSIC; NISBUD; State Financial Corporation SIC; Marketing Management; Production Management; Finance Management; Human Resource Management; Export Marketing; Case Studies-At least 4 (four) in whole course	

Books		
Name of Authors	Title of the Book	Publisher
E Gordon, K Natarajan	Entrepreneurship Development	Himalaya House
Dr R K Singal, ShrutiSingal	Entrepreneurship Development	Katson books
Robert A Baron	Entrepreneurship	E E Publication

Subject Name: Project Work	
Course Code : BVEML602	Semester: VI
Weekly Teaching Hours: TH: 00 Tut: 00 PR : 03	Scheme of Marking PR: 100 , IA: 100 , Total: 200
Credit: 12	

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills

Group GTM3 of Qualifier Packs

(Any one more QP to be opted from the QPs mentioned in the semester V)

Subject Name: FPGA Design Engineer (ELE/Q8201)	
Course Code : BVEME613	Semester: VI
Weekly Skilling Hours: PR: 24 Tut: 00	Scheme of Marking TH: 00 , IA: 00 , Total: 00
PR Exam Duration: 06 Hours	Scheme of Marking PR: 150 , IA: 50 , Total: 200
Credit: 15	Choose any one from specified Group GTM3 of Qualification Packs
Syllabus for this qualifier Pack is available https://www.nqr.gov.in/sites/default/files/QP-FPGA%20Design%20Engineer.pdf	

Subject Name: Sales Executive-Consumer Electronics (ELE/Q3201)	
Course Code : BVEME624	Semester: VI
Weekly Skilling Hours: PR: 24 Tut: 00	Scheme of Marking TH: 00 , IA: 00 , Total: 00
PR Exam Duration: 06 Hours	Scheme of Marking PR: 150 , IA: 50 , Total: 200
Credit: 15	Choose any one from specified Group GTM3 of Qualification Packs
Syllabus for this qualifier Pack is available on https://www.nqr.gov.in/sites/default/files/QP-Sales%20Executive-Consumer%20Electronics.pdf	

Subject Name: Product Engineer (ELE/Q4201)	
Course Code : BVEME635	Semester: V
Weekly Skilling Hours: PR: 24 Tut: 00	Scheme of Marking TH: 00 , IA: 00 , Total: 00
PR Exam Duration: 06 Hours	Scheme of Marking PR: 150 , IA: 50 , Total: 200
Credit: 15	Choose any one from specified Group GTM3 of Qualification Packs
Syllabus for this qualifier Pack is available https://www.nqr.gov.in/sites/default/files/QP-Product%20Engineer.pdf	

*Skill Practical assessment will be done rules/ procedure of respective Skill Sector Council of India