



Karmaveer Bhaurao Patil University, Satara

Syllabus for

B. Sc. II Electronics

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year

2025-26

Course Structure: B.Sc. II Electronics, NEP 2.0

Semester III			
Major			
Course	Course Code	Course Title	Credits
DSC V	BET 231	Fundamentals of Analog Circuit design	02
DSC VI	BET 232	Computer Organization and 8085 Programming Techniques	02
DSC P (III)	BEP 233	Experimental studies of analog circuit design and Microprocessor Programming Lab (Hardware and Software)	02
Minor			
Course	Course Code	Course Title	Credits
DSC V	BET 234	Wave-Shaping Circuits and Timer IC	02
DSC VI	BET 235	Microcomputer Systems and 8085 Microprocessor	02
DSC P (III)	BEP 236	Wave-Shaping & Microprocessor Lab (Hardware and Software)	02
OE III	BEPOE III	Health and Hygiene	02
	BEPOE III	Environmental Studies	02
VSC I	BEPVSC I	Electronics Technical Writing, Documentation and Presentation Essentials Skill	02
SEC I	BEPSEC I	Scientific Programming Skills for Electronics Lab	02
AEC I	English	English For Communication I	02
IKS II	BETIKS II	Contribution of Electronics in Indian knowledge	02
		Total	22
Semester IV			
Major			
Course	Course Code	Course Title	Credits
DSC VI	BET 241	Operational Amplifier and its Applications	02
DSC VIII	BET 242	Fundamentals of 8051 Microcontroller	02
DSC P (IV)	BEP 243	Op-Amp Circuit Design and 8051 Microcontroller Programming Lab (Hardware and Software)	02
Minor			
Course	Course Code	Course Title	Credits
DSC VI	BET 244	Fundamentals of Operational Amplifiers	02
DSC VIII	BET 245	Basics of 8051 microcontroller	02
DSC P (IV)	BEP 246	Operational amplifier and microcontroller Lab (Hardware and Circuit Simulation Software)	02
OE IV	BETOE IV	Scientific Writing	02
	BEPOE IV	Scientific Philosophy	02
VSC II	BEPVSC II	Advanced Digital Tactics for Electronics Enterprises	02
SEC II	BEPSEC II	Advance Scientific programming skills for Electronics	02
AEC II	English	English For Communication II	02
VEC II	BETVEC II	Electronics for Environmental awareness	02
		Total	22

Evaluation Structure: B.Sc. II, NEP 2.0

➤ Semester III, Level 5

Course	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
Major	T	BET 231	10	10	10	30	50	02
	T	BET 232	10	10	10	30	50	02
	P	BEP 233	20			30	50	02
Minor	T	BET 234	10	10	10	30	50	02
	T	BET 235	10	10	10	30	50	02
	P	BEP 236	20			30	50	02
OE	P	BEPOE 3 (For IDS Courses)	20			30	50	02
		BETOE 4 (For Humanities)	10	10	10	30	50	02
VSC	P	BEPVSC 1	20			30	50	02
SEC	P	BEPSEC 1	20			30	50	02
AEC I	T	BETAEC 1	10	10	10	30	50	02
IKS II	T	BETIKS 2	10	10	10	30	50	02
Total							550	22

➤ Semester IV, Level 5

Course	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
Major	T	BET 241	10	10	10	30	50	02
	T	BET 242	10	10	10	30	50	02
	P	BEP 243	20			30	50	02
Minor	T	BET 244	10	10	10	30	50	02
	T	BET 245	10	10	10	30	50	02
	P	BEP 246	20			30	50	02
OE	T	BETOE 4 (For IDS Courses)	20			30	50	02
OE	T	BETOE 4 (For Humanities)	10	10	10	30	50	02
VSC	P	BEPVSC 2	20			30	50	02
SEC	P	BEPSEC 2	20			30	50	02
AEC I	T	BETAEC 2	10	10	10	30	50	02
VEC II	T	BETVEC 2	10	10	10	30	50	02
Total							550	22

Note: Best of two CCE Marks will be considered.

	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 - III	
	Type: Major DSC V	Marks: 50	
	Credits: 2	From: A. Y. 2025-26	
Name of the Course: BET 231, Fundamentals of Analog Circuit Design			
Course Objectives: Students will able to...			
1) explain the fundamental concepts of analog circuit design, including linear and nonlinear wave-shaping circuits. 2) analyze transistorized multivibrators, power amplifiers, and feedback amplifier circuits for their operating characteristics. 3) examine the design, operation, and applications of voltage and current sweep generators and oscillator circuits. 4) apply the functional principles of timer ICs and PLL ICs to timing, modulation, and signal-processing applications.			
Course Outcomes: The students should be able to...			
1) design linear and nonlinear wave-shaping circuits, including differentiators, integrators, clippers, and clampers, for specific applications. 2) evaluate the operational characteristics of multivibrators and power amplifiers to select suitable configurations for specific applications. 3) implement oscillator circuits to meet specified signal-generation requirements. 4) develop timer IC 555 and PLL IC 565 based circuits for advanced timing, modulation, and control applications.			
Module	Title and Contents		Hrs.
Module -1:	Wave shaping Circuits 1.1.Linear wave shaping circuits: Differentiator - High pass R--C circuits, Response to triangular input & square wave, Numerical problems-based designing. Integrator--Low pass RC circuit –Response to square input &rectangular input, Numerical problems-based designing. 1.2.Nonlinear wave shaping: Clippers: Positive clipper, Negative clipper, Combinational clipper. Clampers: Positive clampers, Negative clampers, Combinational clampers, voltage doublers and triplers, Numerical problems-based designing.		7
Module -2:	Multivibrators and Amplifiers 2.1. Transistorized Multivibrators and its types: Circuit Diagram, Operation, timing equations & applications of following: Astable multivibrator, Monostable multivibrator, Bistable Multivibrator, Schmitt Trigger, Numerical problems based on timing Equations.		8

	2.2. Power Amplifiers: Class A, Class B, Class C and their Comparisons, RC couple amplifier, RF Tuned Amplifiers, Applications. 2.3. Feedback Amplifiers: Concept of feedback, Negative and Positive feedback, General Characteristics of feedback circuits, advantages and disadvantages of negative feedback and positive feedback, voltage, current feedback amplifiers and their applications (Series and Shunt).	
Module -3:	Sweep Generators and Oscillators 3.1. Voltage time base generator: Exponential sweep circuit, Transistor switch sweep generator, UJT switch sweep generator, Miller sweep generator, Bootstrap sweep generator. 3.2. Current sweep generator: Transistorized. 3.3. Oscillators: Barkhausen Criteria for Oscillators, Phase Shift Oscillator, Colpitts Oscillator, Hartley Oscillator, Wien bridge Oscillator and Crystal Oscillator.	8
Module -4:	Timer IC and its applications 4.1. Timer IC555: Features, Pin Diagram, Block Diagram, 4.2. Applications: Astable Multivibrator, Monostable Multivibrator, PWM, PAM, PPM, FSK 4.3. PLL IC 565: Introduction Block diagram, Pin diagram, Applications	7
Reference Books :- 1) R. S. Sedha, A Textbook of Wave-Shaping Circuits and 555 Timers, S. Chand & Co., 3rd Multicolour Edition, 2018. 2) D. Roy Choudhuri, Linear Integrated Circuits, 5th Multicolour Edition, 2018. 3) M. L. Soni, A Course in Circuit Analysis, Dhanpat Rai Publications, 4th Edition, 2016. 4) Allen Mottershead, Electronic Devices and Circuits: An Introduction, 11th Edition, 2015. Bernard Grob, Basic Electronics, 8th Edition, 2010. 5) M. E. Van Valkenburg and Kinariwala, Linear Circuits, 1982.		
Evaluation Pattern: 60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Home Assignment • CCE - II: 10 Marks: Short and long answer questions test • CCE -III: 10 Marks: Multiple choice question 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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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - III
	Type: Major DSC VI	Marks: 50
	Credits: 2	From: A. Y. 2025-26
Name of the Course: BET 232, Computer Organization and 8085 Programming Techniques		
Course Objectives: Students will able to... 1) explain the fundamental concepts of microcomputer architecture, memory systems, and I/O interfacing techniques to establish a foundation in microcomputer systems. 2) examine the 8085 microprocessor architecture, including its internal architecture, timing, control signals, and interrupt mechanisms. 3) develop assembly language programs using 8085 instructions, addressing modes, and subroutine calls. 4) evaluate real-world applications of the 8085 microprocessor using interfacing ICs, programming tools, and its functional features.		
Course Outcomes: The students should be able to... 1) describe the architecture and components of microcomputers and explain their roles in various applications. 2) analyze the functionality of the 8085 microprocessor's internal architecture, including registers, control signals, and interrupt-handling mechanisms, and relate them to system performance. 3) construct assembly language programs for data transfer, arithmetic, logical operations, and control-flow applications using 8085 instructions and addressing modes. 4) implement advanced 8085 programming techniques for solving real-world problems.		
Module	Title and Contents	Hrs.
Module -1:	Microcomputer Architecture and Systems 1.1. Introduction to Microcomputers: Definition and characteristics, Overview of microprocessor-based systems, Applications, Comparison with mainframes and minicomputers 1.2. Basic Architecture of a Microcomputer: Components of a microcomputer system, Overview of system buses, Microcomputer block diagram and working, Different types of microprocessors 1.3. Memory and Storage Systems: Types of memory, Memory addressing and access time, Introduction to cache memory, virtual memory, and storage devices. Memory hierarchy. 1.4. I/O Interfacing and Communication: Methods of interfacing I/O devices, Basic I/O operations and types of I/O devices, Synchronous vs. Asynchronous communication, Serial and parallel communication, Applications of microcomputers in various fields.	5

Module -2:	8085 Microprocessor Fundamentals 2.1. Introduction to 8085 Microprocessor: Overview and history, Basic architecture and working, Pin configuration and signal functions. 2.2. 8085 Internal Architecture and Registers: ALU, accumulator, and general purpose registers, Flag register and status flags, Internal buses, data paths, and control units 2.3. Timing and Control Signals: Control signals- ALE, RD, WR, etc. Machine cycles, states, and clock cycles, Timing diagrams for 8085 instructions 2.4. Interrupts and the Stack Mechanism: Maskable and non-maskable interrupts, Interrupt handling mechanism, Stack pointer and stack operations. 2.5. Advanced 8085 Features: Power-down modes, serial data transmission, Multiprocessor configuration, Comparison with other microprocessors (e.g., 8086, Zilog Z80)	9
Module -3:	8085 Programming Essentials 3.1. Instruction Set and Categories: Overview of instruction set architecture of 8085, Types of instructions, Instruction formats and execution 3.2. 8085 Addressing Modes: Addressing modes, use different addressing modes, Examples and applications, 3.3. Data Transfer Instructions: Detailed study of data transfer instructions (MOV, MVI, LDA, STA), Register-to-register and immediate data transfer, Examples and exercises 3.4. Arithmetic Instructions: Study of arithmetic instructions (ADD, SUB, INX, etc.), Implementing arithmetic operations: addition, subtraction, Examples of programs using arithmetic operations. 3.5. Logical Instructions: Logical operations in 8085 (ANA, XRA, RLC, RRC), Bit manipulation techniques using logical instructions, Writing programs for Logical operations 3.6. Branching Instructions: Jump, call, return, and conditional branching instructions (JMP, JC, CALL, RET), Writing loops and condition-based programs, Example programs using branching instructions 3.7. Subroutine and Stack Operations: Subroutine calls and returns (CALL, RET), Push and Pop instructions for stack operations, Writing and testing stack-based programs 3.8. Looping and Counting Techniques: Looping in 8085 programs, Using counters and timers in loops, Example programs for counting and timing operations 3.9. Delay Subroutines and Timing: Implementing delay subroutines in assembly, loops to create time delay Example applications using delays in microprocessor- based systems	8
Module -4:	8085 Programming Techniques 4.1. Assembly language tools: Assembler, debugger, emulator, Programming model of 8085 4.2. Introduction of interfacing ICs (Qualitative only): Programmable Peripheral Interface: Intel 8155, 8253, 8255, programmable Interrupt Controller: Intel 8259 4.3. Case Studies and Practical Applications: real-world applications using 8085 microprocessors.	8

Reference Books:-

- 1) W. Stallings, Computer Organization and Architecture: Designing for Performance, Prentice Hall of India, 8th Edition, 2009.
- 2) D. V. Hall, Microprocessors and Interfacing, Tata McGraw-Hill, Revised 2nd Edition, 2005.
- 3) Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications, Wiley Eastern Ltd., 2nd Edition, 2002.
- 4) P. K. Ghosh and P. R. Sridhar, 8085 Microprocessor, John Wiley and Sons, 2nd Edition, 2002.
- 5) K. Udaya Kumar and B. S. Uma Shankar, The 8085 Microprocessor: Architecture, Programming, and Interfacing, Pearson Education, 2001.
- 6) Walter Triebel and Avtar A. Singh, 8088 and 8086 Microprocessors: Programming, Interfacing, Software Hardware and Applications, Pearson Education, 4th Edition, 2000.

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

- CCE - I : 10 Marks: Home Assignment
- CCE - II: 10 Marks: Short and long answer questions test
- CCE -III: 10 Marks: Multiple choice question 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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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - III
	Type: Major DSC P (III)	Marks: 50
	Credits: 2	From: A. Y. 2025-26
	Name of the Course: BEP233, Experimental Studies of Analog Circuit Design and Microprocessor Programming Lab (Hardware and Software)	

Course Objectives: Students will able to...

- 1) explain the working principles of RC circuits used as differentiators, integrators, high-pass filters, and low-pass filters.
- 2) examine the operation and characteristics of multivibrators and oscillators, including phase-shift and Hartley oscillators.
- 3) develop circuits using IC 555 timers for specific timing and waveform-generation applications.
- 4) analyze the performance of clipping and clamping circuits under different input conditions and relate their applications to waveform shaping.

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

- 1) identify components and connections in RC circuits, multivibrators, and oscillators based on their operating principles.
- 2) evaluate the characteristics of different oscillator and multivibrator configurations for specific applications.
- 3) construct waveform-generating and signal-conditioning circuits by integrating fundamental concepts to address practical requirements.
- 4) demonstrate the operation of clipping, clamping, and waveform-generating circuits through practical experimentation.

Sr. No	Title and Contents (Any 15)	Hrs.
1	Study RC circuit as differentiator and High pass filter.	60
2	Study RC circuit as an integrator and Low pass filter.	
3	Study of clipping and clamping circuits.	
4	Design transistorized astable multivibrator.	
5	Study transistorized bistable multivibrator.	
6	Study IC 555 Timer Application	
7	Study IC 555 Square wave generator Application	
8	Miller sweep generator	
9	To Study of Phase Shift Oscillator	
10	To Study of Hartley Oscillator	
11	Addition and subtraction of numbers	
12	Multiplication by repeated addition	
13	Division by repeated subtraction.	
14	Study of Logical Instructions	
15	Use of Rotate instructions	

16	Arrange an array of data in ascending order	
17	Arrange an array of data in descending order	
18	Find largest number in an array of data	
19	Find smallest number in an array of data	
20	Program to transfer data block / Exchange data block	

Reference Books :-

- 1) R. S. Sedha, A Textbook of Wave-Shaping Circuits and 555 Timers, S. Chand & Co., 3rd Multicolour Edition, 2018.
- 2) D. Roy Choudhuri, Linear Integrated Circuits, 5th Multicolour Edition, 2018.
- 3) M. L. Soni, A Course in Circuit Analysis, Dhanpat Rai Publications, 4th Edition, 2016.
- 4) Allen Mottershead, Electronic Devices and Circuits: An Introduction, 11th Edition, 2015.
- 5) W. Stallings, Computer Organization and Architecture: Designing for Performance, Prentice Hall of India, 8th Edition, 2009.
- 6) D. V. Hall, Microprocessors and Interfacing, Tata McGraw-Hill, Revised 2nd Edition, 2005.
- 7) Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications, Wiley Eastern Ltd., 2nd Edition, 2002.
- 8) K. Udaya Kumar and B. S. Uma Shankar, The 8085 Microprocessor: Architecture, Programming, and Interfacing, Pearson Education, 2001.
- 9) Walter Triebel and Avtar A. Singh, 8088 and 8086 Microprocessors: Programming, Interfacing, Software Hardware and Applications, Pearson Education, 4th Edition, 2000.

Evaluation Pattern: 60:40

Total Marks: 50

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

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Attempt questions
(one questions of 15 Marks)
- Section II: Attempt questions
(one questions of 15 Marks)

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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - III
	Type: Minor DSC V	Marks: 50
	Credits: 2	From: A. Y. 2025-26
Name of the Course: BET 234, Wave-Shaping Circuits and Timer IC		
Course Objectives: Students will able to... 1) identify the concepts and principles of linear and nonlinear wave-shaping circuits, including differentiators, integrators, clippers and clampers. 2) explain the working principles and characteristics of BJT switching circuits, including multivibrators and transistor switching times. 3) implement the design and analysis of sweep generators, including voltage and current time-base circuits, for practical applications. 4) evaluate the functionality of IC 555 timers and PLL IC 565 for signal processing applications, such as multivibrators, pulse width modulation, and frequency shift keying.		
Course Outcomes: The students should be able to... 1) recall the theoretical principles of wave-shaping circuits and their response to different input waveforms. 2) illustrate the operation of multivibrators and transistor-based circuits with appropriate timing equations and diagrams. 3) solve numerical problems and design practical circuits for wave shaping, switching, and timing applications using the principles learned. 4) compare and critique the performance of various sweep generators, timers, and phase-locked loops in signal processing scenarios.		
Module	Title and Contents	Hrs.
Module 1:	Wave shaping Circuits 1.1. Linear wave shaping circuits: Differentiator - High pass R-C circuits, Response to triangular input & square wave, Numerical problems based designing. Integrator--Low pass R-C circuit –Response to square input & rectangular input, Numerical problems-based designing. 1.2. Nonlinear wave shaping: Clippers: Positive clipper, Negative clipper, Combinational clipper, Clampers: Positive clampers, Negative clampers, Combinational clampers, voltage doublers and triplers, Numerical problems-based designing.	7
Module 2:	BJT Switching Circuits 2.1. Transistor as a switch, Transistor Switching Times. 2.2. Transistorized Multivibrators and its types:- Circuit Diagram, Operation, timing equations & applications of following:- Astable Multivibrator, Monostable Multivibrator, Bistable Multivibrator, Schmitt Trigger, Numerical problems based on timing equations.	9

Module 3:	Sweep Generators 3.1. Voltage time base generator: Exponential sweep circuit, Transistor switch sweep generator, UJT switch sweep generator, Miller sweep generator, Bootstrap sweep generator 3.2. Current sweep generator: - Transistorized	7
Module 4:	Timer IC and its applications 4.1. Timer IC555: Features, Pin Diagram, Block Diagram, 4.2. Applications: Astable Multivibrator, Monostable Multivibrator, PWM, PAM, PPM, FSK 4.3. PLL IC 565: Introduction Block diagram, Pin diagram	7
Reference Books :- 1) R. S. Sedha, A Textbook of Wave-Shaping Circuits and 555 Timers, S. Chand & Co., 3rd Multicolour Edition, 2018. 2) D. Roy Choudhuri, Linear Integrated Circuits, 5 th Multicolour Edition, 2018. 3) M. L. Soni, A Course in Circuit Analysis, Dhanpat Rai Publications, 4 th Edition, 2016. 4) Allen Mottershead, Electronic Devices and Circuits: An Introduction, 11 th Edition, 2015. 5) Bernard Grob, Basic Electronics, 8 th Edition, 2010. 6) M. E. Van Valkenburg and Kinariwala, Linear Circuits, 4 th , 1982.		
Evaluation Pattern: 60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): - CCE - I : 10 Marks: Home Assignment - CCE - II: 10 Marks: Short and long answer questions test - CCE -III: 10 Marks: Multiple choice question 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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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - III
	Type: Minor DSC VI	Marks: 50
	Credits: 2	From: A. Y. 2025-26
Name of the Course: BET 235, Microcomputer Systems and 8085 Microprocessor		
Course Objectives: Students will able to... - recall the fundamental components of a microcomputer, including CPU, memory organization, I/O devices, and addressing techniques. - explain the architecture and functionality of the 8085 microprocessor, including its block diagram, pin diagram, and internal structure. - develop and implement assembly language programs for data transfer, arithmetic operations, and control instructions using the 8085-instruction set. - examine interfacing techniques for 8085 microprocessor applications and peripheral devices.		
Course Outcomes: The students should be able to... - describe and differentiate the roles of key microcomputer components and their interactions within the system. - explain the architecture and functioning of the 8085 microprocessors - write and analyze assembly language programs for the 8085-microprocessor using appropriate addressing modes, instructions, and control flow mechanisms. - apply knowledge of programmable peripheral interfaces and interrupt controllers in designing simple microcomputer systems.		
Module	Title and Contents	Hrs.
Module -1:	Microcomputer Organization 1.1. Basic components of microcomputer: CPU, ALU, 1.2. Memory System: Program memory, Data memory, Data Storage (Type of RAM and ROM), Memory organization and addressing, Memory Map, memory hierarchy, registers, internal and external memory, and concept of Virtual Memory, I/O devices, input, and output ports 1.3. Types of I/O Addressing: I/o Mapped I /O and memory mapped I/O).	6
Module -2:	8085 Microprocessor Architecture 2.1. Main features of 8085. Block diagram and Pin-out diagram of 8085. 2.2. Bus structure: Data, address, and control buses. 2.3. Registers: Registers, ALU, Stack memory, Program counter, Flag register.	10
Module -3:	Assembly Language programming 8085 3.1. Instruction classification, addressing modes of Instructions, Instruction set (Data transfer, Arithmetic, logical, branch, and control instructions). 3.2. Timing and Control circuitry: Machine Cycle, Instruction Cycle, Timing states. Instruction cycle, Timing diagram of MOV and MVI. 3.3. Interrupts: Hardware and software	7

Module -4:	Programming of 8085 4.1. Subroutines, delay loops Programs for: Addition, Subtraction, multiplication, Division, Block transfer. 4.2. Introduction of interfacing ICs (Qualitative only): Programmable Peripheral Interface: Intel 8155, 8253, 8255. 4.3. programmable Interrupt Controller: Intel 8259.	7
Reference Books :- 1) W. Stallings, Computer Organization and Architecture: Designing for Performance, Prentice Hall of India, 8 th Edition, 2009. 2) D. V. Hall, Microprocessors and Interfacing, Tata McGraw-Hill, Revised 2 nd Edition, 2005. 3) Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications, Wiley Eastern Ltd., 2nd Edition, 2002. 4) P. K. Ghosh and P. R. Sridhar, 0000 to 8085 Microprocessor, John Wiley and Sons, 2 nd Edition, 2002. 5) K. Udaya Kumar and B. S. Uma Shankar, The 8085 Microprocessor: Architecture, Programming, and Interfacing, Pearson Education, 2001. 6) Walter Triebel and Avtar A. Singh, 8088 and 8086 Microprocessors: Programming, Interfacing, Software Hardware and Applications, Pearson Education, 4 th Edition, 2000.		
Evaluation Pattern: 60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): - CCE - I : 10 Marks: Home Assignment - CCE - II: 10 Marks: Short and long answer questions test - CCE -III: 10 Marks: Multiple choice question 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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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - III
	Type: Minor DSC P (III)	Marks: 50
	Credits: 2	From: A. Y. 2025-26
	Name of the Course: BEP236, Wave-Shaping & Microprocessor Lab (Hardware and Software)	

Course Objectives: Students will able to...

- 1) analyze the behavior of RC circuits when used as differentiators, integrators, high-pass, and low-pass filters.
- 2) design multivibrators (astable and bistable) and waveform generators using transistors and IC 555.
- 3) evaluate the operation of various oscillator circuits, including the Miller sweep generator, Phase Shift, and Hartley oscillators.
- 4) apply logical, rotate, and arithmetic instructions to perform operations such as addition, subtraction, multiplication, and division.

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

- 1) explain the function of RC circuits in signal processing applications such as filtering and differentiation.
- 2) construct transistorized multivibrators and IC 555-based waveform generators for timing and signal generation applications.
- 3) compare different oscillator circuits based on their frequency stability and applications.
- 4) implement logical and arithmetic operations in assembly language for basic computational tasks.

Sr. No	Title and Contents (Any 15)	Hrs.
1	Study RC circuit as differentiator and High pass filter.	60
2	Study RC circuit as an integrator and Low pass filter.	
3	Study of clipping and clamping circuits.	
4	Design transistorized astable multivibrator.	
5	Study transistorized bistable multivibrator.	
6	Study IC 555 Timer Application	
7	Study IC 555 Square wave generator Application	
8	Miller sweep generator	
9	To Study of Phase Shift Oscillator	
10	To Study of Hartley Oscillator	
11	Addition and subtraction of numbers	
12	Multiplication by repeated addition	
13	Division by repeated subtraction.	
14	Study of Logical Instructions	
15	Use of Rotate instructions	
16	Arrange an array of data in ascending order	

17	Arrange an array of data in descending order
18	Find largest number in an array of data
19	Find smallest number in an array of data.
20	Program to transfer data block / Exchange data block.
Reference Books:- 1) A Text Book of Wave-Shaping Circuits and 555 Timers-R. S. Sedha (S. Chand & Co), Multicolour Edition 3/e, 2018 2) Linear Integrated Circuits-D Roy Choudhari, 5th Multicolour Edition, 2018. 3) Electronics Devices and Circuits: An Introduction- Allen mottershed, 11th Edition 2015. 4) A Course in Circuit Analysis- M.L. Soni, 4th Edition, Dhanpat Rai Publications, 2016. 5) W. Stallings, Computer Organization and Architecture: Designing for Performance, Prentice Hall of India, 8 th Edition, 2009. 6) D. V. Hall, Microprocessors and Interfacing, Tata McGraw-Hill, Revised 2 nd Edition, 2005. 7) Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications, Wiley Eastern Ltd., 2nd Edition, 2002.	
Evaluation Pattern: 60:40	
Total Marks: 50	
Journal, Students' Performance Viva, Project (20 Marks): - Journal1: 10 Marks - Students' Performance: 05 Marks - Viva: 05 Marks	Practical Exam Paper (30 Marks): - Section I: Attempt questions (one questions of 15 Marks) - Section II: Attempt questions (one questions of 15 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 - III	
	Type: VSC Practical	Marks: 50	
	Credits:2	From: A. Y. 2025-26	
	Name of the Course: BEPVSC 1, Electronics Technical Writing, Documentation and Presentation Essentials Skill		
Course Objectives: Students will able to...			
1) demonstrate proficiency in Microsoft Word, Excel, and PowerPoint by applying advanced formatting, data visualization, and automation techniques. 2) analyze and structure professional documents, reports, and presentations using Microsoft Office tools to enhance readability, collaboration, and automation. 3) create interactive and data-driven solutions using Excel functions, PivotTables, and Power Query for informed decision-making and data analysis. 4) evaluate the effectiveness of various document formatting, spreadsheet modeling, and presentation techniques for professional and academic use.			
Course Outcomes: The students should be able to...			
1) apply advanced formatting and layout features in Microsoft Word to create professional reports, research papers, and business documents. 2) develop structured and indexed documents by incorporating Table of Contents, citations, bibliographies, and cross-referencing tools. 3) utilize Excel formulas, functions, and data validation techniques to efficiently manage and analyze large datasets. 4) construct dashboards, PivotTables, and automated reports in Excel for business intelligence and decision making.			
	Sr. No	Title and List of Practical (Any 15)	Hrs
		Microsoft Word	
	1	Document Creation, Advanced Formatting & Document Design: Create and format professional documents using fonts, paragraphs, lists, page layouts, sections, columns, headers, footers, styles, cover pages, and themes.	60
	2	Table of Contents, Index & Cross-Referencing: Create and format tables, lists, page numbers, footnotes, automatic tables of contents, indexes, bookmarks, hyperlinks, and cross-references.	
	3	Citations, Footnotes & Bibliographies: Insert and manage citations and footnotes in styles such as APA and IEEE and generate a formatted bibliography.	
	4	Collaboration & Track Changes: Collaborate on documents by using comments, track changes, version comparison, co-authoring, document protection, and accepting or rejecting edits.	
	5	Mail Merge & Automating Letters: Create personalized letters, labels, and envelopes using Mail Merge with Excel data and conditional fields.	
	6	Forms & Interactive Documents: Create interactive fillable forms using text fields, checkboxes, dropdowns, and macros for basic automation.	

7	Project, Thesis & Research Paper Formatting: Format professional research documents, projects, and theses using headings, chapters, figures, tables, equations, appendices, and references.
	Microsoft Excel
8	Data Entry, Validation & Formatting: Enter, format, and validate numeric, text, and date data using appropriate cell, row, column, currency, percentage, and date formats.
9	Conditional Formatting for Reports: Apply conditional formatting, sorting, filtering, and built-in Excel tools to analyze and present data effectively.
10	Functions & Formulas Masterclass: Use mathematical, statistical, logical, and lookup functions such as SUM, AVERAGE, IF, IFERROR, VLOOKUP, HLOOKUP, and XLOOKUP to perform data calculations.
11	Pivot Tables & Data Analysis: Create and analyze PivotTables using filters, slicers, calculated fields, and PivotCharts to summarize datasets.
12	Charts & Data Visualization: Create and customize pie, bar, scatter, and combination charts to present data effectively in reports.
13	Financial Modeling & Forecasting: Develop financial projection models using formulas and What-If Analysis tools such as Goal Seek and Scenario Manager.
14	Macros & VBA Automation: Record, edit, and create basic VBA macros to automate repetitive Excel tasks.
15	Dashboard Creation: Create interactive Excel dashboards using charts, slicers, linked datasets, and summarized insights.
16	Data Cleaning & Power Query: Clean, transform, and import datasets using duplicate removal, Text to Columns, Flash Fill, and Power Query.
	Microsoft PowerPoint
17	Slide Design & Layouts: Design professional presentations using templates, layouts, text boxes, shapes, images, multimedia, SmartArt, charts, and consistent formatting.
18	Animations, Slide Transitions & Action Buttons: Create interactive presentations using slide transitions, animations, customized timing, hyperlinks, and action buttons.
19	Creating Infographics & Charts: Design informative infographics, Gantt charts, flowcharts, process diagrams, and graphical presentations using PowerPoint tools.
20	Preparing & Sharing Presentations: Prepare, export, collaborate on, and share professional presentations in PDF, video, and cloud-based formats using OneDrive.
Reference Books:-	
1) Lambert, Joan. Microsoft Word Step by Step. Redmond, WA: Microsoft Press, 2021. 2) Murray, Katherine, and Microsoft. Microsoft Word 2019 Inside Out. Redmond, WA: Microsoft Press, 2018. 3) Jelen, Bill, and Michael Alexander. Microsoft Excel 2019 Pivot Table Data Crunching. Indianapolis, IN: Pearson Education, 2019. 4) Frye, Curtis D. Microsoft Excel Step by Step. Redmond, WA: Microsoft Press, 2021. 5) Yuschik, Brian. Mastering VBA for Microsoft Office 365. Indianapolis, IN: Wiley, 2021.	
Evaluation Pattern:60:40	
Total Marks: 50	
Journal, Students' Performance Viva, (20 Marks): - Journal: 10 Marks - Students' Performance: 05 Marks - Viva: 05 Marks	Practical Exam Paper (30 Marks): Attempt any three questions (Three questions of 10 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 - III
	Type: SEC Practical	Marks: 50
	Credits:2	From: A. Y. 2025-26
Name of the Course: BEPSEC, Scientific Programming Skills for Electronics Lab		
Course Objectives: Students will able to... 1) demonstrate the ability to write, execute, and debug basic C programs using functions like printf() and scanf () to solve practical electronic problems. 2) implement programs using variables and data types for real-world electronics problems, ensuring correct data handling with precision and formatting. 3) utilize basic input/output operations in C to receive user input, perform calculations, and display results in appropriate formats for electronics applications. 4) implement conditional statements and loops to model decision-making and iterative processes in electronic systems.		
Course Outcomes: The students should be able to... 1) create simple C programs that calculate basic electrical properties such as resistance, frequency, and signal calculations, demonstrating the application of basic programming concepts. 2) apply various data types, correctly initializing and processing variables to calculate and display essential electrical parameters, such as time constants and sensor data. 3) write programs that accept and process user input for variables like voltage, current, resistance, and ADC readings, and display them in a clear, formatted manner using proper units. 4) develop programs that use if-else and else-if statements to control hardware like fans and voltage monitors, as well as loops for tasks like controlling motor speed or managing LED blink patterns.		
Sr. No	Title and List of Practical (Any 15)	Hrs.
1	Write and execute a simple C program to print "Hello, World!"	60
2	Write a C program to calculate the equivalent resistance of two resistors in series and parallel and determine the frequency of an AC input signal.	
3	Write a C program to declare, initialize, accept, and display temperature, humidity, and pressure values using appropriate data types and printf() format specifiers.	
4	Write a C program to calculate and display the time constant (τ) of an RC circuit using appropriate data types, user input, and the formula $\tau = R \times C$.	
5	Write a C program to calculate the missing voltage, current, or resistance using Ohm's Law ($V = I \times R$) based on any two user-provided values and display the result with appropriate units.	
6	Write a C program to convert an ADC reading (0–1023) into voltage using $V = (\text{ADC value} \times 5) / 1023$ and display both values with the voltage formatted to two decimal places.	
7	Write a C program using an if-else statement to control fan operation based on the input temperature and display the appropriate fan status and speed.	
8	Write a C program using an else-if ladder to classify the input voltage into appropriate voltage levels and display the corresponding status or warning message.	

9	Write a C program using a for loop to simulate an LED blinking 10 times with 1-second ON and OFF intervals.
10	Write a C program using a while loop to continuously monitor input voltage and adjust the DC motor speed to half or full speed based on whether the voltage is below or above 5V.
11	Write a C program using a while loop to continuously monitor device temperature and display an overheating warning when it exceeds 75°C.
12	Write a C program using nested loops to multiply two 2×2 matrices and display the input and resulting matrices in a formatted output.
13	Write a C program using a reusable function to calculate and display the power consumption of an electronic device using $P = V \times I$.
14	Write a C program using a function prototype to calculate and display resistance using Ohm's Law ($R = V / I$), demonstrating local and global variable scope.
15	Write a C program using recursion to calculate and display the factorial of a given positive integer.
16	Write a C program using a one-dimensional array to store 10 sensor readings, calculate their average, and display the highest and lowest readings with appropriate units.
17	Multi-Dimensional Arrays, Matrix Operations and Introduction to Strings
18	Write a C program using two-dimensional arrays to multiply two 3×3 matrices and display the resulting matrix.
19	Write a C program using strings to store device information, concatenate the device name and model number, and display their lengths using strlen().
20	Write a C program using string manipulation functions to extract and display the type and value of an electronic component from its code.
Reference Books:- 1) King, K.N. C Programming: A Modern Approach. 2nd ed., W.W. Norton & Company, 2008. 2) Prata, Stephen. C Primer Plus. 6th ed., Addison-Wesley, 2013. 3) Deitel, Paul J., and Harvey Deitel. C: How to Program. 8th ed., Pearson, 2015. 4) Schildt, Herbert. C: The Complete Reference. 4th ed., McGraw-Hill Education, 2000. 5) Gaddis, Tony. Starting Out with C++: From Control Structures through Objects. 8th, ed., Pearson, 2014. 6) Kerrisk, Michael. The Linux Programming Interface: A Linux and UNIX System Programming Handbook No Starch Press, 2010. 7) Stevens, Richard W., Stephen A. Rago, and Linus Torvalds. Advanced Programming in the UNIX Environment. 3rd ed., Addison-Wesley, 2013.	
Evaluation Pattern: 60:40	
Total Marks: 50	
Journal, Students' Performance Viva, (20 Marks): • Journal1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	Practical Exam Paper (30 Marks): • Attempt any two questions (Two questions of 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 - III
	Type: IKS II	Marks: 50
	Credits:2	From: A. Y. 2025-26
Name of the Course: BETIKS II, Contribution of Electronics in Indian Knowledge		
Course Objectives: Students will able to... 1) describe the fundamental concepts and principles of Traditional Knowledge Systems. 2) examine the importance, protection, and value of Traditional Knowledge in contemporary society. 3) identify the contributions of Indian scientists to the development of electronics. 4) explore future technological prospects of electronics in innovative applications.		
Course Outcomes: The students should be able to... 1) explain the role and significance of Traditional Knowledge in societal and technological development. 2) analyze the protection mechanisms and economic value of Traditional Knowledge, including the role of government in its preservation. 3) recognize the contributions of Indian scientists to electronics and their impact on modern technologies such as satellite communication and computing. 4) evaluate emerging electronic technologies, their applications, and their potential to drive innovation and digital transformation.		
Module	Title and Contents	Hrs.
Module 1	Introduction to Traditional Knowledge 1.1. Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, 1.2. Indigenous, Knowledge (IK), characteristics. 1.3. traditional knowledge Vs western knowledge.	6
Module 2	Protection of Traditional knowledge 2.1. The need for protecting traditional knowledge Significance of Traditional knowledge Protection, 2.2. The value of Traditional knowledge in the global economy, 2.3. Role of Government to harness Traditional knowledge.	8
Module 3	Introduction to Electronics Knowledge System 3.1. Introduction of Indian Electronics. 3.2. Contribution of Jagdish Chandra Bose in Electronic. 3.3. Satellite communication in India, Param Computer	8
Module 4	Future Prospects 4.1. Enhancing Access and Availability of Resources. 4.2. Impact of New Technologies and Applications. 4.3. Technology Trends, Innovative Approaches, Digital Transformation	8

Reference Books:-

- 1) A.K. Maini and J. Ramamurthy, Making sense of electronics: Understanding discreet components and their applications, Tata McGraw-Hill Education, 2008.
- 2) NitinGautam, Handbook of Electronics Manufacturing Engineering– CRC Press, 2016.
- 3) Charles Harrell, Designing Electronics for Manufacturing and Testability: A Guide to Designing Automated, Cost-Effective Manufacturing and Test Systems, by Wiley, 2015.
- 4) Hamid R. Arabnia, Embedded Systems Design Challenges in the Electronic InTech, 2013.
- 5) Muhammad H. Rashid et al, RF and Microwave Circuit Design Challenges in System Integration and Miniaturization edited by. –CRC Press, 2012.
- 6) Asok Kumar Das and Chandra Shekhar Bose, Artificial Intelligence in Electronics and Communication, Cambridge University Press, 2004.

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

- CCE - I : 10 Marks: Home Assignment
- CCE - II: 10 Marks: Short and long answer questions test
- CCE -III: 10 Marks: Multiple choice question 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 - IV
	Type: Major DSC VII	Marks: 50
	Credits:2	From: A. Y. 2025-26
Name of the Course: BET 241, Operational Amplifier and its Applications		
Course Objectives: Students will able to... 1) explain the fundamental principles, characteristics, and performance parameters of operational amplifiers, including differential amplifiers and ideal op-amp behavior. 2) analyze open-loop and closed-loop op-amp configurations and their applications in inverting, non-inverting, adder, and subtractor circuits. 3) develop practical op-amp circuits such as integrators, differentiators, precision rectifiers, and instrumentation amplifiers. 4) evaluate op-amp-based waveform generators and active filters with respect to their classification, advantages, and real-world applications.		
Course Outcomes: The students should be able to... 1) describe the characteristics, parameters, and ideal and non-ideal behavior of operational amplifiers. 2) construct op-amp circuits using inverting, non-inverting, adder, and subtractor configurations for practical applications. 3) design op-amp circuits such as precision rectifiers, integrators, differentiators, and instrumentation amplifiers for engineering applications. 4) compare waveform generators and active filters based on their performance and suitability for specific applications.		
Module	Title and Contents	Hrs.
Module 1	Basics of Operational Amplifier 1.1 Differential amplifier: - basics, Circuit Diagram and circuit description only: DIBO, DIUO, SIBO, SIUO. 1.4. Ideal Op-amp: Equivalent Circuit, Circuit Symbols and Terminals, Block diagram, Characteristics. 1.4. Op-amp parameters: Input offset voltage, Input offset current, Input bias current, Differential input resistance, Input capacitance, offset voltage adjustment range, input voltage range, CMRR, SVRR, Large signal voltage gain, Output voltage swing, Output resistance, Output short circuit current, supply current, Power consumption, Slew rate 1.4. Op- amp IC- 741: pin diagram and function, Electrical parameters	6
Module 2	Op-Amp Configuration and Feedback Amplifiers 2.1. Open Loop and closed loop configuration of op-amp comparison, Virtual ground, virtual short concept 2.2. Circuit Diagram, operation, Equations and derivation for output: Open loop configuration – Inverting, non inverting, Close loop configuration – Inverting, non inverting, Voltage follower, Inverter (Sign changer), Inverting and non - inverting configuration of Adders (summing amplifier, scaling Amplifier, averaging amplifier), Subtractor.	8

Module 3	Op-Amp Applications 3.1. Circuit Diagram, Operation, Equation and applications: Integrator, Differentiator, Precision Rectifier (Half wave and Full Wave), Voltage to current (V to I) converter, Current to voltage (I to V) converter. 3.2. Three op amp Instrumentation amplifier (Circuit diagram, operation, advantages & application), Inverting & non inverting Voltage comparator, Inverting & Non inverting Zero crossing detector. 3.3. Window comparators (Detector), Schmitt Trigger, Comparison between voltage comparator and Schmitt trigger.	8
Module 4	Waveform Generator and Active filters 4.1. Op- amp as: an astable multivibrator, monostable multivibrator, bistable multivibrator, Triangular waveform generator, Phase shift oscillator using op- amp, Study of waveform generator IC 566 block diagram, pin diagram, simple circuit. 4.2. Active filters: Introduction, Classification of filters, Concept of passive and active filters, Merits and demerits of active filters over passive filters. Qualitative study: - cut off frequency, Pass band, Stop band, center frequency, roll off rate, BW, Q factor. Realistic and ideal response curve of LP, HP, BP, P, notch filters, Order of filter and Need of higher order filter.	8
Reference Books:- 1) Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, Prentice Hall/Pearson Education, 11th Edition, 2015. 2) K. Lal Kishore, Operational Amplifiers and Linear Integrated Circuits, Pearson Education, 2016. 3) R. F. Coughlin and F. F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, Pearson Education, 2001. 4) Jacob Millman and Christos C. Halkias, Integrated Electronics, Tata McGraw-Hill, 2001. 5) Walt Jung, Op Amp Applications, Pearson Education, 2009.		
Evaluation Pattern: 60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): - CCE - I : 10 Marks: Home Assignment - CCE - II: 10 Marks: Short and long answer questions test - CCE -III: 10 Marks: Multiple choice question 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 - IV
	Type: Major DSC VIII	Marks: 50
	Credits: 2	From: A. Y. 2025-26
Name of the Course: BET 242, Fundamentals of 8051 Microcontroller		
Course Objectives: Students will able to... 1) differentiate between microcontrollers and general-purpose microprocessors, including criteria for microcontroller selection and the features of the 8051 family and its variants. 2) examine the internal architecture of the 8051 microcontroller, including its registers, memory organization, I/O ports, and timers/counters. 3) formulate basic embedded-system solutions using the architectural features of the 8051 microcontroller. 4) develop assembly language programs using the 8051 instruction set, addressing modes, arithmetic and logical operations, and control structures.		
Course Outcomes: The students should be able to... 1) describe the key features, specifications, functional blocks, and variants of the 8051-microcontroller family. 2) analyze the architecture and operation of the 8051 components, including the accumulator, PSW, timers, and I/O ports, for basic embedded-system applications. 3) construct assembly language programs using appropriate instructions, addressing modes, and program structures to solve practical embedded-system problems. 4) configure 8051 I/O ports and timers for interfacing external devices such as LEDs and relays and for performing time-sensitive operations.		
Module	Title and Contents	Hrs
Module 1:	8051 microcontrollers 1.1. Introduction: Microcontrollers vs General Purpose Microprocessors. Microcontrollers for Embedded Systems, Criteria for Choosing a microcontroller. 1.2. Overview of 8051 family members and its comparison –8052, 8031, 8751, AT89C51, DS89C4x0	6
Module 2:	8051 Architecture 2.1. 8051 Architecture: Features, Architectural block diagram, 2.2. Accumulator and B register, Program Status Word (PSW) register, Program Counter Register, Data Pointer Register. 2.3. Stack, I/O ports, Timers/Counters, Interrupts. Internal RAM Structure and Code ROM	8
Module 3:	8051 Assembly Language Programming 3.1. Introduction, Structure of Assembly Language, Assembling and Running steps, Assembler directives. 3.2. Program Counter and ROM memory map, 8051 Data types and Directives. 3.2. 8051 addressing modes. 3.3. Instruction set: Arithmetic, Logical, Data transfer, Boolean, Decision making and Branching. subroutine, rules for labels, delay generation simple programs.	8

Module 4:	8051 Programming 4.1. I/O Ports and their functions, Introduction of I/O port, programming, pin out diagram of 8051 microcontroller, I/O port, pins description & their functions, clock and reset. circuit, I/O port 4.2. programming in 8051: Bit manipulation, Interfacing of LED and Relay. 4.3. Introduction to 8051 timers, TMOD, TCON registers, timer modes of operation.	8
Reference Books :- 1) Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Wiley Eastern Limited, 6th Edition, 2013. 2) J. W. Valvano, Embedded Microcomputer Systems: Real-Time Interfacing, Cengage Learning, 2011. 3) K. V. Shibu, Introduction to Embedded Systems, McGraw Hill, 1st Edition, 2009. 4) S. F. Barrett, Embedded Systems: Design & Applications, Pearson Education India, 2008. 5) M. A. Mazidi, J. G. Mazidi, and R. D. McKinlay, The 8051 Microcontroller and Embedded Systems Using Assembly and C, Pearson Education India, 2nd Edition, 2007. 6) Kenneth Ayala, The 8051 Microcontroller, Cengage Learning, 3rd Edition, 2005. 7) Ajay V. Deshmukh, Microcontrollers: Theory and Applications, Tata McGraw-Hill, 2005.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): - CCE - I : 10 Marks: Home Assignment - CCE - II: 10 Marks: Short and long answer questions test - CCE -III: 10 Marks: Multiple choice question 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 - IV
	Type: Major DSC P (IV)	Marks: 50
	Credits: 2	From: A. Y. 2025-26
	Name of the Course: BEP 243, Op-Amp Circuit Design and 8051 Microcontroller Programming Lab (Hardware and Software)	

Course Objectives: Students will able to...

- 1) explain the fundamental applications of operational amplifiers, including comparators, amplifiers, integrators, differentiators, adders, and subtractors.
- 2) design waveform generators, Schmitt triggers, precision rectifiers, and voltage-to-current (V-I) and current-to-voltage (I-V) converters.
- 3) develop 8051 microcontroller programs involving arithmetic and logical operations, data transfer, and stack operations.
- 4) troubleshoot operational amplifier circuits and 8051 microcontroller programs using software simulators and hardware setups.

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

- 1) describe the operating principles of op-amp circuits and 8051 microcontroller-based systems involving arithmetic, logical, and interfacing operations.
- 2) implement op-amp circuits such as amplifiers, waveform generators, and precision rectifiers and execute 8051 programs for arithmetic and logical operations.
- 3) construct practical embedded-system applications by interfacing 8051 microcontrollers with external components such as LEDs, relays, and oscillators.
- 4) debug assembly language programs and operational amplifier circuits using software simulators and real-time hardware techniques.

Sr. No	Title and Contents (Any 15)	Hrs.
1	Study Op-amp comparator and Zero crossing detector.	60
2	Study Op-amp as Inverting amplifier and Non-Inverting amplifier.	
3	Study Op-amp as Integrator and Differentiator.	
4	Study Op-amp as Adder and Subtractor.	
5	Study Schmitt trigger using Op-amp.	
6	Study Phase shift oscillator and Wien bridge oscillator using Op-amp.	
7	Study Astable Multivibrator and Monostable Multivibrator using Op- amp.	
8	Study of Instrumentation amplifier.	
9	Study of Voltage follower and Precision Rectifier using Op-amp.	
10	Study of V to I and I to V converter.	
11	Study of Simulator I: Assembling, Running Program, Compiling for errors and warnings, Converting into Hex file and Debugging.	
12	Study of Arithmetical Operations (Addition, Subtraction, Multiplication and Division).	
13	Study of Logical Operations (AND, OR, XOR, NOT).	
14	Accessing 8051 Stack (Push, Pop, Stack and Bank 1 Conflict).	
15	Data transfer block move and exchange.	

16	Find largest and smallest number.
17	Arrange numbers in ascending order and descending order.
18	Use of timer 0 and timer 1 in mode 1 and 2 to generate time delay.
19	Generating Square wave and triangular wave of given frequency at port pin.
20	Interfacing of LED/RELAY with 8051 microcontroller (Simulation using proteus)

Reference Books :-

- 1) K. Lal Kishore, Operational Amplifiers and Linear Integrated Circuits, Pearson Education, 2016.
- 2) Ramakant Gaikwad, Op-Amps and Linear Integrated Circuits, 11th Edition, 2015.
- 3) Walt Jung, Op Amp Applications, Pearson Education, 2009.
- 4) Raj Kamal, Embedded Systems: Architecture, Programming & Design, Tata McGraw-Hill, 2008.
- 5) M. A. Mazidi, J. G. Mazidi, and R. D. McKinlay, The 8051 Microcontroller and Embedded Systems Using Assembly and C, Pearson Education India, 2nd Edition, 2007.
- 6) Ajay V. Deshmukh, Microcontrollers: Theory and Applications, Tata McGraw-Hill, 2005.
- 7) Kenneth Ayala, The 8051 Microcontroller, Cengage Learning, 3rd Edition, 2005.
- 8) A. P. Malvino, Electronic Principles, Tata McGraw-Hill, 6th Edition, 2003.
- 9) R. S. Gaonkar, Microprocessor Architecture, Programming & Applications with 8085, Prentice Hall, 2002.
- 10) R. F. Coughlin and F. F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, Pearson Education, 2001.
- 11) J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw-Hill, 2001.

Evaluation Pattern: 60:40

Total Marks: 50

Journal, Students' Performance Viva, Project (20 Marks): • Journal1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	Practical Exam Paper (30 Marks): • Section I: Attempt questions (one questions of 15 Marks) • Section II: Attempt questions (one questions of 15 Marks)
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	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 -IV
	Type: Minor DSC VII	Marks: 50
	Credits: 2	From: A. Y. 2025-26
Name of the Course: BET 244, Fundamentals of Operational Amplifiers		
Course Objectives: Students will able to... 1) understand the fundamental principles of operational amplifiers, their characteristics, and their role in analog electronics. 2) analyze the design and operation of linear and non-linear applications of operational amplifiers, including inverting and non-inverting amplifiers, comparators, and rectifiers. 3) evaluate the performance of advanced operational amplifier applications such as instrumentation amplifiers, voltage regulators, and power amplifiers. 4) design and implement various operational amplifier-based circuits for practical applications in signal processing, control systems, and power electronics.		
Course Outcomes: The students should be able to... 1) explain the historical evolution, characteristics, and ideal assumptions of operational amplifiers. 2) apply operational amplifier concepts to design and analyze linear applications such as inverting, noninverting, summing, and difference amplifiers. 3) demonstrate the working of non-linear applications, including comparators, Schmitt triggers, precision rectifiers, and clipping circuits. 4) develop advanced operational amplifier circuits, including instrumentation amplifiers, active filters, and oscillators, for real-world applications.		
Module	Title and Contents	Hrs.
Module 1:	Introduction to Operational Amplifiers 1.1. Introduction: Definition, Role and significance in analog electronics, Basic applications of Op-Amps. 1.2. History and Evolution of Operational Amplifiers: Historical development of OpAmps, Early uses in analog computers, Advancements in technology and modern Op- Amps 1.3. Ideal Op-Amp: Characteristics and Assumptions, op-amp parameters 1.4. Open-Loop vs. Closed-Loop Configuration: Open-loop gain and application in high-gain circuits, Negative feedback in closed-loop operation, Stability considerations in feedback systems	7
Module 2:	Linear Applications of Operational Amplifiers 2.1 Introduction: Overview of linear applications: amplifiers, filters, and more, Role of feedback in linear applications. 2.2 Inverting Amplifier: Circuit Design and Analysis, Inverting amplifier configuration, Gain formula and analysis, Applications. 2.3 Non-Inverting Amplifier: Circuit Design and Analysis, Non-inverting amplifier configuration, Voltage gain and input impedance considerations, Applications. 2.4 Voltage Follower (Buffer): Operation and Applications, Purpose and operation of voltage followers, Applications.	8

	2.5 Summing Amplifier: Circuit design and analysis of summing amplifiers, Applications. 2.6 Difference Amplifier: Circuit Analysis, Applications, and Precision Measurement, Applications. 2.7 Integrator Circuit: Theory, circuit analysis, Applications in Signal Processing, Operation of an integrator circuit, Applications 2.8 Differentiator Circuit: Theory, circuit analysis, Applications.	
Module 3:	Non-Linear Applications of Operational Amplifiers 3.1 Introduction: Overview of non-linear applications, Role of non-linearity in signal processing 3.2 Comparator Circuits: Basics, Hysteresis, and Applications in Digital Logic, operation of comparators. 3.3 Schmitt Trigger: Operation, Hysteresis, and Applications. 3.4 Precision Rectifiers: Half-Wave and Full-Wave Rectifiers Operation, Advantages over conventional diodes, Applications. 3.5 Logarithmic and Antilogarithmic Amplifiers: Working principle of log and antilog amplifiers. 3.6 Clipping and Clamping Circuits: Operation and Applications.	8
Module -4:	Advanced Applications of Operational Amplifiers 4.1 Instrumentation Amplifiers and oscillators: Design and Operation of instrumentation amplifier, and overview of Oscillators Using Op-Amps. 4.2 Voltage Regulators: Operation of voltage regulation using Op-Amps, Applications. 4.3 Power Amplifiers and active filters: Design of power amplifiers using Op-Amps, Applications in audio amplification and power control systems, overview of active filters	7

Reference Books:-

- 1) Bruce Carter, Op Amps for Everyone, Texas Instruments, 2nd Edition, 2020.
- 2) K. Lal Kishore, Operational Amplifiers and Linear Integrated Circuits, Pearson Education, 2016.
- 3) Ramakant Gaikwad, Op-Amps and Linear Integrated Circuits, 11th Edition, 2015.
- 4) Walt Jung, Op Amp Applications, Pearson Education, 2009.
- 5) A. P. Malvino, Electronic Principles, Tata McGraw-Hill, 6th Edition, 2003.
- 6) R. F. Coughlin and F. F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, Pearson Education, 2001.
- 7) J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw-Hill, 2001.

Evaluation Pattern: 60:40

Total Marks: 50

Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Home Assignment • CCE - II: 10 Marks: Short and long answer questions test • CCE -III: 10 Marks: Multiple choice question 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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	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 - IV
	Type: Minor DSC VIII	Marks: 50
	Credits: 2	From: A. Y. 2025-26
Name of the Course: BET 245, Basics of 8051 microcontroller		
Course Objectives: Students will able to... 1) understand the fundamental concepts of microcomputer organization, microcontroller architecture, and the 8051 family. 2) analyze the internal architecture, memory organization, and special features of the 8051 microcontroller. 3) apply the 8051 instruction set and programming techniques for basic operations, data transfer, and control applications. 4) design embedded applications using 8051 microcontroller programming, including interfacing with peripheral devices.		
Course Outcomes: The students should be able to... 1) explain the organization of microcontrollers, the difference between microprocessors and microcontrollers, and the selection criteria for microcontrollers. 2) illustrate the architecture, pin configuration, memory organization, and power-saving features of the 8051 microcontroller. 3) implement 8051 assembly language programs using various instruction sets and addressing modes for arithmetic, logic, and control operations. 4) develop microcontroller-based applications by programming 8051 timers, counters, and parallel ports for real- world interfacing.		
Module	Title and Contents	Hrs.
Module -1:	Introduction and Overview of 8051 family 1.1. Microcomputer Organization: General block diagram of microprocessor and microcontroller, Comparison of Microprocessors and Microcontrollers. 1.2. Types of architectures- Harvard and Von- Neumann, Selection factors of microcontroller (Architecture type, speed, Word size, instruction set, memory, and I/O capability) 1.3. 8051 family members and its comparison –8052, 8031, 8751, AT89C51, DS89C4x0	8
Module -2:	8051 Architecture 2.1. 8051 Architecture: Features, Architectural block diagram, Pin description, Accumulator and B register, PSW, Stack, I/O ports, Timers/Counters, Interrupts 2.2. Memory Organization and Programming model: Internal RAM and ROM 2.3. Special Features of 8051: Power saving options- idle and power Down mode, clock and reset.	8
Module -3:	Instruction set and programming 3.1. Instruction format and addressing modes. 3.2. Data transfer instructions, Logical and rotate instructions, 3.3. Arithmetic instructions, Jump and call instructions, subroutine, delay generation simple programs.	7

Module -4:	Programming of 8051 4.1. Parallel Port- I/O port Structure and its Programming: Interfacing of LED, Relay 4.2. Timer/Counter programming: 8051 timers, TMOD, TCON registers, timer modes of operation. 4.3. Programming timers 0 and 1 (8 bit and 16 bit mode)	7
Reference Books:- 1) Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Wiley Eastern Limited, 6th Edition, 2013. 2) J. W. Valvano, Embedded Microcomputer Systems: Real-Time Interfacing, Cengage Learning, 2011. 3) K. V. Shibu, Introduction to Embedded Systems, McGraw Hill, 1st Edition, 2009. 4) S. F. Barrett, Embedded Systems: Design & Applications, Pearson Education India, 2008. 5) M. A. Mazidi, J. G. Mazidi, and R. D. McKinlay, The 8051 Microcontroller and Embedded Systems Using Assembly and C, Pearson Education India, 2nd Edition, 2007. 6) Kenneth Ayala, The 8051 Microcontroller, Cengage Learning, 3rd Edition, 2005. 7) Ajay V. Deshmukh, Microcontrollers: Theory and Applications, Tata McGraw-Hill, 2005.		
Evaluation Pattern: 60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): - CCE - I : 10 Marks: Home Assignment - CCE - II: 10 Marks: Short and long answer questions test - CCE -III: 10 Marks: Multiple choice question 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 - IV
	Type: Minor DSC P (IV)	Marks: 50
	Credits: 2	From: A. Y. 2025-26
	Name of the Course: BEP 246, Operational amplifier and microcontroller Lab (Hardware and Circuit Simulation Software)	

Course Objectives: Students will able to...

- 1) develop practical circuit designs through conceptual, analytical, and simulation stages.
- 2) examine the scientific and analytical principles associated with operational amplifiers.
- 3) explain the fundamental concepts and applications of operational amplifiers.
- 4) execute the assembly, operation, and debugging of programs for microcontroller-based applications.

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

- 1) design practical circuits through conceptual, analytical, and simulation stages.
- 2) implement operational-amplifier-based applications for specific requirements.
- 3) demonstrate the use of appropriate tools and techniques for professional electronic practices.
- 4) program microcontrollers for performing complex operations in embedded-system applications.

Sr. No	Title and Contents (Any 15)	Hrs.
1	Study Op-amp comparator and Zero crossing detector.	60
2	Study Op-amp as Inverting amplifier and Non Inverting amplifier	
3	Study Op-amp as Integrator and Differentiator.	
4	Study Op-amp as Adder and Subtractor 5) Study Schmitt trigger using Op-amp.	
5	Study Phase shift oscillator and Wien bridge oscillator using Op-amp.	
6	Study Astable Multivibrator and Monostable Multivibrator using Op-amp.	
7	Study of Instrumentation amplifier.	
8	Study of Voltage follower and Precision Rectifier using Op-amp.	
9	Study of V to I and I to V converter.	
10	Study Op-amp comparator and Zero crossing detector.	
11	Study of Simulator I: Assembling, Running Program, Compiling for errors and warnings, Converting into Hex file and Debugging	
12	Study of Arithmetical Operations (Addition, Subtraction, Multiplication and Division)	
13	Study of Logical Operations (AND, OR, XOR, NOT)	
14	Accessing 8051 Stack (Push, Pop, Stack and Bank 1 Conflict)	
15	Data transfer block move and exchange	
16	Find largest and smallest number	
17	Arrange numbers in ascending order and descending order	
18	Use of timer 0 and timer 1 in mode 1 and 2 to generate time delay.	
19	Generating Square wave and triangular wave of given frequency at port pin.	
20	Interfacing of LED/RELAY with 8051 microcontrollers (Simulation using proteus / Hardware)	

Reference Books:-

- 1) K. Lal Kishore, Operational Amplifiers and Linear Integrated Circuits, Pearson Education, 2016.
- 2) Ramakant Gaikwad, Op-Amps and Linear Integrated Circuits, 11th Edition, 2015.
- 3) Walt Jung, Op Amp Applications, Pearson Education, 2009.
- 4) Raj Kamal, Embedded Systems: Architecture, Programming & Design, Tata McGraw-Hill, 2008.
- 5) M. A. Mazidi, J. G. Mazidi, and R. D. McKinlay, The 8051 Microcontroller and Embedded Systems Using Assembly and C, Pearson Education India, 2nd Edition, 2007.
- 6) Ajay V. Deshmukh, Microcontrollers: Theory and Applications, Tata McGraw-Hill, 2005.
- 7) Kenneth Ayala, The 8051 Microcontroller, Cengage Learning, 3rd Edition, 2005.

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

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Attempt questions
(one questions of 15 Marks)
- Section II: Attempt questions
(one questions of 15 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 - IV		
	Type: VSC Practical	Marks: 50		
	Credits: 2	From: A. Y. 2025-26		
	Name of the Course: BEPVSC 2, Advanced Digital Tactics for Electronics Enterprises			
Course Objectives: Students will able to...				
1) develop comprehensive skills in Google Workspace Applications.				
2) learn to organize, store, and manage information effectively using Google apps.				
3) acquire proficiency in Collaboration and Communication Skills.				
4) understand and implement best practices for Security and Privacy Awareness				
Course Outcomes: The students should be able to...				
1) demonstrate proficiency in using Gmail, Google Drive, Google Calendar, and other Google apps for creating, organizing, and sharing information efficiently.				
2) communicate effectively using Google Chat, conduct virtual meetings with Google Meet, and manage collaborative projects in Google Workspace.				
3) demonstrate competence in organizing and managing information using Google Drive, Google Photos, and Google Contacts, ensuring accessibility and data integrity.				
4) apply essential skills for security practices within Google apps, including password management, privacy settings, and data protection measures, contributing to a secure digital environment.				
Sr. No	Title and List of Practical (Any 15)			Hrs.
1	Gmail: Create and manage email filters, labels, advanced searches, offline mode, and keyboard shortcuts for efficient email management.			60
2	Google News: Customize news preferences, explore local and global news, and set alerts for specific topics or keywords.			
3	Google Meet: Schedule and host virtual meetings using screen sharing, recording, and Google Calendar integration.			
4	Google Chat: Create group chats and direct messages and use collaboration features, reactions, emojis, and file sharing.			
5	Google Drive: Create, upload, organize, share, and collaboratively edit files and folders while managing version history and sharing settings.			
6	Google Shopping: Research products, compare prices and reviews, create shopping lists, and explore personalized recommendations and deals.			
7	Google Calendar: Schedule events and appointments, set reminders and notifications, and share calendars to coordinate schedules.			
8	Google Maps: Use navigation and directions, explore Street View and satellite imagery, and contribute reviews, photos, and location updates.			
9	Google Contacts: Manage and organize contacts, synchronize them across devices, and use contact groups with other Google services.			
10	Google Photos: Upload, organize, edit, back up, and share photos and videos using albums and storage features.			
11	Google Classroom: Create and manage virtual classrooms, assignments, submissions, grading, feedback, and online collaboration.			

12	Google Password Manager: Securely store and manage passwords, generate strong passwords, and configure password security settings.
13	Google Play Store: Discover and download apps and digital content, manage updates and subscriptions, and configure Play Store settings.
14	Google Finance: Track stock market performance and financial news, create portfolios, and explore financial charts and investment tools.
15	Google Blogger: Create and manage blogs, customize themes and layouts, and explore blogging tools and analytics.
16	Google Ads: Create and manage advertising campaigns, configure targeting options, analyze performance, and optimize campaigns.
17	Google Travel: Plan trips, explore destinations, arrange flights and hotels, and manage travel itineraries and reservations.
18	Google Arts & Culture: Explore virtual museums, artworks, cultural sites, historical artifacts, and augmented-reality experiences.
19	Google Earth: Explore 3D maps, satellite imagery, geographical information, and landmarks for educational and research purposes.
20	Google Translate: Translate text, websites, and documents using text, voice, and image translation features and explore language-learning tools.

Reference Books: -

- 1) Smith, Jane, Google Workspace Essentials: Mastering Gmail, Drive, Calendar, and Meet, Pearson, 2021.
- 2) Lee, Michelle, Google Meet for Professionals: A Comprehensive Guide to Video Conferencing with Google Meet, Wiley, 2020.
- 3) Garcia, Maria, Google Photos: The Complete Guide to Managing, Organizing, and Sharing Your Photos Online, Peachpit Press, 2020.
- 4) Patel, Ravi, Google Drive Mastery: A Beginner's Guide to Managing Files on Google Drive, Packt Publishing, 2019.
- 5) Thompson, Laura, Google Classroom in the Classroom: A Teacher's Guide to Online Learning with Google Classroom, McGraw-Hill, 2019.
- 6) Williams, David, Google Chat and Collaboration: A Practical Guide to Streamline Communication and Collaboration, Springer, 2018.
- 7) Anderson, Michael, Google Workspace Security and Compliance: A Comprehensive Guide to Data Security in Google Apps, Addison-Wesley Professional, 2018.
- 8) Johnson, Mark, Google Apps for Work: The Ultimate Guide to Google's Productivity Tools, O'Reilly Media, 2017.

Evaluation Pattern: 60:40

Total Marks: 50

Journal, Students' Performance Viva, (20 Marks): • Journal: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	Practical Exam Paper (30 Marks): • Attempt any three questions (Three questions of 10 Marks)
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	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 - III
	Type: SEC Practical	Marks: 50
	Credits:2	From: A. Y. 2025-26
	Name of the Course: BEP SEC2, Advance Scientific programming skills for Electronics	
Course Objectives: Students will able to...		
1) understand basic pointer operations and memory addressing in C.		
2) apply pointer arithmetic and dynamic memory allocation.		
3) analyze the use of structures and unions for data representation.		
4) develop programs using function pointers and callback mechanisms.		
Course Outcomes: The students should be able to...		
1) demonstrate pointer operations and address manipulation.		
2) implement dynamic memory management using malloc, calloc, realloc, and free.		
3) use structures and unions to model real-world data.		
4) utilize function pointers in sorting and modular program design.		
	Title and List of Practical (Any 15)	Hrs.
1	Basic Pointer Operations: Write a C program to use a pointer to access and modify an integer hardware register value and display its original and modified values with memory addresses.	60
2	Basic Pointer Operations: Write a C program to traverse an array of five sensor readings using pointer arithmetic and display each value with its memory address.	
3	Pointers and Arrays: Write a C program to use pointers to traverse an integer array, calculate its sum, display its elements, and reverse the array in place.	
4	Pointers and Arrays: Write a C program to dynamically allocate an integer array of user-defined size, accept and display its elements, and free the allocated memory.	
5	Pointers and Functions: Write a C program to swap two integer values by passing their addresses to a function using pointers and display the values before and after swapping.	
6	Pointers and Functions: Write a C program using a function that dynamically allocates an integer array, returns its pointer, accepts array elements, and frees the allocated memory.	
7	Dynamic Memory Allocation: Write a C program to demonstrate malloc(), calloc(), realloc(), and free() by dynamically managing memory for sensor readings.	
8	Dynamic Memory Allocation: Write a C program to dynamically allocate, initialize, resize, validate, and free memory for a user-defined sensor data array using malloc(), calloc(), and realloc().	
9	Advanced Pointer Concepts: Write a C program to use a double pointer to indirectly modify an integer variable and display its value before and after modification.	
10	Advanced Pointer Concepts: Write a C program to implement a linked list using structures and dynamic memory allocation with functions for insertion, display, and memory deallocation.	
11	Structures in C: Write a C program using a structure to accept and display student information including name, roll number, and marks.	

12	Structures in C: Write a C program using an array of structures to store and display details of multiple employees including name, ID, department, and salary.
13	Nested Structures: Write a C program using nested structures to store and display student information along with street, city, and ZIP code details.
14	Nested Structures and Unions: Write a C program to compare the memory sizes of a structure and union containing the same data types using the sizeof operator.
15	Function Pointers – Basics: Write a C program using function pointers to dynamically perform addition, subtraction, multiplication, or division based on the user's choice.
16	Function Pointers – Basics: Write a C program to implement a calculator using an array of function pointers for basic arithmetic operations.
17	Function Pointers – Callback Mechanism: Write a C program to implement a sorting algorithm using a function pointer as a comparison callback and display the sorted elements.
18	Function Pointers – Callback Mechanism: Write a C program to implement ascending and descending sorting using appropriate comparison functions passed through function pointers.
19	Application of Function Pointers: Write a C program to create a menu-driven system using an array of function pointers for mathematical and file-handling operations.
20	Application of Function Pointers: Write a C program to implement a menu-driven system using function pointers for mathematical calculations, file operations, and system information display.
Reference Books:- 1) Deitel, Paul J. and Harvey Deitel, C: How to Program, Pearson, 8th Edition, 2015. 2) Gaddis, Tony, Starting Out with C++: From Control Structures through Objects, Pearson, 8th Edition, 2014. 3) Prata, Stephen, C Primer Plus, Addison-Wesley, 6th Edition, 2013. 4) Stevens, Richard W., Stephen A. Rago and Linus Torvalds, Advanced Programming in the UNIX Environment, Addison-Wesley, 3rd Edition, 2013. 5) Kerrisk, Michael, The Linux Programming Interface: A Linux and UNIX System Programming Handbook, No Starch Press, Edition not specified, 2010. 6) King, K. N., C Programming: A Modern Approach, W. W. Norton & Company, 2nd Edition, 2008. 7) Robbins, Arnold and Arthur B. Robbins, UNIX Systems Programming: Concurrency, Communication, and Threads, Prentice Hall, Edition not specified, 2003.	
Evaluation Pattern: 60:40	
Total Marks: 25	
Journal, Students' Performance Viva, Project (20 Marks): • Journal1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	Practical Exam Paper (30 Marks): • Attempt any two questions (Two questions of 15 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 - IV
	Type: BETVEC 2	Marks: 50
	Credits:2	From: A. Y. 2025-26
	Name of the Course: BETVEC 2, Electronics for Environmental Awareness	

Course Objectives: Students will able to...

- 1) introduce students to major environmental issues such as pollution, biodiversity loss, and climate change, and their underlying causes.
- 2) familiarize students with key environmental protection laws and ethical responsibilities of citizens toward sustainable living.
- 3) provide knowledge of Sustainable Development Goals (SDGs) and their interrelation with disaster resilience, health, water, and food security.
- 4) explore the role of electronics science and technologies in addressing environmental challenges and achieving sustainability.

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

- 1) identify and explain major environmental problems and their causes, including the role of technology in environmental degradation.
- 2) interpret and apply relevant environmental laws and ethical frameworks in personal and professional contexts.
- 3) analyze how specific Sustainable Development Goals (SDGs) relate to environmental and technological challenges and solutions.
- 4) evaluate and propose sustainable technological solutions, particularly in electronics, for challenges like energy efficiency, e-waste, and climate action.

Module	Title and Contents	Hrs.
Module 1	Environmental issues	10
	1.1 Pollution (Air, Water and Land) 1.2 Fresh-water overuse, 1.3 Natural disasters, 1.4 Fuel and Energy shortage due to overuse, 1.5 Increase in wasteland, 1.6 Biodiversity loss. 1.7 Global warming and climate change (Causes and intensity of the problem). 1.8 role of Electronics science in creation of environmental issues	
Module 2	Environmental laws and ethics	07
	2.1 Environmental Protection Act 2.2 Wildlife Protection Act 2.3 Forest Conservation Act 2.4 Prevention and Control of Pollution Act (Air, water and Land)	

	2.5 From unsustainable to sustainable development 2.6 Responsibilities of an Environmentally aware citizen.	
Module 3	Sustainable Development Goals 3.1. Introduction to Sustainable Development Goals (SDGs) 3.2. Disaster Resilience and Early Warning Systems (SDG 1) 3.3. Agriculture and Food Security (SDG 2) 3.4. Water Management and Environmental Sensor (SDG 6) 3.5. Health Technologies and Well-being (SDG 3) 3.6. Smart Cities and Sustainable Urbanization (SDG 11)	07
Module 4	Role of Electronics Sciences in meeting the sustainable development goals. 4.1. Energy Efficiency and Affordable Clean Energy (SDG 7) 4.2. Information and Communication Technologies (ICT) (SDG 4) 4.3. Sustainable Manufacturing and Responsible Consumption (SDG 12) 4.4. Climate Action and Environmental Monitoring (SDG 13) 4.5. Innovation, Research, and Partnerships for Sustainable Development (SDG 17) 4.6. Circular Economy and Electronics 4.7 E-Waste Management	06
Reference Books:- 1) Cunningham, William P. and Mary Ann Cunningham, Environmental Science: A Global Concern, McGraw-Hill Education, 13th Edition, 2017. 2) Nathanson, Jerry A., Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control, Pearson, 6th Edition, 2015. 3) Rogers, Peter P., Kazi F. Jalal and John A. Boyd, An Introduction to Sustainable Development, Earthscan, 2nd Edition, 2008. 4) Agarwal, R. K., Environmental Laws in India, Prentice Hall of India, Edition not specified, 2006.		
Evaluation Pattern: 60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): - CCE - I : 10 Marks: Home Assignment - CCE - II: 10 Marks: Short and long answer questions test - CCE -III: 10 Marks: Multiple choice question 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