



Karmaveer Bhaurao Patil University, Satara

Syllabus for

B. Sc. III Electronics

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year 2026-2027

STRUCTURE OF COURSE:
As per NEP-2020 (2.0)

Level	Sem.	Subject				VSC	FP	CEP/SEC	OJT/CC	AEC	Total
		DSC		DSE*							
		T	P	T	P						
5.5	V	Major IX (2)	Major P V (2)	Major XII (Elect.) (2)	Major P VI (Elect.) (2)	VSC III (2) (P)	-	CEP (2)	OJT (4)	AEC III (2) (English)	22
		Major X (2)									
		Major XI (2)									
5.5	VI	Major XIII (2)	Major P VII (2)	Major XVI (Elect.) (2)	Major P VIII (Elect.) (2)	VSC IV (2) (P)	FP (2)	SEC III (2) (P)	CC (2)	AEC III (2) (English)	22
		Major XIV (2)									
		Major XV (2)									

* DSE - 2 Courses out of four for each semester.

7. COURSE TITLE
1) Fifth Semester

Sr. No.	Course	Theory				Practical		
		Course No. & Course Code	Title of Course	No. of lectures per week	Credits	Course No. & Course Code	No. of Practical Per week	Credits
1	DSC I	BET 351	Power Electronics Devices and Applications	2	2	BEP 356	1	2
2	DSC II	BET 352	Digital Logic Design using HDL	2	2			
3	DSC III	BET 353	8051 microcontroller Interfacing and Application	2	2			
4	DSE I	BET 354	Mechatronics	2	2	BEP 357	1	2
	DSE II	BET 355	Fundamentals of Optoelectronics, IoT, and Networking					
5.	VSC	--	--	--	--	BEPVSC III	1	2
6.	CEP	--	--	--	--	BEPCEP I	1	2
7.	OJT	--	--	--	--	BEPOJT I	2	4
8.	AEC III		English	2	2			

2) Sixth Semester

Sr. No.	Course	Theory				Practical		
		Course No. & Course Code	Title of Paper	No. of lectures per week	Credits	Course No. & Course Code	No. of Practical Per week	Credits
1.	DSC I	BET 361	Electronic Instrumentation	2	2	BEP 366	1	2
2.	DSC II	BET 362	Principles of Antennas and Communication Systems	2	2			
3.	DSC III	BET 363	Advanced Microcontroller: PIC	2	2	BEP 367	1	2
4.	DSE I	BET 364	Digital Signal Processing and Artificial Intelligence					
	DSE II	BET 365	Industrial Process Control and PLC Programming	2	2			
5.	VSC	--	--	--	--	BEPVSC IV	1	2
6.	FP	--	--	--	--	BEPFP I	1	2
7.	SEC III	--	--	--	--	BEPSEC III	1	2
8.	CC						1	2
9.	AEC IV		English	2	2			

EVALUATION STRUCTURE:

➤ B.Sc. III NEP 2.0

Semester V (5.5)

Vertical	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC	T	BET 351	10	10	10	30	50	02
	T	BET 352	10	10	10	30	50	02
	T	BET 353	10	10	10	30	50	02
	P	BEP 356	20			30	50	02
DSE (1 Theory Papers Out of 2)	T	BET 354	10	10	10	30	50	02
	T	BET 355	10	10	10	30	50	02
	P	BEP 357	20			30	50	02
AEC	T	AEC III	10	10	10	30	50	02
VSC	P	BEPVSC III	20			30	50	02
CEP	P	BEPCEP I	20			30	50	02
OJT	P	BEPOJT I	50			50	100	04
Total							550	22

Semester VI

Vertical	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC	T	BET 361	10	10	10	30	50	02
	T	BET 362	10	10	10	30	50	02
	T	BET 363	10	10	10	30	50	02
	P	BEP 366	20			30	50	02
DSE (1 Theory Papers Out of 2)	T	BET 364	10	10	10	30	50	02
	T	BET 365	10	10	10	30	50	02
	P	BEP 367	20			30	50	02
AEC	T	AEC IV	10	10	10	30	50	02
VSC	P	BEPVSC IV	20			30	50	02
SEC	P	BEPSEC III	20			30	50	02
CC	T	BEPCC I	10	10	10	30	50	02
FP	P	BEPFP I	20			30	50	02
Total							550	22

Abbreviations: DSC: Discipline Specific Course; DSE: Discipline Specific Elective; CCE: Continuous Comprehensive Examination; AEC: Ability Enhancement Course; VSC: Vocational Skill Course; SEC: Skill Enhancement Course; OJT: On Job Training; FP: Field Project; CEP: Community Engagement Program; CC: Co-curricular Course; T: Theory; P: Practical

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - V
	Type: Major IX	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BET 351: Power Electronics Devices and Applications		
Course Objectives: Student will able to... 1. study of power semiconductor devices 2. learn and familiarize with thyristor. 3. familiar with terminology and concepts of power circuits. 4. understand applications of power devices		
Course Outcomes: The students should be able to... 1. identify power electronics devices in circuit. 2. apply the techniques of thyristor use. 3. design various power circuits 4. utilize power devices skill in power application		
Module	Title and Contents	Hrs.
Module -1:	Introduction to Power Electronics 1.1 Introduction: Definition of power electronics, scope and Applications of power electronics, classification of power semiconductor devices, control characteristics of devices 1.2 characteristics of power devices as a switch, types of Power circuits, Concept of single phase and three phase using phase supply 1.3 Power semiconductor devices: Need for semiconductor power devices, Power Diode, Power BJT, Power MOSFET, IGBT, SCR, TRIAC (Symbol, types, construction (Drift layer), working and their characteristics, two transistor analogy of SCR)	7
Module -2:	Thyristor 2.1 Introduction to Thyristor family:- Classification, Symbols and Rating. Thyristor turn ON methods: High voltage, high temperature, Light turn on, dv/dt turn on, Gate turn on. 2.2 Thyristor Turn off (Commutation)Process: - Class A Commutation, Class B Commutation, Class C Commutation, Class D Commutation, Class E Commutation, Class F Commutation 2.3 Thyristor Protections: - Over a voltage protection, Over a Current protection, Gate protection, Over temperature protection. 2.4 Firing circuit of Thyristors:- Simple Resistor triggering circuit, RC triggering circuit, UJT relaxation oscillator	8
Module -3:	Power circuits 3.1 AC Voltage Controllers: - Principle of On-Off and phase controls, Single phase ac voltage controller with resistive and inductive loads (Analysis of all these circuits with resistive load only) 3.2 Single phase controlled Rectifier: Half wave controlled rectifier with resistive and inductive load, semiconverter with resistive and inductive load, Full wave controlled rectifier with resistive and inductive load (Analysis of	9

	all these circuits with resistive load only) 3.3 Chopper: Introduction, Need, applications, types, Block diagram and working of step up and step down chopper. 3.4 Inverters: Introduction, Need, applications, types, circuit diagram and working of series Inverter and parallel Inverter	
Module -4:	Applications of Power Devices 4.1 SMPS, UPS, Electronic Ballast, Power factor correction. 4.2 Principle of induction and dielectric heating, Introduction to e- vehicle, renewable energy.	6
Reference Books :- 1. Bimbhra, P. S. Power Electronics. Khanna Publishers, 2012. 2. Erickson, Robert W. Fundamentals of Power Electronics. 3rd ed., Springer, 2020. 3. Mohan, Ned, and Tore M. Undeland. Power Electronics: Converters, Applications, and Design. 2nd ed., Wiley, 2002. 4. Rashid, M. H. Power Electronics: Circuits, Devices and Applications. 3rd ed., Pearson Education, 2004. 5. Umanand, L. Power Electronics: Essentials & Applications. Wiley, 2009.		
Evaluation Pattern: 60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Compulsory Home Assignment • CCE - II: 10 Marks: Seminar • CCE - III: 10 Marks: Compulsory MCQ Test Note: Best of two CCE Marks will be Considered)		End Semester Examination (50 Marks): • Question -1: Solve the following questions (Five questions of 2 Marks) • Question -2: Attempt any two questions (Three questions of 10 Marks) • Question -3: Attempt any four questions (Five questions of 5 Marks) Note: Conversion of 50 marks of ESE evaluation to 30 Marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Electronics		
	Programme: B.Sc.	Semester - V	
	Type: Major X	Marks: 50	
	Credits: 2	From: A. Y. 2026-27	
Name of the Course: BET 352: Digital Logic Design using HDL			
Course Objectives: Student will able to... 1. study the concepts of VHDL programming language. 2. understand the use of VHDL statements by writing program in VHDL 3. design combinational circuits using VHDL programming. 4. construct sequential circuit using VHDL programming			
Course Outcomes: The students should be able to... 1. explain VHDL programming languages. 2. describe program in VHDL. 3. develop combinational circuits using VHDL programming. 4. explore sequential circuit using VHDL programming.			
Module	Title and Contents	Hrs.	
Module -1:	Introduction to VHDL 1.1 History of VHDL, Introduction to VHDL, 1.2 Data objects, classes and data types, Operators, Overloading, logical operators. Types of delays 1.3 Entity and Architecture declaration. 1.4 Introduction to behavioral, dataflow and structural models.	7	
Module -2:	VHDL statements 2.1 Introduction, General format for VHDL program. 2.2 Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, concurrent statements. 2.3 VHDL code example: AND, OR, NOT. NAND, NOR,X-OR and X-NOR Gates.	8	
Module -3:	Combinational circuit design 3.1 Introduction, Adders, Subtractors. 3.2 Multiplexers, Demultiplexers, encoders, decoders. 3.3 Code converters, comparators, implementation of circuit using Boolean functions.	7	
Module -4:	Sequential circuit design 4.1 Introduction: Flip-flop, flip-flops: D flip-flop, RS flip-flop, Clocked RS Flip-flop, and JK flip-flop 4.2 Shift Registers: SISO, SIPO, PISO, PIPO 4.3 Counters: Synchronous, Asynchronous, design of counters, UP counter, Down Counter, UP/DOWN synchronous counter, ring counter, Johnson counter	8	

Reference Books: -

1. Perry, Douglas. VHDL Programming by Examples. McGraw-Hill, 2002.
2. Roth, Charles H. Digital System Design Using VHDL. 2nd ed., Thompson Publishers, 2007.
3. Pedroni, Volnei A. Circuit Design with VHDL. MIT Press, 2004.
4. Brown, Stephen, and Zvonko Vranesic. Fundamentals of Digital Logic with VHDL. 2nd ed., Tata McGraw-Hill, 2008.
5. Roth, Charles H. Digital System Design Using VHDL. PWS Publishing Company, 1998.

Evaluation Pattern: 60:40**Total Marks: 50**

Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Compulsory Home Assignment • CCE - II: 10 Marks: Seminar • CCE - III: 10 Marks: Compulsory MCQ Test Note: Best of two CCE Marks will be Considered)	End Semester Examination (50 Marks): • Question -1: Solve the following questions (Five questions of 2 Marks) • Question -2: Attempt any two questions (Three questions of 10 Marks) • Question -3: Attempt any four questions (Five questions of 5 Marks) Note: Conversion of 50 marks of ESE evaluation to 30 Marks
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	Board of Studies in Electronics	
	Programme: B.Sc.	Semester -V
	Type: Major XI	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BET 353: 8051 microcontroller Interfacing and Application	
Course Objectives: Student will able to... 1. study basics of C programming 2. understand 8051 C programming 3. learn the advanced architectures for advanced embedded systems 4. familiar with I/O port, timer, counter and interrupt operations		
Course Outcomes: The students should be able to... 1. avail the skill of write code using embedded C 2. able to write code for 8051 using C programming 3. design and test advanced Embedded systems using 8051 microcontrollers 4. perform interfacing of various real world devices		
Module	Title and Contents	Hrs.
Module -1:	Serial communication 8051 1.1 Serial Port: Serial port of 8051, RS-232 standard and IC MAX-232, 1.2 Concept of Baud Rate, Baud rate in 8051, Baud rate doubling using crystal frequency and PCON, SBUF, SCON registers, various modes of serial port, Importance of TI and RI flags, 1.3 Programming for data transmission and reception in mode-1 in ALP External Hardware Interrupts Programming and Setting Priority.	8
Module -2:	Programming of 8051 in C 2.1 Advantages and disadvantages of Program in 8051-C & Assembly Language. Data types and time delay in 8051-C, I/O programming in 8051-C 2.2 Accessing SFR addresses in 8051- C, Logical operation in 8051 C. Data conversion programs in 8051 C. Accessing code ROM space in 8051 C 2.3 Programming for Time delay generation (using timer), external interrupts (Level and edge triggering) and transmits, receive data serially.	8
Module -3:	Real World Interfacing of 8051 3.1 Interfacing LED, LCD, Switch, Relay, 4X4 matrix keyboard 3.2 Interfacing opto-coupler, thumb wheel switch and seven segment display, seven segment (multiplexing mode), 3.3 Stepper Motor, DAC0808 and ADC0804, RTC, Speed Control of DC motor by PWM technique.	8
Module -4:	Sequencing Problem 4.1 Case study: i) Temperature measurement using LM35, ADC0804, LCD. 4.2 Case study ii) Water level controller 4.3 Case study iii) Traffic Light controller iv) speed measurement of motor ((Use ALP/C during programming)	6

Reference Books :-

1. Ayala, Kenneth J. The 8051 Microcontroller. Penram International Publishing (India) Pvt. Ltd., 1996.
2. Mazidi, Muhammad Ali, and Janice Gillispie Mazidi. The 8051 Microcontroller and Embedded Systems. 2nd ed., Pearson Education Asia, 2006.
3. Predko, Myke. Programming and Customizing the 8051 Microcontroller. Tata McGraw-Hill Publishing Company Ltd., 1999.
4. Schultz, Thomas W. C and the 8051: Programming and Multitasking. PTR Prentice-Hall, Inc., 1993.
5. Pont, Michael J. Embedded C. 1st ed., Pearson Education, 2002.

Evaluation Pattern: 60:40**Total Marks: 50****Internal Continuous Evaluation (20 Marks):**

- CCE - I : 10 Marks: Compulsory Home Assignment
- CCE - II: 10 Marks: Seminar
- CCE - III: 10 Marks: Compulsory MCQ Test

Note: Best of two CCE Marks will be Considered)

End Semester Examination (50 Marks):

- Question -1: Solve the following questions (Five questions of 2 Marks)
- Question -2: Attempt any two questions (Three questions of 10 Marks)
- Question -3: Attempt any four questions (Five questions of 5 Marks)

Note: Conversion of 50 marks of ESE evaluation to 30 Marks

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	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - V
	Type: Major XII	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BET 354: Mechatronics		
Course Objectives: Student will able to... 1. avail the knowledge of mechatronics 2. study the basic principles of mechatronics 3. learn and implementing signal conditioning in system 4. design and development mechatronics system for various applications.		
Course Outcomes: The students should be able to... 1. do fabrication of mechatronics based systems. 2. demonstarte hydraulic actuation systems 3. define fault finding, mechatronic systems 4. implement basic mechatronics applications.		
Module	Title and Contents	Hrs.
Module -1:	Introduction to Mechatronics 1.1 Overview of Mechatronics: Definition, scope, and significance of integrating mechanical, electrical, electronics, and computer systems. 1.2 Sensors and Transducers: Principles, classification, and application in measuring physical variables like temperature, pressure, position, etc. 1.3 Signal Conditioning: Amplification, filtering, analog-to-digital and digital-to-analog conversion.	8
Module -2:	Actuation Systems 2.1 Pneumatic and Hydraulic Actuators: Working principles, components, and applications in automation. 2.2 Mechanical Actuation Systems: Gears, cams, levers, and belt drives used for motion control. 2.3 Electrical Actuation Systems: Working of DC motors, stepper motors, and servo motors with selection criteria for different applications.	8
Module -3:	Properties of Models 3.1 System Modeling: Types of system models (physical, mathematical, and graphical). 3.2 Dynamic Behavior: Time-domain and frequency-domain response analysis. 3.3 Transfer Function and Frequency Response: Derivation and use in predicting system performance and stability.	8
Module -4:	Applications of Mechatronics 4.1 Control Systems: Concept of open-loop and closed-loop systems, feedback and stability. 4.2 Input/Output Devices and Communication: Interfacing, serial/parallel communication, microcontrollers in Mechatronics. 4.3 Troubleshooting and Maintenance: Basic techniques for fault diagnosis. 4.4 Case Studies: Practical examples of mechatronic systems in	6

	industries such as robotics, automotive systems, and consumer electronics.	
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Reference Books:- 1. Alciatore, David G., and Michael B. Hstand. Introduction to Mechatronics and Measurement Systems. 5th ed., McGraw-Hill Education, 2020. 2. Bolton, W. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering. 7th ed., Pearson Education, 2018. 3. de Silva, Clarence W. Mechatronics: An Integrated Approach. 1st ed., CRC Press, 2005. 4. Mahalik, N. P. Mechatronics: Principles, Concepts and Applications. Tata McGraw-Hill Publishing Company Ltd., 2003. 5. Shetty, Devdas, and Richard A. Kolk. Mechatronics System Design. 2nd ed., Cengage Learning, 2011.	
Evaluation Pattern: 60:40	
Total Marks: 50	
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Compulsory Home Assignment • CCE - II: 10 Marks: Seminar • CCE - III: 10 Marks: Compulsory MCQ Test Note: Best of two CCE Marks will be Considered)	End Semester Examination (50 Marks): • Question -1: Solve the following questions (Five questions of 2 Marks) • Question -2: Attempt any two questions (Three questions of 10 Marks) • Question -3: Attempt any four questions (Five questions of 5 Marks) Note: Conversion of 50 marks of ESE evaluation to 30 Marks

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	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - V
	Type: Major XIII	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BET 355: Fundamentals of Optoelectronics, IoT, and Networking		
Course Objectives: The students will be able to... 1. understand optical communication principles and optical fiber systems. 2. learn photonic devices and their role in optical systems. 3. grasp IoT concepts, networking basics, and enabling technologies. 4. develop IoT solutions using python and hardware platforms.		
Course Outcomes: The students should be able to... 1. explain total internal reflection, fiber modes and applications of optical communication. 2. describe LASER, LED, photodiodes, and optical receiver operations. 3. define IoT, explain network types, protocols (MQTT/CoAP), and IoT applications (e.g., smart cities). 4. write python programs and program IoT devices (Raspberry Pi, Arduino) for basic applications.		
Module	Title and Contents	Hrs.
Module -1:	Optical Communication 1.1 Principles: Total internal reflection, optical fiber modes (step index, graded index, single-mode fibers). 1.2 Fiber Basics: Materials, basic structure, and overview of optical fiber communication systems (transmitters, receivers, transmission links). 1.3 Advantages and Applications: Key benefits and use cases of optical fiber communication.	8
Module -2:	Photonic Devices 2.1 Optical Sources: LASER: Basic concepts, semiconductor injection laser (ILD), key characteristics. LED: Structure, power, efficiency, characteristics. 2.2 Optical Detectors: p-n photodiodes, p-i-n photodiodes, avalanche photodiodes (Basic constructing and working only). 2.3 Optical Receiver: Basic operation and performance considerations	7
Module -3	Introduction to IoT and Networking 3.1 IoT Basics: Definition, physical and logical design, IoT levels. 3.2 Basics of Networking: i. Fundamentals: Network types (LAN, WAN, PAN), network topologies (star, mesh, bus). ii. Terminologies: IP address, MAC address, protocol, packet, router, switch, gateway, bandwidth, latency. iii. IoT-specific networking: MQTT, CoAP, HTTP, and their roles in IoT communication. 3.3 IoT Enabling Technologies: Wireless sensor networks, cloud	8

	computing, communication protocols.	
Module -4:	IoT Applications, Logical Design & Physical Devices 4.1 Applications: Overview of domain-specific IoT use cases (home automation, smart cities, energy). 4.2 Logical Design with Python: Introduction, Python data types, control flow, functions, key modules. 4.3: IoT Physical Devices: Introduction to IoT devices, exemplary boards (Raspberry Pi, Arduino), basic interfaces, and programming for IoT.	7

Reference Books :-

1. Bahga, Arshdeep, and Vijay Madisetti. Internet of Things: A Hands-On Approach. VPT, 2014.
2. Dargie, Waltenegus, and Christian Poellabauer. Fundamentals of Wireless Sensor Networks: Theory and Practice. Wiley, 2010.
3. Kasap, Safa O. Optoelectronics and Photonics: Principles and Practices. 2nd ed., Pearson, 2012.
4. Matthes, Eric. Python Crash Course. 2nd ed., No Starch Press, 2019.
5. Monk, Simon. Programming the Raspberry Pi: Getting Started with Python. 3rd ed., McGraw-Hill Education, 2021.

Evaluation Pattern: 60:40

Total Marks: 50

Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Compulsory Home Assignment • CCE - II: 10 Marks: Seminar • CCE - III: 10 Marks: Compulsory MCQ Test Note: Best of two CCE Marks will be Considered)	End Semester Examination (50 Marks): • Question -1: Solve the following questions (Five questions of 2 Marks) • Question -2: Attempt any two questions (Three questions of 10 Marks) • Question -3: Attempt any four questions (Five questions of 5 Marks) Note: Conversion of 50 marks of ESE evaluation to 30 Marks
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	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - V
	Type: Major Practical V	Marks: 50
	Credits:2	From: A. Y. 2026-27
Name of the Course: BEP356: Practical Based on BET351, BET 352, BET 353		
Course Objectives: The students will be able to...		
1) study the operation of power electronic devices. 2) understand the basic structure of VHDL code, including entities, architectures, processes, and components. 3) learn the architecture and programming of the 8051 microcontroller. 4) develop interfacing techniques for digital and analog components with the 8051.		
Course Outcomes: The students should be able to...		
1) identify and analyze characteristics of power electronic devices. 2) write correct VHDL code for describing both combinational and sequential circuits. 3) use simulation tools to analyze the behavior of the VHDL designs and identify errors. 4) interface and control output devices like seven-segment displays, LED matrices, and LCDs and actuators such as DC motors, stepper motors, and servo motors using the 8051.		
Module	List of Practical	Hrs.
	1) To study characteristics of SCR and measure latching and holding currents 2) To study characteristics of Power MOSFETTo study characteristics of IGBT 3) To study VI Characteristics of DIAC/ TRIAC 4) Study of AC/DC Timer 5) Study of DC Motor /AC motor Control/ BLDC motor control 6) Study of Basic and Derived gates 7) Study of Arithmetic Circuits 8) Study of Multiplexer & Demultiplexer 9) Study of D flip-flop & SR flip-flop 10) Study of Study of up-down counter 11) To turn an LED on or off using a push button using 8051 microcontroller 12) To generate 10 kHz square wave using 8051 microcontroller 13) Interfacing of Relay/Optocoupler with 8051 microcontroller 14) To study the implementation & interfacing of LCD 15) To study implementation & interfacing DC /stepper motor with 8051 microcontroller	60

Reference Books:-

- 1) Bimbhra, P. S. Power Electronics. Khanna Publishers, 2012.
- 2) Rashid, M. H. Power Electronics: Circuits, Devices and Applications. 3rd ed., Pearson Education, 2004.
- 3) Perry, Douglas. VHDL Programming by Examples. McGraw-Hill, 2002.
- 4) Roth, Charles H. Digital System Design Using VHDL. 2nd ed., Thompson Publishers, 2007.
- 5) Ayala, Kenneth J. The 8051 Microcontroller. Penram International Publishing (India) Pvt. Ltd., 1996.

Evaluation Pattern: 60:40**Total Marks: 50****Journal, Students' Performance Viva, Project
(20 Marks):**

- Regular Journal Progress Assessment:
10 Marks
- Lab work & Performance: 05 Marks
- Practical attendance: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Perform one experiments
(30 Marks)



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Electronics

Programme: B.Sc.

Semester - V

Type: Major Practical VI

Marks: 50

Credits:2

From: A. Y. 2026-27

Name of the Course: BEP357: Practical Based on BET354

Course Objectives: The students will able to...

- 1) introduce students to the fundamentals of signal conditioning and sensor integration in mechatronic systems.
- 2) enable the design and implementation of basic mechanical actuation and control systems.
- 3) develop practical skills in designing and programming proportional controllers.
- 4) foster innovation in building real-world automation applications using sensors, actuators, and microcontrollers.

Course Outcomes: The students should be able to...

- 1) analyze and implement signal conditioning circuits for effective sensor data processing.
- 2) design and test mechanical actuation and proportional control systems for automation tasks.
- 3) develop microcontroller-based prototypes such as line-following robots and solar trackers.
- 4) integrate sensors and actuators (e.g., ultrasonic, temperature, servo motors) into functional embedded systems.

Module	List of Practical's	Hrs.
	1) Study of Signal Conditioning Unit. 2) Designing of Mechanical Actuation Systems. 3) Designing of Proportional Controller. 4) Development of a Mechatronics Application: Rain Sensor Wiper. 5) Development of a Mechatronics Application: Line Following Robot. 6) Development of a Mechatronics Application: Solar Tracker. 7) Car Engine Temperature Management System. 8) Distance Measurement Using Ultrasonic Sensor. 9) To Create a Prototype for an Automatic Door Using an Ultrasonic Sensor and a Servo Motor. 10) To Create a Temperature-Controlled Fan System Using a Temperature Sensor and Microcontroller. 11) Speed Control of DC Motor Using PWM Technique. 12) Automatic Water Level Monitoring and Pump Control System. 13) Automatic Street Light Control Using LDR Sensor 14) Automatic Fire Detection and Alarm System Using Flame Sensor 15) Traffic Light Control System Using Microcontroller.	60

Reference Books: -

1. Alciatore, David G., and Michael B. Histan. Introduction to Mechatronics and Measurement Systems. 5th ed., McGraw-Hill Education, 2020.
2. Bolton, W. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering. 7th ed., Pearson Education, 2018.
3. de Silva, Clarence W. Mechatronics: An Integrated Approach. 1st ed., CRC Press, 2005.

4. Mahalik, N. P. Mechatronics: Principles, Concepts and Applications. Tata McGraw-Hill Publishing Company Ltd., 2003.
5. Shetty, Devdas, and Richard A. Kolk. Mechatronics System Design. 2nd ed., Cengage Learning, 2011.

Evaluation Pattern: 60:40

Total Marks: 50

**Journal, Students' Performance Viva, Project
(20 Marks):**

- Regular Journal Progress Assessment:
10 Marks
- Lab work & Performance: 05 Marks
- Practical attendance: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Perform one experiments
(30 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Electronics		
	Programme: B.Sc.	Semester - V	
	Type: Major Practical VI	Marks: 50	
	Credits:2	From: A. Y. 2026-27	
Name of the Course: BEP358: Practical Based on BET355			
Course Objectives: The Students will able to...			
1) provide foundational understanding of light propagation and losses in optical fibers. 2) equip students with skills to measure key parameters of optical communication systems. 3) introduce students to interfacing sensors and actuators with IoT platforms using Bluetooth and Wi-Fi modules. 4) enable the development of basic smart IoT systems for real-world applications.			
Course Outcomes: The students should be able to...			
1) analyze propagation and bending losses in optical fibers and assess their impact on signal quality. 2) measure optical power and numerical aperture using appropriate instruments and techniques. 3) interface and configure Bluetooth and Wi-Fi modules with IoT platforms for wireless communication. 4) integrate various sensors (e.g., ultrasound, light intensity) with IoT platforms for real-time data acquisition.			
Module	List of Practical's		Hrs.
	1) Study of Propagation Loss in Optical Fiber. 2) To study the Characteristics of Photodiode. 3) To study the Characteristics of Phototransistor. 4) Study of Bending Loss in Optical Fiber. 5) Measurement of Optical Power using Optical Power Meter. 6) Measurement of Numerical Aperture of Optical Fiber. 7) Interfacing Bluetooth Module with IoT Platform. 8) Interfacing Ultrasonic Sensor with IoT Platform. 9) Interfacing Analog Directional Light Intensity Sensor with IoT Platform. 10) Interface Wi-Fi Module with IoT Platform to Toggle LEDs. 11) Use of Wi-Fi Module with IoT Platform to Control Relays. 12) Interfacing Temperature and Humidity Sensor (DHT11/DHT22) with IoT Platform. 13) Interfacing Soil Moisture Sensor with IoT Platform. 14) Interfacing PIR Motion Sensor with IoT Platform for Motion Detection and Monitoring. 15) Interfacing Gas Sensor (MQ-2/MQ-135) with IoT Platform for Air Quality Monitoring.		60

Reference Books: -

1. Bahga, Arshdeep, and Vijay Madisetti. Internet of Things: A Hands-On Approach. VPT, 2014.
2. Dargie, Waltenegus, and Christian Poellabauer. Fundamentals of Wireless Sensor Networks: Theory and Practice. Wiley, 2010.
3. Kasap, Safa O. Optoelectronics and Photonics: Principles and Practices. 2nd ed., Pearson, 2012.
4. Matthes, Eric. Python Crash Course. 2nd ed., No Starch Press, 2019.
5. Monk, Simon. Programming the Raspberry Pi: Getting Started with Python. 3rd ed., McGraw-Hill Education, 2021.

Evaluation Pattern: 60:40**Total Marks: 50****Journal, Students' Performance Viva, Project (20 Marks):**

- Regular Journal Progress Assessment: 10 Marks
- Lab work & Performance: 05 Marks
- Practical attendance: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Perform one experiments (30 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Electronics		
	Programme: B.Sc.	Semester - V	
	Type: VSC III	Marks: 50	
	Credits:2	From: A. Y. 2026-27	
Name of the Course: BEPVSCIII: Python Programming I			
Course Objectives: Student will able to... 1) learn the fundamentals of python programming for electronics applications. 2) interface python with electronic components like LEDs, sensors, and actuators. 3) develop skills for controlling electronic devices using python, such as motor control and PWM. 4) provide hands-on experience with data acquisition and real-time sensor data processing			
Course Outcomes: The students should be able to... 1) design and simulate basic electronic circuits using Python tools. 2) develop IoT-based systems for remote monitoring and data logging applications. 3) build Python-based systems for automated control of electronic devices. 4) troubleshoot and debug python programs for electronics applications effectively.			
Module	List of Practical (Any 15)		Hrs.
	1) Print Voltage and Current Values Using Python 2) Calculate Resistance Using Ohm’s Law in Python 3) Compute Power in a Circuit Using Python 4) Simulate Total Resistance for Resistors in Series Using Python 5) Simulate Total Resistance for Resistors in Parallel Using Python 6) Calculate Energy Stored in a Capacitor Using Python 7) Convert Celsius to Fahrenheit Using Python 8) Convert Frequency to Time Period Using Python 9) Determine LED Resistor Value Using Python 10) Calculate Charge Time for an RC Circuit Using Python 11) Read Voltage and Current Values from a Text File Using Python 12) Save Circuit Calculations to a File Using Python 13) Plot Voltage vs. Time Data Using Python 14) Create a Simple Line Graph for Temperature Readings Using Python 15) Plot a Bar Chart for Sensor Data Using Python 16) Simulate an LED Blinking Pattern 17) Simulate Charging and Discharging of a Capacitor 18) Read Data from Arduino using PySerial 19) Send Commands to Control an LED 20) Blink an LED using Python and Raspberry Pi GPIO		60

Reference Books: -

- 1) McKinney, Wes. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython. 2nd ed., O'Reilly Media, 2017.
- 2) Norris, Donald. Beginning Python for Electronics and Embedded Systems. McGraw-Hill Education, 2016.
- 3) Platt, Charles. Make: Electronics: Learning through Discovery. 2nd ed., Maker Media, 2015.
- 4) Scherz, Paul, and Simon Monk. Practical Electronics for Inventors. 4th ed., McGraw-Hill Education, 2016.
- 5) Monk, Simon. Electronics Cookbook: Practical Recipes with Python and Raspberry Pi. O'Reilly Media, 2017.

Evaluation Pattern: 60:40**Total Marks: 50****Journal, Students' Performance Viva, Project (20 Marks):**

- Regular Journal Progress Assessment: 10 Marks
- Lab work & Performance: 05 Marks
- Practical attendance: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Perform one experiments (30 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s3(6) of MPUA2016) Faculty of Science	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc	Semester- V
	Type: OJT	Marks: 100
	Credits:4	From: A. Y.2026-27
Name of the Course: BEP OJT: On Job Training in Electronics		

Course Objectives: Students will be able to....

- 1) gain practical experience in industrial and laboratory electronics.
- 2) develop skills in handling electronic components, circuits, and instruments.
- 3) apply electronics concepts to practical workplace problems.
- 4) develop professional skills, teamwork, safety, and communication.

Course Outcomes: Students should be able to....

- 1) apply electronics concepts in industrial and laboratory work.
- 2) operate electronic instruments safely and correctly.
- 3) test circuits and analyze practical electronic data.
- 4) demonstrate technical, communication, teamwork, and professional skills.

Student Work:

- 1) Obtain approval from the institution before starting OJT.
- 2) Develop technical and professional skills.
- 3) Complete the required training hours as prescribed by college. (1month)
- 4) Follow Company's working hours.
- 5) Any absence should be reported to both the company supervisor and faculty coordinator.
- 6) Report to the workplace on time.
- 7) Complete assigned tasks responsibly.
- 8) Maintain an OJT logbook or daily diary.
- 9) Daily attendance record and weekly progress report
- 10) Submit final training report and take completion certificate by the company.
- 11) Receive a satisfactory performance evaluation from the company supervisor.
- 12) Complete any required presentation or viva conducted by the institution.

Evaluation Pattern: 60:40	
Total Marks: 100	
Internal Continuous Evaluation (20 Marks): Q.1 : Internal Work = 40 marks	End Semester Examination : Q.1 = 60 marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s3(6) of MPUA2016) Faculty of Science	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc	Semester- V
	Type: CEP	Marks: 50
	Credits: 2	From: A. Y.2026-27
Name of the Course: BEP CEP: Community Engagement programme in Electronics		

Course Objectives: Students will be able to....

- 1) create awareness about the uses of electronics in daily life.
- 2) apply basic electronics knowledge to community problems.
- 3) develop social responsibility, leadership, and teamwork skills.
- 4) promote awareness about e-waste, energy saving, and electronic safety.

Course Outcomes: Students should be able to....

- 1) apply basic electronics to solve simple community problems.
- 2) explain basic electronics concepts through demonstrations and activities.
- 3) demonstrate teamwork, leadership, and social responsibility.
- 4) understand the social and environmental impact of electronic technologies.

Student Work:

- 1) Student Should form a group of 5 to10 people for the field visit.
- 2) Each respective group should collectively select a village, city, school.
- 3) Go to that village and provide information regarding the curriculum you have studied.
- 4) Take Goggle Tag photos while providing the information.
- 5) Every student must maintain a field dairy and get it checked by the professor.
- 6) Take attendance of the people listening to the information and attach it to your report.
- 7) Work for 4 hours every Saturday of the week.
- 8) It is necessary for students to complete a total of 60 hours of Participation.
- 9) A minimum of 75 % attendance is mandatory

Evaluation Pattern: 60:40	
Total Marks: 50	
Internal Continuous Evaluation (20 Marks): Q.1 : Internal Work = 20 marks	End Semester Examination : Q.1 = 30 marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s3(6) of MPUA2016) Faculty of Science	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc	Semester- VI
	Type: Major XIII	Marks: 50
	Credits:2	From: A. Y.2026-27
Name of the Course: BET 361: Electronic Instrumentation		
Course Objectives: Students will be able to 1) familiar with the constructions and working principle of different types of sensors and transducers. 2) study different types of ADC, DAC, and operational amplifiers. 3) learn data acquisition system and instrument characteristics. 4) understand working of electronics instruments and display devices.		
Course Outcomes: Students should be able to 1) use concepts in common methods for converting a physical parameter into an electrical quantity. 2) develop signal conditioner for electronics system. 3) design data acquisition system for various electronics circuits. 4) utilize electronic instruments and display devices for measurement and observation.		
Module	Electronic Instrumentation	Hrs
Module-1:	Transducers and Sensors 1.1 Definition, Classification of transducers, Characteristics of transducers, General application of Transducers. 1.2 Pressure/Force: Strain Gauge, Capacitive, Inductive (LVDT), load cell and piezoelectric transducers, Pneumatic Sensors, Hall Effect sensors. 1.3 Temperature: RTD, Thermistor, Thermocouple, Semiconductor IC (LM 35) sensors, 1.4 Optical: Photovoltaic Cell, Photodiodes, PIR sensor 1.5 Biomedical Sensors: EMG Sensor, GSR Sensor, Heart Rate Sensors, wearable sensors	8
Module-2:	Signal Conditioning and Data Convertors 2.1 Introduction, AC and DC Signal conditioning, A.C and D.C Bridges, Pre-amplifiers 2.2 Concept of Filters 2.3 Principles and working of different types of ADC and DAC, 2.4 Comparators, Instrumentation Amplifier, Differential Bridge Amplifier	7
Module-3:	Data Acquisition Systems and Introduction to Measurement 3.1 Definition & Principle, Generalized Data Acquisition System, Signal conditioning for DAS, sample and Hold Circuit, Computer based DAS, Data Logger 3.2 Introduction to measurement, performance characteristics: Static characteristics, Dynamic characteristics, Error in measurement, Types of Static Error, Sources of Error 3.3 Statistical Analysis, Standards, Electrical Standards	8

Module-4:	Electronic Instruments and Display Devices 4.1 Digital Voltmeter, Digital Multimeter, Digital Frequency Meter, Universal Counter, Digital PH Meter. 4.2 Signal Generators: Pulse Generator, Function generators 4.3 Display Devices: CRT, Block Diagram of CRO, Concept of DSO, LCD, LED, PLASMA, OLED Displays (Comparative Study).	7
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Reference Books:-

1. Bell, David A. Electronic Instrumentation and Measurements. Prentice Hall, 2013.
2. Carr, Joseph J. Elements of Electronic Instrumentation and Measurement. Pearson Education, 2005.
3. Cooper, W. D., and A. D. Helfrick. Electronic Instrumentation and Measurement Techniques. Prentice Hall, 2005.
4. Doebelin, E. O. Measurement Systems: Application and Design. 5th ed., McGraw-Hill, 2003.
5. Goldwing, E. W., and Widdies. Electrical Measurement in Measuring Instruments. n.d.

Evaluation Pattern: 60:40	
Total Marks:50	
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Compulsory Home Assignment • CCE - II: 10 Marks: Seminar • CCE - III: 10 Marks: Compulsory MCQ Test Note: Best of two CCE Marks will be Considered)	End Semester Examination (50 Marks): • Question -1: Solve the following questions (Five questions of 2 Marks) • Question -2: Attempt any two questions (Three questions of 10 Marks) • Question -3: Attempt any four questions (Five questions of 5 Marks) Note: Conversion of 50 marks of ESE evaluation to 30 Marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s3(6)ofMPUA2016) Faculty of Science	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc	Semester- VI
	Type: Major XIV	Marks: 50
	Credits: 2	From: A. Y.2026-27
Name of the Course: BET362: Principles of Antennas and Communication Systems		

Course Objectives: Students will be able to

- 1) study fundamental antenna parameters and numerical methods to analyze and differentiate the antennas.
- 2) learn construction and working of HF, VHF, UHF and microwave antennas.
- 3) understand construction and working of monopole, dipole and patch antennas.
- 4) Familiar with basic terminology and concepts of smart antennas.

Course Outcomes: Students should be able to

- 1) identify antenna parameters.
- 2) describe the various types of HF, VHF, UHF and microwave antennas.
- 3) explain construction, working and applications of monopole, dipole and patch antennas.
- 4) describe concept of smart antenna

Module	Title and Contents	Hrs
Module-1:	Introduction to Antenna Theory and HF, VHF, UHF ANTENNAS 1.1 Introduction: Definition and significance of antennas in communication systems, Overview of different types of antennas, Basic antenna operation, and radiation mechanism 1.2 Antenna Parameters: frequency, wavelength, bandwidth, beamwidth, gain, directivity, efficiency, Impedance matching and VSWR, Antenna radiation patterns and polarization 1.3 Antenna Types and Classification: Classification by frequency range and application, Overview of dipole, folded dipole, monopole, and loop antennas, Antenna arrays and their benefits 1.4 HF Antennas (High Frequency): Characteristics of HF antennas, Types: Long wire antennas, rhombic antennas, V-antennas, Applications and advantages of HF antennas 1.5 VHF Antennas (Very High Frequency): Characteristics of VHF antennas, Types: Dipole antennas, Yagi-Uda arrays, Applications in television broadcasting and FM radio 1.6 UHF Antennas (Ultra High Frequency): Characteristics of UHF antennas, Types: Microstrip (patch) antennas, helical antennas, Applications in mobile communication and satellite TV	8

Module-2:	Microwave Antennas 2.1 Introduction: Definition and significance of microwave frequencies 2.2 Fundamentals of Microwave Antenna Theory: Electromagnetic waves at microwave frequencies 2.3 Reflector Antennas: Types of reflectors: parabolic, Cassegrain, corner reflectors, Design principles and radiation patterns, Applications in satellite and radar systems 2.4 Horn Antennas: Structure and types: pyramidal, conical, corrugated, Radiation characteristics and pattern analysis, Applications in microwave links and measurement systems 2.5 Slot and Waveguide Antennas: Basics of slot antennas: design and radiation mechanism, Waveguide-fed slot arrays, Applications in microwave engineering 2.6 Microstrip Antennas (Patch Antennas): Design and fabrication of microstrip antennas, Patch antenna shapes, Advantages, limitations, and applications in mobile communication 2.7 Smart Antennas and Adaptive Arrays: Concept and benefits of smart antennas, Basics of beamforming and adaptive arrays, Applications in wireless networks and 5G technology	7
Module-3:	Analog Communication 3.1 Electromagnetic Spectrum and Signal Transmission: Electromagnetic spectrum and frequency bands Signal types: analog vs. digital, Bandwidth requirements for analog signals 3.2 Amplitude Modulation (AM): Principles of amplitude modulation, Modulation index and bandwidth, AM waveforms and spectrum analysis, Advantages and limitations of AM 3.3 Frequency Modulation (FM): Frequency modulation principles, Modulation index and bandwidth, FM waveforms and spectrum analysis, Comparison between AM and FM 3.4 Phase Modulation (PM): Basics of phase modulation, Mathematical representation and waveforms, Applications and limitations 3.5 Noise in Analog Communication: Types of noise: internal and external, Impact of noise on analog signals, Noise reduction techniques 3.6 Modulation Techniques Comparison: Comparison of AM, FM, and PM, Criteria for selecting modulation techniques, Applications of each modulation type	
Module-4:	Digital communication 4.1 Introduction, Comparison with analog communication, Basic components of a digital communication system 4.2 Sampling theorem and Nyquist rate, Quantization process and quantization error, Pulse Code Modulation (PCM) 4.3 Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying (QPSK), Quadrature Amplitude Modulation (QAM) 4.4 Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM), Comparison and applications 4.5 Error Detection and Correction: Types of errors in digital communication,	7

	Error detection techniques: parity check, checksum, Error correction techniques: Hamming code, Reed-Solomon 4.6 Synchronous and asynchronous transmission, Protocols for digital communication (e.g., TCP/IP, HTTP), Basics of network communication 4.7 Design of a simple digital communication system, Case studies of real-world digital communication systems, Emerging trends in digital communication (e.g., 5G, IoT)	
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Reference Books:-

1. Balanis, Constantine A. Antenna Theory: Analysis and Design. 3rd ed., Wiley, 2005.
2. Blake, Roy. Electronic Communication Systems. 5th ed., Cengage, 2015.
3. Frenzel, Louis E. Principles of Electronic Communication Systems. 3rd ed., McGraw-Hill, 2012.
4. Haykin, Simon. Communication Systems. Wiley, 2006.
5. Jordan, E. C., and K. G. Balmain. Electromagnetic Waves and Radiating Systems. 2nd ed., PHI, 2000.

Evaluation Pattern: 60:40

Total Marks:50

Internal Continuous Evaluation (20 Marks):

- CCE - I : 10 Marks: Compulsory Home Assignment
 - CCE - II: 10 Marks: Seminar
 - CCE - III: 10 Marks: Compulsory MCQ Test
- Note: Best of two CCE Marks will be Considered)

End Semester Examination (50 Marks):

- Question -1: Solve the following questions (Five questions of 2 Marks)
- Question -2: Attempt any two questions (Three questions of 10 Marks)
- Question -3: Attempt any four questions (Five questions of 5 Marks)

Note: Conversion of 50 marks of ESE evaluation to 30 Marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s3(6)ofMPUA2016) Faculty of Science	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc	Semester- VI
	Type: Major XV	Marks: 50
	Credits: 2	From: A. Y.2026-27
Name of the Course: BET363: Advanced Microcontroller PIC		
Course Objectives: Students will be able to.... 1) learn embedded C programming for the PIC microcontroller. 2) understand the architecture and features of the PIC microcontroller. 3) explore various interfacing techniques using the PIC microcontroller. 4) apply PIC microcontroller-based systems to real-world applications.		
Course Outcomes: Students should be able to.... 1) develop embedded C programs for PIC applications. 2) understand the architecture and features of the PIC microcontroller. 3) interface peripherals like LEDs, sensors, and motors with PIC. 4) design PIC-based systems for real-world applications.		
Module	Advanced Microcontroller: PIC	Hrs
Module-1:	Introduction to Embedded Systems 1.1 Overview of Embedded Systems, Features, Requirements and Applications, Recent Trends in the Embedded System Design. 1.2 Common architectures for the Embedded System Design, Embedded Software design issues 1.3 Introduction to microcontrollers, Overview of Harvard architecture and Von-Neumann architecture, RISC and CISC microcontrollers	8
Module-2:	PIC 18Fxx Microcontrollers 2.1 Introduction to PIC Microcontrollers. 2.2 Architecture overview, status register, general purpose register file, memories. 2.3 Instruction set, Data Transfer Instructions, Arithmetic and Logic Instructions, Branch Instructions, Bit and Bit-test Instructions, MCU Control Instructions 2.4 Simple programs in Assembly Language / C Language, I/O port programming in PIC	7
Module-3:	Timers, Interrupts and on chip Peripherals in PIC 18Fxx 3.1 Introduction to System Clock, Reset sources 3.2 Interrupts: Introduction to interrupts, Types, configuration, and usage 3.3 Timers and counters, Analog-to-Digital Converter, Serial Peripheral Interface (SPI), The Universal Synchronous and Asynchronous serial Receiver and Transmitter (USART), Two Wire Interface (TWI) / I2C bus (Configuration and applications)	8
Module-4:	Real World Interfacing with PIC 4.1 Interfacing of LED, switch, Relay, optocoupler, seven segment displays, LCD, Keypad, stepper motor, servo motor, speed control of DC motor using PWM technique 4.2 Interfacing of sensors and actuators.	7

Reference Books:-

- 1 Huang, Han-Way. PIC Microcontroller: An Introduction to Software and Hardware Interfacing. Cengage Learning, 2004.
- 2 Ibrahim, Dogan. Advanced PIC Microcontroller Projects in C. Newnes, 2008.
- 3 Mazidi, Muhammad Ali, Rolind D. McKinlay, and Danny Causey. PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18. Pearson, 2008.
- 4 Peatman, John B. Design with PIC Microcontrollers. Pearson Education, 2003.
- 5 Singh, Rajesh, Anita Gehlot, and Bhupendra Singh. The PIC Microcontroller: An Introduction to Software and Hardware Interfacing. CRC Press, 2016.

Evaluation Pattern: 60:40**Total Marks: 50****Internal Continuous Evaluation (20 Marks):**

- CCE - I : 10 Marks: Compulsory Home Assignment
- CCE - II: 10 Marks: Seminar
- CCE - III: 10 Marks: Compulsory MCQ Test

Note: Best of two CCE Marks will be Considered)

End Semester Examination (50 Marks):

•Question -1: Solve the following questions (Five questions of 2 Marks)

•Question -2: Attempt any two questions (Three questions of 10 Marks)

•Question -3: Attempt any four questions (Five questions of 5 Marks)

Note: Conversion of 50 marks of ESE evaluation to 30 Marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s3(6)ofMPUA2016) Faculty of Science	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc	Semester- VI
	Type: Major XVI	Marks: 50
	Credits: 2	From: A. Y.2026-27
Name of the Course: BET364: Digital Signal Processing and Artificial Intelligences		
Course Objectives: Students will be able to.... 1) study the comprehension of the concepts of discrete-time signals and systems and about the most important issues in sampling and reconstruction. 2) learn the comprehension of the Z- and their inverse. 3) introduce fundamental concepts of artificial intelligence and provide them the ability to analyze and design intelligent systems. 4) perform the application of Artificial Intelligence (AI) techniques to improve the performance of DSP.		
Course Outcomes: Students should be able to.... 1) capable of calibrating and resolving different frequencies existing in any signal. 2) understand use of different transforms and analyze the discrete time signals and systems. 3) realize the use of LTI filters for filtering different real-world signals. 4) explore the fundamentals of AI.		
Module	Digital Signal Processing and Artificial Intelligences	Hrs
Module-1:	Discrete-Time Signals and Systems 1.1 Classification of Signals, Transformations of the Independent Variable, Periodic and A periodic Signals, Energy and Power Signals, Even and Odd Signals 1.2 Discrete-Time Systems, System Properties. 1.3 Impulse Response, Convolution Sum, Graphical Method, Analytical Method, Properties of Convolution, Commutative, Associative, Distributive, 1.4 Shift Sum Property System Response to Periodic Inputs, Relationship Between LTI System Properties and the Impulse Response, Causality, Stability, Invertibility, Unit Step Response.	8
Module-2:	Discrete Fourier Transform 2.1 Need of transform, Discrete-Fourier Transform & Fast Fourier Transform, The discrete Fourier Series and its Properties Fourier Transform of Periodic Signals, Sampling the Fourier Transform 2.2 The Discrete-Fourier Transform, Properties of DFT, Linear Convolution using DFT. 2.3 FFT-Efficient Computation of DFT, Goertzel Algorithm, radix2 Decimation-in-Time and Decimation - in - Frequency FFT Algorithms 2.4 Introduction to other transforms.	7

Module-3:	Z-Transform 3.1 Definition and properties, Inverse Z Transform and stability Inverse z- Transform 3.2 Relationship Between z-Transform and Discrete-Time Fourier Transform, z-plane, Region-of-Convergence. 3.3 Properties of ROC, Time Reversal, Differentiation in the z-Domain, Power Series Expansion Method (or Long Division Method) 3.4 Analysis and Characterization of LTI Systems, Transfer Function and Difference- Equation System, Solving Difference Equations.	8
Module-4:	Digital Filters and Artificial Intelligence 4.1 Analog filter review, Advantages and Disadvantages of Digital Filters 4.2 Types of Digital Filters, FIR and IIR Filters; Difference Between FIR and IIR Filters, Design of FIR and IIR filter, Windowing Method, Rectangular, Triangular, Kaiser Window 4.3 Introduction to Digital signal processor, Application of digital signal processing 4.4 Introduction to AI, Artificial intelligence: History, Trends and Future Application of Artificial Intelligence (AI)	7

Reference Books:-

1. Ambardar, A. *Digital Signal Processing: A Modern Introduction*. Cengage Learning India Pvt. Ltd., New Delhi.
2. Babu, P. Ramesh. *Digital Signal Processing*. 4th ed., Scitech Publications.
3. Lapsley, Phil. *DSP Processor Fundamentals: Architectures and Features*. Wiley Publication.
4. Mitra, S. K. *Digital Signal Processing: A Computer-Based Approach*. Tata McGraw-Hill, New Delhi, 2009.
5. Pirsch, P. *Architectures for Digital Signal Processing*. John Wiley Publication, New Delhi.

Evaluation Pattern: 60:40

Total Marks:50

Internal Continuous Evaluation (20 Marks):	End Semester Examination (50 Marks):
• CCE - I : 10 Marks: Compulsory Home Assignment • CCE - II: 10 Marks: Seminar • CCE - III: 10 Marks: Compulsory MCQ Test Note: Best of two CCE Marks will be Considered)	• Question -1: Solve the following questions (Five questions of 2 Marks) • Question -2: Attempt any two questions (Three questions of 10 Marks) • Question -3: Attempt any four questions (Five questions of 5 Marks) Note: Conversion of 50 marks of ESE evaluation to 30 Marks



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s3(6)ofMPUA2016)

Faculty of Science

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Electronics

Programme: B.Sc

Semester- VI

Type: Major XVI

Marks: 50

Credits: 2

From: A. Y.2026-27

Name of the Course: BET365: Industrial Processes control and PLC programming

Course Objectives: Students will be able to....

- 1) understand the fundamentals of automation and various automation systems used in industry such as PLC, DCS, and SCADA.
- 2) learn how to design an automation system.
- 3) study the Ladder programming language.
- 4) familiar with the PI, PD and PID controllers

Course Outcomes: Students should be able to....

- 1) design PLC based application by proper selection and sizing criteria and ladder program.
- 2) understand evolution and architecture of DCS, SCADA architecture
- 3) design communication systems in SCADA, develop any application based on SCADA
- 4) perform automation plant programming using ladder programming language

Module	Industrial Processes control and PLC programming	Hrs
Module-1:	Introduction to control system 1.1 Basic elements of control system, open loop control system, closed loop control system, control system terminology, manually controlled closed loop systems, automatic controlled closed loop systems, 1.2 comparison closed-loop system and open- loop control, feed-forward control system, adaptive control system, classification of control system.	8
Module-2:	Components of Control System 2.1 Op-Amp as zero crossing detector, non-inverting comparator, inverting comparator, Two position controller using op-Amp 2.2 proportional controller, integral controller using Op-Amp, derivative controller, PI controller, PID controller	7
Module-3:	Introduction to PLC 3.1 Programmable logic controller (PLC) basics: Definition, overview of PLC systems, block diagram of PLC, Input/output modules, power supplies, isolators, features like scan time, system scale, user interface. 3.2 Modular PLC and Redundant PLC and Applications, communication protocols: RS485, Profibus, Modbus. 3.3 Distributed control system, DCS components/block diagram, SCADA, adaptive control system	8

Module-4:	Ladder Programming basics 4.1 Basic components: fuse, pushbutton, selector switches, limit switches, indicators, relay, time Delay relays functions and symbols. General PLC programming procedures, programming on-off Inputs/outputs 4.2 Auxiliary commands and functions: PLC Basic Functions: Register basics, timer functions, counter functions 4.3 Ladder Programming: Programs for Boolean logic and flip-flops, counters, timers, flasher 4.4 Application: Bottle filling plant, elevator control, washing machine control, Four-wheeler parking.	7
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Reference Books:-

1. Gray, Stephen, and Robert Dunning. *Introduction to Programmable Logic Controllers*. 2nd ed., Thomson Education, 2004.
2. Hackworth, J. R., and F. D. Hackworth Jr. *Programmable Logic Controllers: Programming Methods and Applications*. Pearson, 2004.
3. Mitra, Madhuchhanda. *Programmable Logic Controllers and Industrial Automation: An Introduction*.
4. Webb, John W., and Ronald A. Reiss. *Programmable Logic Controllers: Principles and Applications*. 5th ed., PHI.

Evaluation Pattern: 60:40	
Total Marks:50	
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Compulsory Home Assignment • CCE - II: 10 Marks: Seminar • CCE - III: 10 Marks: Compulsory MCQ Test Note: Best of two CCE Marks will be Considered)	End Semester Examination (50 Marks): • Question -1: Solve the following questions (Five questions of 2 Marks) • Question -2: Attempt any two questions (Three questions of 10 Marks) • Question -3: Attempt any four questions (Five questions of 5 Marks) Note: Conversion of 50 marks of ESE evaluation to 30 Marks



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Electronics

Programme: B.Sc.

Semester - VI

Type: Major Practical VII

Marks: 50

Credits:2

From: A. Y. 2026-27

Name of the Course: BEP 366: Based on BET 361, BET 362, BET 363

Course Objectives: The Students will be able to....

- 1) learn the principles of a sensor and transducer
- 2) give exposure to the modern instruments and tools
- 3) introduced to antennas, their principle of operation.
- 4) enhance and develop scientific, analytical skills about electronics communication.

Course Outcomes: The Students should be able to....

- 1) understand basic measurement principles and modern instrumentation.
- 2) gain practical knowledge of various instruments and tools.
- 3) analyze antenna parameters and radiation patterns.
- 4) demonstrate modulation and demodulation techniques.

Module	Title and Contents	Hrs.
	List of Practical 1) Study of Instrumentation Amplifier (TL084/LM324) 2) Measurement of Resistance Using Wheatstone Bridge 3) Study of characteristics of RTD (PT-100) 4) Study of Linear Variable Displacement Transducer 5) To study the Characteristics of LDR 6) Study of Simple and Folded Dipole ($\lambda/2$) antenna 7) Study of Dipole ($\lambda/4$) antenna 8) Study of Yagi-UDA 3/ 5 Element Simple and Folded dipole antenna 9) Study of Amplitude Modulator and demodulator/ FM – Modulator and Demodulator 10) Study of Amplitude Shift Keying/ Frequency Shift Keying 11) Interfacing of LED and RELAY using PIC18Fxxcontroller with MPLAB 12) Write an assembly language program to generate 10 KHz frequency using interrupts 13) To interface IR Obstacle sensor with PIC18Fxx microcontroller 14) To study Serial communication using PIC18Fxx 15) Programming of PIC18Fxx on chip ADC	60

Reference Books:-	
1) Kalsi, H. S. Electronic Instrumentation. TMH, 2006. 2) Rawat, Tarun Kumar. Digital Signal Processing. Oxford University Press, India. 3) Balanis, Constantine A. Antenna Theory: Analysis and Design. 3rd ed., Wiley, 2005. 4) Frenzel, Louis E. Principles of Electronic Communication Systems. 3rd ed., McGraw-Hill, 2012. 5) PIC Microcontroller and Embedded Systems: Using Assembly and C by Muhammad Ali Mazidi, SarmadNaimi, SepehrNaimi, PHI	
Evaluation Pattern: 60:40	
Total Marks: 50	
Journal, Students' Performance Viva, Project (20 Marks): - Regular Journal Progress Assessment: 10 Marks - Lab work & Performance: 05 Marks - Practical attendance: 05 Marks	Practical Exam Paper (30 Marks): Section I: Perform one experiments (30 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Electronics		
	Programme: B.Sc.	Semester - VI	
	Type: Major Practical VIII	Marks: 50	
	Credits:2	From: A. Y. 2026-27	
Name of the Course: BEP 367: Based on BET 364			
Course Objectives: Students will be able to...			
1) understand and implement basic discrete-time signals and systems in a computational environment. 2) analyze signals using z-transform, fourier transform, DFT, and FFT techniques. 3) design and simulate analog and digital filters for signal processing applications. 4) develop skills in system response analysis using convolution, pole-zero plots, and frequency responses.			
Course Outcomes: Students should be able to...			
1) generate and analyze basic discrete-time signals such as step, ramp, and sinusoidal sequences. 2) demonstrate the ability to compute and interpret z-transforms and perform frequency domain analysis. 3) design and simulate analog and digital filters, evaluating their magnitude and phase responses. 4) apply convolution and system analysis techniques to model and evaluate LTI systems.			
Module	List of Practical	Hrs.	
	1) Generation of unit sample sequence, unit step, ramp function, discrete time sequence, real sinusoidal sequence. 2) Given $x[n]$, write a program to find $X[z]$. 3) To study Fourier Transform, Discrete Fourier Transform and Fast Fourier Transform 4) Design of a Butterworth analog filter for low pass signal 5) Design of a Butterworth analog filter for high pass signal 6) Write a program to generate and plot the following sequences: (a) Unit sample sequence $\delta(n)$, (b) unit step sequence $u(n)$ 7) Write a program to compute the convolution sum of a rectangle signal (or 8) gate function) with itself for $N = 5$ 9) Given a casual system $y[n] = 0.9y[n-1] + x[n]$ (a)Find (z) and sketch its pole-zero plot (b) Plot the frequency response $H(e^{j\omega})$ and $\angle H(e^{j\omega})$ 10) $H(e^{j\omega})$ and $\angle H(e^{j\omega})$ 11) Design a digital filter to eliminate the lower frequency sinusoid of $x[n] = \sin 7n + \sin 200n$. The sampling frequency is $f_s = 500$ Hz. Plot its pole zerodiagram, magnitude response, input and output of the filter. 12) Write a program to generate and plot the following sequences: ramp sequence $r(n)$, real valued exponential sequence $x[n] = 0.8^n u(n)$ for $0 \leq n \leq 50$. 13) Design and analysis of an FIR digital filter using the window method (Hamming/Hanning/Rectangular).	30	

	14) Design and analysis of an IIR digital Butterworth filter and study its pole-zero plot and frequency response. 15) Perform circular convolution of two discrete-time sequences using DFT and verify the result with linear convolution.	
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Reference Books:-

- 1) Ambardar, A. Digital Signal Processing: A Modern Introduction. Cengage Learning India Pvt. Ltd., New Delhi.
- 2) Babu, P. Ramesh. Digital Signal Processing. 4th ed., Scitech Publications.
- 3) Lapsley, Phil. DSP Processor Fundamentals: Architectures and Features. Wiley Publication.
- 4) Mitra, S. K. Digital Signal Processing: A Computer-Based Approach. Tata McGraw-Hill, New Delhi, 2009.
- 5) Pirsch, P. Architectures for Digital Signal Processing. John Wiley Publication, New Delhi.

Evaluation Pattern: 60:40	
Total Marks: 50	
Journal, Students' Performance Viva, Project (20 Marks): • Regular Journal Progress Assessment: 10 Marks • Lab work & Performance: 05 Marks • Practical attendance: 05 Marks	Practical Exam Paper (30 Marks): • Section I: Perform one experiments (30 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Electronics		
	Programme: B.Sc.	Semester - VI	
	Type: Major Practical VIII	Marks: 50	
	Credits: 2	From: A. Y. 2026-27	
Name of the Course: BEP 368: Based on BET 365			
Course Objectives: Students will be able to...			
1) introduce students to PLC programming using simulation software like TriLOGI. 2) design and implement sequential logic using flip-flops, timers, and counters. 3) apply PLC programming concepts to real-time industrial automation systems. 4) simulate sensor-based control systems for temperature, motion, and automated mechanisms.			
Course Outcomes: Students should be able to...			
1) write and simulate boolean logic functions using PLC software. 2) demonstrate the ability to implement and test sequential logic circuits in PLCs. 3) develop and simulate PLC programs for industrial applications like elevators, bottle filling, and gates. 4) model and test sensor-based automated systems using virtual environments.			
Module	Title and Contents		Hrs.
	List of Practical 1) Study of PLC Simulator (TriLOGI Software) 2) Implementation of Basic Logic gates using ladder programming 3) Implementation of Derived gate using ladder programming 4) Programming PLC for sequential logic RS -FF and D-FF 5) Programming PLC for sequential logic JK-FF and T-FF 6) Study of PLC timers 7) Study of PLC Counters 8) Programming PLC for Bottle filling plants 9) Programming PLC for Automatic parking Gate 10) Programming PLC for Elevator control 11) Programming PLC for Traffic Light Control 12) Simulate a temperature control system using a virtual sensor 13) Simulate an automatic door system controlled by a motion sensor 14) To study the UP/DOWN counter using PLC programming 15) To Study the arithmetic instructions using PLC ladder programming.		60
Reference Books:-			
1) Gray, Stephen, and Robert Dunning. Introduction to Programmable Logic Controllers. 2nd ed., Thomson Education, 2004. 2) Hackworth, J. R., and F. D. Hackworth Jr. Programmable Logic Controllers: Programming Methods and Applications. Pearson, 2004. 3) Mitra, Madhuchhanda. Programmable Logic Controllers and Industrial Automation: An Introduction.			

- 4) Webb, John W., and Ronald A. Reiss. Programmable Logic Controllers: Principles and Applications. 5th ed., PHI.

Evaluation Pattern: 60:40

Total Marks: 50

**Journal, Students' Performance Viva, Project
(20 Marks):**

- Regular Journal Progress Assessment:
10 Marks
- Lab work & Performance: 05 Marks
Practical attendance: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Perform one experiments
(30 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - VI
	Type: VSC IV	Marks: 50
	Credits:2	From: A. Y. 2025-26
Name of the Course: BEPVSC-IV: Python Programming II		
Course Objectives: Student will able to...		
1) understand fundamental electronic principles such as voltage dividers, capacitor charging/discharging, amplifiers, and logic gates. 2) develop embedded systems using Arduino and Raspberry Pi platforms. 3) simulate electronic signals and systems using Python programming. 4) interface sensors with microcontrollers and perform real-time data logging.		
Course Outcomes: Students should be able to...		
1) ability to analyze and simulate basic analog and digital circuits. 2) capability to build and program embedded projects using microcontrollers and single-board computers. 3) skill in generating and visualizing electronic signals using Python tools like NumPy and Matplotlib. 4) proficiency in acquiring and logging sensor data using PySerial and Python.		
Module	List of Practical (Any 15)	Hrs.
	1) Generate a Voltage Divider Output 2) Simulate an LED Blinking Pattern 3) Generate Simple PWM Signals 4) Simulate Charging and Discharging of a Capacitor 5) Visualize Binary Signals 6) Create a Simple Digital Clock 7) Calculate Voltage Gain of an Amplifier 8) Find the RMS Value of a Sine Wave 9) Generate a Frequency Table for Time Periods 10) Simulate a Simple Logic Gate 11) Read Data from Arduino using PySerial 12) Send Commands to Control an LED 13) Log Temperature and Humidity Data from a Sensor 14) Control a Servo Motor Using PWM 15) Blink an LED using Python and Raspberry Pi GPIO 16) Integrate Sensors with IoT for Data Storage 17) Build a Simple Circuit Simulator using Matplotlib 18) Simple Audio Signal Generator 19) Create a Circuit Design using Python 20) Build a Simple Voltage Measurement System	60

Reference Books: -

- 1) McKinney, Wes. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython. 2nd ed., O'Reilly Media, 2017.
- 2) Norris, Donald. Beginning Python for Electronics and Embedded Systems. McGraw-Hill Education, 2016.
- 3) Platt, Charles. Make: Electronics: Learning through Discovery. 2nd ed., Maker Media, 2015.
- 4) Scherz, Paul, and Simon Monk. Practical Electronics for Inventors. 4th ed., McGraw-Hill Education, 2016.
- 5) Monk, Simon. Electronics Cookbook: Practical Recipes with Python and Raspberry Pi. O'Reilly Media, 2017.

Evaluation Pattern: 60:40**Total Marks: 50****Journal, Students' Performance Viva, Project (20 Marks):**

- Regular Journal Progress Assessment: 10 Marks
- Lab work & Performance: 05 Marks
- Practical attendance: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Perform one experiments (30 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - V
	Type: SEC III	Marks: 50
	Credits:2	From: A. Y. 2026-27
Name of the Course: BEPSEC III: 3D Modeling with TinkerCAD		
Course Objectives: Students will be able to...		
1) equip students with the ability to create and manipulate 3D shapes using fundamental tools like Group, Align, and Hole. 2) develop skills in combining text and shapes for designing customized 3D objects such as nameplates or keychains. 3) introduce techniques for importing, exporting, and preparing 3D models for printing, including slicing. 4) foster creativity and precision in designing functional enclosures for electronic circuits and devices.		
Course Outcomes: Students should be able to...		
1) create and modify 3D shapes and combine them effectively for complex designs. 2) design and prepare 3D models with text and shape combinations for practical applications. 3) import external 3D models, customize them, and export in formats ready for 3D printing 4) slice and optimize 3D designs for printing using basic and advanced slicing techniques.		
Module	List of Practical (Any 15)	Hrs.
	1) Basic Shape Creation:Learn to create and manipulate basic shapes like cubes, spheres, and cylinders. 2) Shape Grouping:Combine multiple shapes into a single object using the "Group" tool. 3) Shape Alignment:Align objects precisely along specific axes using the "Align" tool. 4) Hole Tool:Create holes in objects using the "Hole" tool and subtract shapes. 5) Extrude Tool:Convert 2D shapes into 3D objects by extruding them. 6) Shape Modification (Resize and Rotate):Practice resizing and rotating objects in 3D space. 7) Mirror Tool:Create symmetrical designs using the "Mirror" tool. 8) Workplane Tool:Use the "Workplane" tool to create objects on different surfaces. 9) Text Tool:Add 3D text to designs and combine it with other shapes. 10) Ruler Tool: Measure and scale objects precisely using the "Ruler" tool. 11) Duplicate Tool: To create multiple copies of objects with the "Duplicate" tool. 12) Snap Grid Tool:To position objects accurately using the "Snap Grid" feature.	60

	13) Text and Shape Combination: To combine text and shapes to design objects like nameplates or keychains. 14) Importing 3D Files: To import external 3D models (STL or OBJ) and modify them. 15) Exporting and 3D Printing: Export designs in STL or OBJ format for 3D printing. 16) Basic Object Slicing: Learn to load, scale, slice, and save a model for 3D printing using FlashPrint 5 17) Advanced Slicing with Variable Settings: Experiment with advanced slicing options like variable layer height and custom infill patterns. 18) Basic Circuit Enclosure: Design an enclosure for a basic electronic circuit board, considering mounting holes and ventilation. 19) Power Supply Housing: Create a case for a power supply module, ensuring space for wires and connectors. 20) Sensor Mounting Bracket: Design a mounting bracket for a temperature, humidity, or motion sensor.	
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Reference Books:-

- 1) Bardak, E., and C. Tuncer. 3D Printing: Principles and Applications. Elsevier, 2018.
- 2) Benedict, M. 3D Printing for Dummies. Wiley, 2016.
- 3) Choi, Y. S., and T. Hwang. Design and 3D Printing of Customized Prostheses for Manufacturing. Springer, 2020.
- 4) Hunt, B. R., R. L. Lipsman, and J. M. Rosenberg. A Guide to MATLAB. 3rd ed., Wiley, 2014.
- 5) Khamari, R., and A. Kumar. 3D Printing and Additive Manufacturing: The Ultimate Guide. Springer, 2019.

Evaluation Pattern: 60:40

Total Marks: 50

Journal, Students' Performance Viva, Project (20 Marks):

- Regular Journal Progress Assessment: 10 Marks
- Lab work & Performance: 05 Marks
- Practical attendance: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Perform one experiments (30 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s3(6) of MPUA2016) Faculty of Science	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc	Semester- VI
	Type: FP	Marks: 50
	Credits: 2	From: A. Y.2026-27
Name of the Course: BEP FP: Field Project in Electronics		
Course Objectives: Students will be able to.... 1) apply basic electronics concepts to real-life problems. 2) develop practical skills in electronic measurements and experiments. 3) gain experience in using electronic components, circuits, and instruments. 4) develop teamwork, communication, problem-solving, and report-writing skills.		
Course Outcomes: Students should be able to.... 1) apply basic electronics principles to solve practical problems. 2) perform measurements and experiments using electronic instruments. 3) analyze electronic circuits and interpret experimental results. 4) present project work effectively through teamwork and technical reports.		
Student Work: 1) Student should work in a group of 2 people for field project. 2) Select a topic that addresses a real-world problem or requirements. 3) Maintain proper record as observations and activities. 4) Present ongoing work periodically as per timetable 5) Submit the project report within the prescribed deadline. 6) Give a project presentation. 7) Successfully complete the viva-voce.		
Evaluation Pattern: 60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): Q.1 : Internal Work = 20 marks	End Semester Examination : Q.1 = 30 marks	

Bachelor of Science (B.Sc.) Part III: Electronics

Semester VI

C.C. (Co-Curricular) (Credit 2)

Evaluation Pattern: 60:40	
Total Marks: 50	
Internal Continuous Evaluation (20 Marks): Q.1 : Internal Work = 20 marks	End Semester Examination : Q.1 = 30 marks