



**Karmaveer Bhaurao Patil University,
Satara**

**Syllabus for
B. Sc. IV Electronics (Honors)**

**Under
Faculty of Science and Technology**

(As per NEP 2020)

With effect from Academic Year 2026-2027

STRUCTURE OF COURSE:

Karmaveer Bhaurao Patil University, Satara

NEP-2020: Credit Framework for UG (B. Sc.) Programme under Faculty of Science and Technology

4th Year UG Honors Degree

w.e.f. 2026-27

Sem (Level)	Courses			OE	VSC/ SEC	AEC/ VEC/ IKS	OJT/ FP/ CEP/ CC/ RP	Total Credits	Degree/ Cum. Cr. MEME
	Course I	Course II	Course III						
	Major Mandatory	Major Elective	-						
SEMVII (6.0)	Major XVII (4) Major XVIII (4) Major XIX (4) Major (P) IX (2)	Major XX (2) (Elect.) Major (P) X (2)	RM I (2) RM (P) I (2)	-	-	-	-	22	UG Honors Degree: 176
SEMVIII (6.0)	Major XXI (4) Major XXII (4) Major XXIII (4) Major (P) XI (2)	Major XXIV (2) (Elect.) Major P XII (2)	-	-	-	-	OJT (4)	22	
Credit	28	08	04					44	
Total	108		16	08	14	16	14	176	

B. Sc. IV Semester VII

Level	Course Code	Title of the Course	Course Category	No. of Lectures Per Week	Credits
6	DSC (Discipline Specific Core)				
	BET471	Foundation of Semiconductor Devices	Theory	4	4
	BET472	Measurement Techniques	Theory	4	4
	BET473	Computer Organization	Theory	4	4
	DSE (Discipline Specific Elective) (any one out of two)				
	BET474	Advanced Digital System Design	Theory	2	2
	BET475	Advances in Digital Communication			
	RM (Research Methodology)				
	BETRM476	Research Methodology	RM	2	2
	Practical				
	BEP477	Practical Course: Lab XIII (Based on BET471, 472, 473)	Practical	4	2
	BEP478	Practical Course: Lab XIV (Based on BET474, 475)	Practical	4	2
	BEPRM479	Practical Course: (Research Methodology)	RM	4	2
Total					22

B. Sc. IV Semester VIII

Level	Course Code	Title of the Course	Course Category	No. of Lectures Per Week	Credits
6	DSC (Discipline Specific Core)				
	BET481	Power Electronics	Theory	4	4
	BET482	Applied Electromagnetics and Microwaves	Theory	4	4
	BET483	8-bit Microcontrollers and Applications	Theory	4	4
	DSE (Discipline Specific Elective) (any one out of two)				
	BET484	HDL and MOS Technology	Theory	2	2
	BET485	Computer Networks			
	Practical				
	BEP486	Practical Course: Lab XV (Based on BET 481, 482, 483)	Practical	4	2
	BEP487	Practical Course: Lab XVI (Based on BET 484, 485)	Practical	4	2
	OJT (On Job Training)				
	BEPOJT488	On Job Training	OJT	8	4
Total					22

Notations (BET xyz):

B: B.Sc., **E:** Electronics, **T:** Theory, **P:** Practical, **x (1 to 4):** Class Year, **yz (71 to 88):** course number, **DSC:** Discipline Specific Core, **DSE:** Discipline Specific Elective

	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 - VII
	Type: DSC	Marks: 100
	Credits: 4	From: A. Y. 2026-27
Name of the Course: BET471: Foundation of Semiconductor Devices		

Course Objectives: Students will be able to:

1. understand crystal structure and bonding in semiconductor materials.
2. explain the principles of quantum and statistical mechanics.
3. analyse the characteristics and behavior of semiconductor devices.
4. describe the theory and operation of diodes, transistors, and FETs.

Course Outcomes: Student should be able to:

1. apply the theory of solids to explain semiconductor behavior.
2. explore quantum and statistical mechanics concepts.
3. demonstrate the physics underlying semiconductor devices.
4. evaluate the characteristics of diodes, transistors, and FETs.

Module	Title and Contents	Hrs.
Module -1:	Theory of Solids 1.1 Crystal structure of solids: Semiconductor materials, types of solids, 1.2 basics of crystallography, space lattice atomic 1.3 bonding, unit cell, Miller indices imperfections and impurities in solids, methods for semiconductor, crystal growth.	(15)
Module -2:	Introduction to Quantum and statistical Mechanics 2.1 Principles of quantum mechanics, Schrodinger wave equation, and Applications of Schrodinger's wave equation for bound state potential problems. 2.2 Introduction to quantum theory of solids: Allowed & forbidden energy bands, electrical conduction in solids, extensions to three dimensions, density of states 2.3 Statistical mechanics: Statistical laws, Fermi-Dirac probability function, the distribution function, and the Fermi energy.	(15)
Module -3:	Physics of Semiconductors 3.1 Semiconductor in equilibrium: Charge carriers in semiconductors, dopant atoms and energy levels, extrinsic semiconductors, Statistics of donors and acceptors, charge neutrality, position of Fermi energy level. 3.2 Carrier transport phenomena: charge, effective mass, state & carrier distributions, Carrier drift, carrier diffusion, graded impurity distribution, resistivity, Hall Effect. 3.3 Non-equilibrium excess carriers in semiconductors: Carrier generation and recombination, characteristics of excess carriers, bipolar transport, quasi-Fermi energy levels, excess carrier lifetime, surface effects	(15)
Module -4:	Basics of Semiconductor Devices	(15)

	4.1 Diode: Junction terminologies, Poisson's equation, built-in potential, depletion approximation, diode equation, Qualitative and Quantitative analysis, Reverse-bias breakdown, avalanching, zener process, C-V characteristics, Transient response. 4.2 BJT: Terminology, electrostatics and performance parameters, Eber-Moll model, two port model, hybrid – pi model, device models in spice, Modern BJT structures –polysilicon emitter BJT, Heterojunction bipolar transistor (HBT) 4.3 FETs: JFET and MESFET - Junction terminologies, characteristics, ac response, spice models 4.4 MOSFET: Fundamentals, Capacitance- voltage characteristics, I-V characteristics, Qualitative Theory of Operation, ID - VD Relationship, ac response, spice models.	
• Reference Books: 1. Neamen, Donald A. Semiconductor Physics and Devices: Basic Principles. 3rd ed. New York: McGraw-Hill, 2003. 2. Pierret, Robert F. Semiconductor Device Fundamentals. Upper Saddle River, NJ: Pearson Education, 2006. 3. Streetman, Ben G., and Sanjay Banerjee. Solid State Electronic Devices. 5th ed. Upper Saddle River, NJ: Prentice Hall, 2006. 4. Sze, S. M., and Kwok K. Ng. Physics of Semiconductor Devices. 3rd ed. Hoboken, NJ: Wiley, 2006. 5. Singh, Jasprit. Semiconductor Devices: Basic Principles. New York: John Wiley & Sons, 2001.		
Evaluation Pattern:60:40		
Total Marks: 100		
Internal Continuous Evaluation (40 Marks): • CCE - I : 20 Marks: • CCE - II: 20 Marks: • CCE III- 20 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc. Note: <i>The best two scores will be considered for final mark entry.</i>	End Semester Examination (60 Marks): • Question -1: Answer the following questions (Six questions of 2 Marks) • Question -2: (Two questions of 6 Marks) • Question -3: (Two questions of 6 Marks) • Question -4: (Two questions of 6 Marks) • Question -5: (Three questions of 4 Marks) • Question -6: (Three questions of 4 Marks) • Question -7 (Three questions of 4 Marks) Note: <i>Question No. 1 is compulsory and Attempt any four questions from question number 2 to 7.</i>	

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	Programme: B.Sc.	Semester - VII
	Type: DSC	Marks: 100
	Credits: 4	From: A. Y. 2026-27
Name of the Course: BET472: Measurement Techniques		
Course Objectives: Students will be able to: 1. understand the configuration and functioning of measuring instruments. 2. explain the performance characteristics of instruments. 3. analyse the working principles of sensors and transducers. 4. relate electronics measurement techniques to other disciplines.		
Course Outcomes: Student should be able to: 1. explore measurement systems and their classification. 2. describe static and dynamic system characteristics. 3. compare various motion measurement methods. 4. apply process parameter measurement techniques.		
Module	Title and Contents	Hrs.
Module -1:	Introduction to Measurement and Measurement Systems 1.1 Definition and significance of measurement, classification of instruments and types of measurement applications, 1.2 elements of an instrument / measurement system, active and passive transducers, analog and digital modes of operation, null and deflection methods, input output configuration of instruments and measurement systems, methods of correction of instruments and measurement systems 1.3 Generalized performance characteristics of instruments: static characteristics and static calibration, meaning of static calibration, true value, basic statistics, least-squares calibration curves, calibration accuracy versus installed accuracy, combination of components errors in overall system accuracy calculations, theory validation by experimental testing	(15)
Module -2:	Static Dynamic Characteristic of Measurement System 2.1 Static sensitivity, linearity, threshold, noise floor, resolution, hysteresis and dead space, scale readability, span, generalized static stiffness and input impedance, loading effect 2.2 Dynamic characteristics: generalized mathematical model of measurement system, operational transfer function, sinusoidal transfer function, zero-order instrument, first order instrument, second order instruments, step response, ramp response, frequency response of first -order instruments and second order instruments 2.3 Errors in measurement: Types of Errors - gross, systematic, environmental errors, systemic errors, computational error, personal error etc.	(15)
Module -3:	Motion Measurement 3.1 Methods of transduction, primary sensing elements and transducers electrical transducers, classification of transducers Motion and dimensional measurement: fundamental standards, relative displacement translational and	(15)

	rotational, calibration, resistive potentiometers, resistance strain gauge, differential transformers, variable–inductance and variable– reluctance pickups, eddy current, non-contacting transducers, capacitance pickups, piezoelectric transducers, digital displacement transducers (translational and rotary encoders), ultrasonic transducers, detailed discussion of strain gauges, LVDT and synchros 3.2 Relative velocity: translational and rotational, calibration, average velocity from measured x and t, tachometer encoder methods, laser based methods, stroboscopic methods, translational– velocity transducers (moving coil and moving magnet pickups) 3.3 Relative acceleration measurements: seismic (absolute) displacement pickups, seismic (absolute) velocity pickups, seismic (absolute) acceleration pickups (accelerometers)	
Module -4:	Process Parameter Measurements 4.1 Force, Torque and Shaft power: standards and calibration, basic methods of, bonded strain gauge, differential transformer, 4.2 piezoelectric, variable reluctance/ FM oscillator digital system, torque measurement on rotating shafts Pressure and Sound Measurement: standards and calibration, dead weight gauges and manometers, low pressure measurement – Mcleod gauge, Knudsen gauge, viscosity, thermal conductivity, ionization, sound level meter, microphone, capacitor microphone Flow measurement: Pitot- static tube, Yaw tube, hot wire and hot film anemometers, 4.3 Laser Doppler anemometer, Gross Volume Flow Rate- rotameter, turbine, ultrasonic flow meter, electromagnetic flow meters Temperature and Heat Measurement Transducers: standards and calibration, bimetallic thermometers, liquid in glass thermometers, 4.4 pressure thermometers, RTD, thermocouples, thermistors, semiconductor based temperature sensors, detailed discussion on basics of thermocouples, laws of thermocouples, cold junction compensation; thermistor types, materials used, application circuits, LM35 Radiation Fundamentals: detectors, optical pyrometers, IR imaging systems, heat flux sensing slug type sensors, Gorden gauge	(15)
• Reference Books: 1. Ernest O. Doebelin and Dhanesh N. Manik, Measurement Systems, Applications and Design, 5th Edition, Tata McGraw Hill.,2007 2. A. K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation by Dhanpat Rai & Co. 2012 3. Kalsi, Electronic Instrumentation, McGraw-Hill Education, 2018 TMH. 4. Cooper and Helfrick, Modern Electronic Instrumentation and Measurements Techniques, PHI,2022 5. M. M. S. Anand, <i>Electronic Instruments and Instrumentation Technology</i>, PHI Learning, New Delhi, 2nd Edition, 2013.		
Evaluation Pattern:60:40		
Total Marks: 100		
Internal Continuous Evaluation (40 Marks): • CCE - I : 20 Marks: • CCE - II: 20 Marks: • CCE III- 20 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project	End Semester Examination (60 Marks): • Question -1: Answer the following questions (Six questions of 2 Marks) • Question -2: (Two questions of 6 Marks) • Question -3: (Two questions of 6 Marks) • Question -4: (Two questions of 6 Marks)	

work.quizzes etc.

Note: *The best two scores will be considered for final mark entry.*

- Question -5: (Three questions of 4 Marks)
- Question -6: (Three questions of 4 Marks)
- Question -7 (Three questions of 4 Marks)

Note: ***Question No. 1 is compulsory and Attempt any four questions from question number 2 to 7.***

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	Programme: B.Sc.	Semester - VII
	Type: DSC	Marks: 100
	Credits: 4	From: A. Y. 2026-27
Name of the Course: BET473: Computer Organization		
Course Objectives: Students will be able to: 1. understand the basics of computer organization. 2. explain fundamental computer architectures. 3. analyse parallel processing concepts in computer organization. 4. describe the implementation of functional blocks in computers.		
Course Outcomes: Student should be able to: 1. explore computer system organization - hardware and software. 2. define computer architecture and its classification. 3. apply architecture classification tools to processor design. 4. implement functional blocks of a computer system.		
Module	Title and Contents	Hrs.
Module -1:	Introduction to Computer Organization 1.1 Computer system organization – hardware and software components 1.2 overview of Operating System, Computer booting process 1.3 Instruction set architectures, Chronology of Microprocessor Development w.r.t. CISC/RISC families, Timeline of POWER PC, Alpha SPARC families. 1.4 Operating system case study: DOS, UNIX.	(15)
Module -2:	Fundamental Architectures 2.1 Defining a Computer Architecture, Von Neumann and Harvard Architectures bus topologies, pipelining, Super pipelining 2.2 Superscalar processors, Very Long Instruction Word (VLIW) architectures 2.3 multithreaded processors – super threading, hyperthreading	(15)
Module -3:	Parallel Processors 3.1 Flynn’s taxonomy, SIMD, MIMD and multi-computer approaches. 3.2 Implementation Considerations: memory technologies, Hierarchical Memory Systems, caches, prefetching techniques, virtual memory, pipelining, ternary logic, 3.3 packaging considerations, wafer scale integration.	(15)
Module -4:	Implementation of Functional Units 4.1 Memory Management, Arithmetic Logic Unit, Floating Point Unit, Branch Unit, Vector Unit, Load/Store Unit. 4.2 Development Tools: Microcomputer Development Systems (MDS), In Circuit Emulator (ICE), Assembler, Editors, Logic Analyses.	(15)
• Reference Books: 1. Hamacher, Carl V., Zvonko G. Vranesic, and Safwat G. Zaky. Computer Organization. 5th ed. New York: McGraw-Hill, 2002. 2. Patterson, David A., and John L. Hennessy. Computer Organization and Design: The Hardware/Software Interface. 3rd ed. San Francisco: Morgan Kaufmann, 2007. 3. Stallings, William. Computer Organization and Architecture: Designing for Performance. 8th ed. Upper Saddle River, NJ: Pearson, 2010.		

4. Null, Linda, and Julia Lobur. The Essentials of Computer Organization and Architecture. Sudbury, MA: Jones & Bartlett Publishers, 2003.
5. Pal Chaudhuri, P. Computer Organization and Design. 3rd ed. New Delhi: PHI Learning, 2008.
6. Kernighan, Brian W., and Dennis M. Ritchie. The C Programming Language. 2nd ed. Upper Saddle River, NJ: Prentice Hall, 1988.
7. Kernighan, Brian W., and Rob Pike. *The UNIX Programming Environment*. Upper Saddle River, NJ: Prentice Hall, 1984.

Evaluation Pattern:60:40

Total Marks: 100

Internal Continuous Evaluation (40 Marks):

- CCE - I : 20 Marks:
- CCE - II: 20 Marks:
- CCE III- 20 Marks : Objective

CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc.

Note: *The best two scores will be considered for final mark entry.*

End Semester Examination (60 Marks):

- Question -1: Answer the following questions (Six questions of 2 Marks)
- Question -2: (Two questions of 6 Marks)
- Question -3: (Two questions of 6 Marks)
- Question -4: (Two questions of 6 Marks)
- Question -5: (Three questions of 4 Marks)
- Question -6: (Three questions of 4 Marks)
- Question -7 (Three questions of 4 Marks)

Note: ***Question No. 1 is compulsory and Attempt any four questions from question number 2 to 7.***

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	Programme: B.Sc.	Semester - VII
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BET474 : Advanced Digital System Design		
Course Objectives: Students will be able to: 1. explain key concepts of digital system design. 2. design CMOS-based circuits as a foundation for VLSI technology. 3. analyse and solve problems in digital systems and CMOS design. 4. prepare for industry aptitude tests in VLSI and embedded design.		
Course Outcomes: Student should be able to: 1. understand key concepts of digital system design. 2. explore CMOS-based circuits for VLSI applications. 3. solve digital system design problems. 4. construct and test combinational and sequential logic circuits.		
Module	Title and Contents	Hrs.
Module -1:	Combinational Logic Design 1.1 Decoder Design using Universal Gates: BCD to Binary, BCD to 7 Segment, 3:8 Decoder, 1.2 Concept of Redundant Logic, One-hot encoder, One-Cold Encoder, and its importance, Four, Five Variable K-Map, Variable Reduction in K-Map, Folded K-Map, and Implementation of Logic Functions: using K-Map, using Multiplexor (MUX) ICs. 1.3 Comparison between Decoder and DMUX, Full Adder using DMUX. Designing Logic Gates using MUXs. 1.4 BCD Adder using ICs, Single bit comparator.	(7)
Module -2:	Sequential Logic Design 2.1 Difference between Flip-Flop (F/F) and Latch, F/F Characteristics, F/F Conversions, Race Condition in JK F/F, Excitation table of F/Fs. 2.2 Finite State Machines (FSMs): Moore and Mealy Machine 2.3 Asynchronous Counter Design: 2-bit, 3-bit and 4-bit, Glitches 2.4 Synchronous Counters Design: 2-bit, 3-bit and 4-bit using FSM. Decade Counter Design using FSM. Synchronous Counter design for given state diagram.	(7)
Module -3:	Programmable Logic Devices 3.1 Need of PLD, antifuse, architecture of simple PLD (SPLD)- PAL, PLA, typical combinational and sequential system implementation. 3.2 Complex Programmable Logic Device (CPLD), Types, Difference between SPLDs and CPLDs. 3.3 FPGAs: Architecture study of some popular FPGA families (Ultra Scale architecture), Detailed study of an AMD-Xilinx high end FPGA family, Architecture of Microcontrollers in FPGA (ARM), 3.4 The backend tools, Integrating non-HDL modules: Building macros. Introduction to System on Chip (SOC), Multicore Architecture.	(8)

Module -4:	Memory Architecture 4.1 Memory types, data storage principle, control inputs, and timings applications, Random Access Memories (RAM), Static Ram (SRAM) 4.2 standard architecture, 6 transistor cell diagram, address decoders, timings, Dynamic RAM (DRAM), different DRAM cells, refresh circuits, timings, role of memories in PLD.	(8)
• Reference Books: 1. R. J. Tocci, Digital Systems Principles and Applications, PHI Pvt. Ltd.2004 2. N. G. Palan, Digital Electronics, Technova Publications.,2017 3. John F. Wakerly, Digital Design Principles and Practices Prentice Hall International Edition.1999 4. R. Jacob Baker, Layout, and Simulation, Wiley India, 2008 5. Anantha P. Chandrakasan and Jan M. Rabaey, Digital Integrated Circuits: A design perspective, Prentice Hall publication,1996 6. Douglas A. Pucknell and Kamran Eshraghian, Basic VLSI Design, Prentice Hall Publication,1987		
Evaluation Pattern:60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: • CCE - II: 10 Marks: • CCE III- 10 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc. Note: <i>The best two scores will be considered for final mark entry.</i>		End Semester Examination (30 Marks): • Question -1: Answer the following questions (Five questions of 2 Marks) • Question -2: (Two questions of 5 Marks) • Question -3: (Two questions of 5 Marks) • Question -4: (Two questions of 5 Marks) Note: Question No. 1 is compulsory and Attempt any two questions from question number 2 to 4.

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	Programme: B.Sc.	Semester – VII
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BET475 : Advances in Digital Communication		

Course Objectives: Students will be able to:

1. understand coding techniques for digital communication.
2. explain communication through different channel types.
3. understand spread spectrum signaling techniques.
4. analyse digital communication over fading multipath channels.

Course Outcomes: Student should be able to:

1. explore coding techniques for digital communication.
2. compare digital modulation and spread spectrum techniques.
3. apply coding techniques to design optimum receivers.
4. design modulation and equalization schemes for fading channels.

Module	Title and Contents	Hrs.
Module -1:	Overview of Digital Communication 1.1 Principles, baseband and band-pass digital modulation demodulation schemes. 1.2 Coding techniques: Information measures, Coding techniques for discrete and analog sources. Channel capacity, error detection and correction codes - Linear block codes, cyclic convolutional codes..	(7)
Module -2:	Communication through band limited linear filter channels 2.1 Optimum receiver for channels with ISI and AWGN 2.2 Linear equalization, Decision feedback equalization, Iterative equalization and decoding, Adaptive equalization.	(7)
Module -3:	Spread Spectrum signals for digital communication 3.1 Model of spread spectrum digital communication system, 3.2 Direct sequence spread spectrum (DSSS), Frequency hopped spread spectrum (FHSS), 3.3 CDMA, Time hopping Spread Spectrum (THSS), Synchronization of spread spectrum systems.	(8)
Module -4:	Digital communication through fading multi-path channels 4.1 Characterization of fading multipath channels, 4.2 The effect of signal characteristics on the choice of a channel model, Frequency nonselective, Slowly fading channel, 4.3 Diversity techniques for fading multipath channels, Digital signals over a frequency selective, Slowly fading channel.	(8)

• **Reference Books:**

1. John G. Proakis and Masoud Salehi, "Digital Communications", Tata McGraw Hill, 5th Edition., 2007
2. Bernard Sklar and Pabitra Kumar Ray, "Digital Communications: Fundamentals and Applications", Pearson Education Asia, 2nd Edition. 2001
3. John R. Barry, Edward A. Lee and David G. Messerschmitt, "Digital Communication", Springer 2003,

3rd edition.

4. Andrew J. Viterbi, "CDMA: Principles of Spread Spectrum Communications", Prentice Hall, 2000
5. Haykin, Simon, and Michael Moher. *Communication Systems*. 5th ed. Hoboken, NJ: John Wiley & Sons, 2009.

Evaluation Pattern: 60:40

Total Marks: 50

Internal Continuous Evaluation (20 Marks):

- CCE - I : 10 Marks:
- CCE - II: 10 Marks:
- CCE III- 10 Marks : Objective

CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work, quizzes etc.

Note: *The best two scores will be considered for final mark entry.*

End Semester Examination (30 Marks):

- Question -1: Answer the following questions (Five questions of 2 Marks)
- Question -2: (Two questions of 5 Marks)
- Question -3: (Two questions of 5 Marks)
- Question -4: (Two questions of 5 Marks)

Note: *Question No. 1 is compulsory and Attempt any two questions from question number 2 to 4.*

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	Programme: B.Sc.	Semester – VII
	Type: RM	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BETRM476: Research Methodology		

Course Objectives: Students will be able to:

1. understand the fundamentals of research methodology.
2. explain how to present research in a scientific manner.
3. apply statistical tools used in modern research.
4. relate computational methods to research analysis.

Course Outcomes: Student should be able to:

1. apply measurement, scaling, and data-collection techniques.
2. design a research plan.
3. present research findings in scientific language.
4. analyse research data using computational tools.

Module	Title and Contents	Hrs.
Module -1:	Fundamentals of Research 1.1 Introduction: Meaning, Objectives, Types and Significance of Research, Motivation in Research, Research Approaches, Research Methods vs Methodology, Research and Scientific Method, Research Process, Criteria of Good Research 1.2 Research Problem: Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem 1.3 Research Design: Need for Research Design, Features and Important Concepts Relating to Research Design, Basic Principles of Experimental Designs, Developing Research Plan, Quantitative vs Qualitative study designs, Sampling Design	(7)
Module -2:	Measurement, Scaling Techniques and Methods of Data Collection 2.1 Measurement and Scaling: Measurement in Research, Measurement Scales, Sources of Error in Measurement, Tests for Electronics Measurement, Technique of Developing Measurement Tools, Meaning of Scaling, Scale Classification Bases, Scaling Techniques 2.2 Methods of Data Collection: Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Schedules, Difference between Questionnaires and Schedules, Other Methods of Data Collection, Collection of Secondary Data	(8)
Module -3:	Processing and Analysis of Data 3.1 Processing Operations, Problems in Processing, Elements/Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Asymmetry (Skewness), Measures of Relationship 3.2 Simple Regression Analysis, Multiple Correlation and Regression, Partial Correlation, Association in Case of Attributes, Other Measures	(7)

Module -4:	Interpretation and Report Writing 4.1 Meaning of Interpretation, Technique of Interpretation: Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports 4.2 Ethics and Plagiarism: Seeking consent, Maintaining confidentiality, Ethical issues to consider relating to the researcher Avoiding bias 4.3 Research Application Tools: Latex (Writing Paper, Thesis, Report, Bibliography), BEAMER for presentation	(8)
Reference Books: 1. N. Gurumani, Scientific thesis writing and Paper presentation, (MJP Publishers, Chennai, 2010) 2. C. R. Kothari, Research Methodology; Methods and Techniques, 2nd Ed, (New Age International Publishers, New Delhi, 2004) 3. Irfan Ali Khan and Atiya Khanum, Fundamentals of Biostatistics. 3rd (Ukaaz, Publications, Hyderabad, 2004) 4. Robert R. Sokal and F. James Rohlf, Introduction to Biostatistics, 2nd Ed, (Dover Publications, INC. Mineola, New York, 1969) 5. P.N. Arora, P. K. Malhan, Biostatistics, (Himalaya Publishing House, Mumbai, 2006)		
Evaluation Pattern:60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: • CCE - II: 10 Marks: • CCE III- 10 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc. Note: <i>The best two scores will be considered for final mark entry.</i>	End Semester Examination (30 Marks): • Question -1: Answer the following questions (Five questions of 2 Marks) • Question -2: (Two questions of 5 Marks) • Question -3: (Two questions of 5 Marks) • Question -4: (Two questions of 5 Marks) Note: Question No. 1 is compulsory and Attempt any two questions from question number 2 to 4.	

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	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Electronics		
	Programme: B.Sc.	Semester – VII	
	Type: Practical	Marks: 50	
	Credits: 2	From: A. Y. 2026-27	
Name of the Course: BEP477: Lab XIII: General Electronics Lab (Hardware and Simulation) (Based on BET471, 472, 473 courses)			
Course Objectives: Students will be able to: 1. review types of instruments and measurement systems. 2. study transducers and their response characteristics. 3. understand the design of digital systems. 4. design digital systems for practical applications.			
Course Outcomes: Student should be able to: 1. test and analyse semiconductor devices and circuits. 2. measure and calibrate instruments and transducers. 3. design and verify digital logic circuits. 4. apply computer organization concepts in hardware simulation.			
Section	Title and Contents (Any 15)	Hrs.	
Section -1:	List of Practical 1. Design build and test rms to dc converter for voltage measurement of ac signal 2. Displacement measurement using LVDT, signal conditioning and DPM 3. Temperature measurement using PT100, signal conditioning and DPM 4. Temperature measurement using thermocouple with cold junction compensation 5. To build and test current telemetry (4 to 20 mA) 6. Ultrasonic transmitter and receiver, distance measurement 7. RPM measurement using various methods 8. Design and calibrate light intensity meter using photodiode or LDR and the necessary signal conditioning and display. 9. Study of Strain Measurement using Strain Gauges and Cantilever Assembly 10. Determination of Linear Range of operation of Strain Measurement 11. Two-digit combinational lock 12. Keyboard encoder with latches 13. Traffic light controller 14. Multiplexed display (Bank token / two-digit counter) 15. Bidirectional stepper motor control (Sequence Generator) 16. One digit BCD adder and 8-bit adder / subtractor 17. Object counter (use of MMV, counter) 18. Binary-Gray and Gray-Binary code converter 19. Design build and test IR transmitter and receiver (TSOP1738 or similar) for object detection 20. Hot wire anemometer	(60)	

- **Reference Books:**

1. Ernest O. Doebelin and Dhanesh N Manik, Measurement Systems, Applications and Design,.5th Edition, Tata McGrawHill.2007
2. A.K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation Dhanpat Rai & Co.2005
3. H. S. Kalsi, *Electronic Instrumentation*, 4th Edition, McGraw Hill Education, 2019.
4. Modern Electronic Instrumentation and Measurements Techniques, Cooper and Helfrick, PHI.2022
5. R. J. Tocci, Digital Systems Principles and Applications, PHI Pvt. Ltd.2022
6. N.G. Palan, Digital Electronics, Technova Publications.1997
7. John F. Wakerly, Digital Design Principles and Practices Prentice Hall International Edition 1999

Evaluation Pattern:60:40

Total Marks: 50

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

- Journal1: 10 Marks
- Students' Performance: 10 Marks

Practical Exam Paper (30 Marks):

- Section I: Perform an one Complete experiment
25 M
- Viva:05 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 – VII

Type: Practical

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course: BEP478: Lab XIII: C Programming Lab
(Based on BET474 / BET475 course)

Course Objectives: Students will be able to:

1. understand programming logic and algorithm design.
2. develop skills in writing programs using C.
3. apply control structures and functions to solve problems.
4. debug and test C programs for correctness.

Course Outcomes: Student should be able to:

1. design algorithms and flowcharts for given problems.
2. write and execute C programs using various constructs.
3. apply arrays, functions, and pointers in C programs.
4. debug and analyse program output for accuracy.

Section	Title and Contents (Any 15)	Hrs.
Section -1:	• Basic C Programs. 1. The printf and Scanf functions 2. Use of data types, variables. 3. Expression in C. • Floating Point Operations. 4. Conditional Statements. 5. Program to check whether input alphabet is vowel or not. 6. Program to input no and check even and odd no. 7. Program to display sum of digit. • Looping Structure 8. Program to display factorial of given number. 9. Program to accept no and checks if no is palindrome or not. 10. Program to find sum of first n natural no's. • Functions 11. Write recursive function to print Fibonacci series. 12. Write function to check given no is Armstrong or not. 13. Program to display factorial of given number using recursion. 14. Functions With Argument/non argument and return/no return values. • Array 15. Array Declaration	(60)

	16. Program to print minimum Number between an Array. 17. Program to perform string comparison using C. Pointers 18. Declaration and Initialization of Pointers 19. Accessing String Elements in Pointers. 20. Accessing array Elements using the pointers.	
Reference Books: - Kernighan, Brian W., and Dennis M. Ritchie. <i>The C Programming Language</i>. 2nd ed. Englewood Cliffs, NJ: Prentice Hall, 1988. - Balagurusamy, E. <i>Programming in ANSI C</i>. 8th ed. New Delhi: McGraw Hill Education, 2019. - Gottfried, Byron S. <i>Programming with C</i>. 4th ed. New York: McGraw-Hill, 2018. - Kanetkar, Yashavant P. <i>Let Us C</i>. 17th ed. New Delhi: BPB Publications, 2020. - Prata, Stephen. <i>C Primer Plus</i>. 6th ed. Boston: Addison-Wesley, 2014.		
Evaluation Pattern:60:40		
Total Marks: 50		
Journal, Students' Performance Viva, (20 Marks): - Journa1: 10 Marks - Students' Performance: 10 Marks	Practical Exam Paper (30 Marks): - Section I: Perform an one Complete experiment 25 M - Viva:05 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 – VII	
	Type: Practical	Marks: 50	
	Credits: 2	From: A. Y. 2026-27	
Name of the Course: BEPRM479: Research Methodology (Based on BETRM476 courses)			
Course Objectives: Students will be able to: 1. develop research skills. 2. gain hands-on experience in data handling. 3. understand research tools and ethics. 4. apply scientific reasoning in report writing and presentation.			
Course Outcomes: Student should be able to: 1. design a research proposal with clear objectives and methodology. 2. analyse data using statistical tools. 3. create professional research reports using digital tools. 4. demonstrate research ethics and scientific integrity.			
Section	Title and Contents	Hrs.	
Section -1:	1. Identify a Research Problem from Your Field 2. Comparative Study of Research Approaches 3. Develop a Research Design 4. Sampling Techniques Demonstration 5. Construct a Likert Scale Questionnaire 6. Compare Measurement Scales 7. Observation Method in Data Collection 8. Conduct Structured and Unstructured Interviews 9. Prepare and Distribute a Questionnaire 10. Collect and Analyze Secondary Data 11. Data Coding and Tabulation 12. Calculate Central Tendency Measures 13. Calculate Measures of Dispersion 14. Study Skewness and Kurtosis 15. Perform Simple Regression Analysis 16. Perform Correlation Analysis 17. Interpret Research Results 18. Write a Mini Research Report 19. Demonstrate Report Formatting using LaTeX 20. Ethics and Plagiarism Check	(60)	

• **Reference Books:**

1. N. Gurumani, Scientific thesis writing and Paper presentation, (MJP Publishers, Chennai, 2010)
2. C. R. Kothari, Research Methodology; Methods and Techniques, 2nd Ed, (New Age International Publishers, New Delhi, 2004)
3. Irfan Ali Khan and Atiya Khanum, Fundamentals of Biostatistics. 3rd (Ukaaz, Publications, 2004)
4. Robert R. Sokal and F. James Rohlf, Introduction to Biostatistics, 2nd Ed, (Dover Publications, INC. Mineola, New York, 1969)
5. P.N. Arora, P. K. Malhan, Biostatistics, (Himalaya Publishing House, Mumbai, 2006)

Evaluation Pattern:

Total Marks: 50

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

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

Practical Exam Paper (30 Marks):

- Section I: Perform an one Complete experiment
25 M
- Viva: 05 Marks

B. Sc. IV Semester VIII

Level	Course Code	Title of the Course	Course Category	No. of Lectures Per Week	Credits
6	DSC (Discipline Specific Core)				
	BET481	Power Electronics	Theory	4	4
	BET482	Applied Electromagnetics and Microwaves	Theory	4	4
	BET483	8-bit Microcontrollers and Applications	Theory	4	4
	DSE (Discipline Specific Elective) (any one out of two)				
	BET484	HDL and MOS Technology	Theory	2	2
	BET485	Computer Networks			
	Practical				
	BEP486	Practical Course: Lab XV (Based on BET 481, 482, 483)	Practical	4	2
	BEP487	Practical Course: Lab XVI (Based on BET 484, 485)	Practical	4	2
	OJT (On Job Training)				
	BEPOJT488	On Job Training	OJT	8	4
Total					22

Notations (BET xyz):

B: B.Sc., **E:** Electronics, **T:** Theory, **P:** Practical, **x (1 to 4):** Semester number, **yz (1 to 5):** course number, **DSC:** Discipline Specific Core, **DSE:** Discipline Specific Elective

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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - VIII
	Type: DSC	Marks: 100
	Credits: 4	From: A. Y. 2026-27
Name of the Course: BET481: Power Electronics		
Course Objectives: Students will be able to: 1. understand advanced power electronics circuits. 2. explain the concepts of choppers. 3. apply design principles to inverters. 4. design principles to converters.		
Course Outcomes: Student should be able to: 1. explore chopper design as per end-user requirement. 2. analyse and design a transistorised inverter. 3. evaluate and design a thyristorised inverter. 4. create PWM converters.		
Module	Title and Contents	Hrs.
Module -1:	Basics of Electrical machines 1.1 Introduction to motors, Types of D.C. Motors, BLDC Motors, Torque Speed Characteristics. Types of Induction Motors. 1.2 Construction and Working of Synchronous Machines and Stepper Motors. Interface techniques of Stepper Motor with IBM PCs and Digital Circuits. 1.3 Concept of Full-Step, Half-Step and Micro-stepping in Stepper Motors.	(15)
Module -2:	Choppers 2.1 Introduction and Classification of Choppers, 2.2 Control Strategies: Pulse Width Modulation, Constant Pulse Width Variable Frequency, Current Limit Control, Variable Pulse Width and Frequency. Chopper Configurations Single Quadrant Chopper, Four- Quadrant Chopper. Step- Down and Chopper with Resistive Load. 2.3 Step-Up Chopper. Three-Thyristor Choppers, Resonant Pulse Chopper.	(15)
Module -3:	Transistorized Inverter Circuits 3.1 Half Bridge Inverter: Square Wave Half Bridge Inverter, Quasi-square wave inverter, PWM Inverter, Thyristorized Half Bridge Inverter. 3.2 Push- Pull Inverter, Single-phase bridge inverter with resistive and inductive load, PWM bridge Inverter, three phase inverters. Voltage Control of Single-Phase Inverter. 3.3 SPWM, MPWM, Sinusoidal PWM, Modified Sinusoidal pulse width modulation and Phase displacement control. 3.4 Voltage control of Three Phase inverters.	(15)
Module -4:	Thyristorized Inverters 4.1 Forced commutated thyristor inverters. i.e. Auxillary commutated inverters, Mc Murray commutated inverter, 4.2 Complementary commutated inverters /Mc-Murray Bedford inverter, Current source inverter, Series resonant inverter with unidirectional and bidirectional switches, Parallel	(15)

	4.3 MOSFET: Fundamentals, Capacitance- voltage characteristics, I-V characteristics, Qualitative Theory of Operation, ID - VD Relationship, ac response, spice models. 4.4 resonant inverters, Resonant DC link inverter	
• Reference Books: 1. Sen, P. C. <i>Power Electronics</i>. New Delhi: Tata McGraw-Hill, 2008. 2. Rashid, Muhammad H. <i>Power Electronics: Circuits, Devices, and Applications</i>. 3rd ed. Upper Saddle River, NJ: Pearson/Prentice Hall, 2007. 3. Dubey, G. K., S. R. Doradla, A. Joshi, and R. M. Sinha. <i>Thyristorised Power Controllers</i>. New Delhi: New Age International, 1986. 4. Bose, Bimal K. <i>Modern Power Electronics and AC Drives</i>. Upper Saddle River, NJ: Prentice Hall, 2002. 5. Mohan, Ned, Tore M. Undeland, and William P. Robbins. <i>Power Electronics: Converters, Applications, and Design</i>. 3rd ed. Hoboken, NJ: John Wiley & Sons, 2003.		
Evaluation Pattern:60:40		
Total Marks: 100		
Internal Continuous Evaluation (40 Marks): • CCE - I : 20 Marks: • CCE - II: 21 Marks: • CCE III- 20 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc. Note: <i>The best two scores will be considered for final mark entry.</i>	End Semester Examination (60 Marks): • Question -1: Answer the following questions (Six questions of 2 Marks) • Question -2: (Two questions of 6 Marks) • Question -3: (Two questions of 6 Marks) • Question -4: (Two questions of 6 Marks) • Question -5: (Three questions of 4 Marks) • Question -6: (Three questions of 4 Marks) • Question -7 (Three questions of 4 Marks) Note: <i>Question No. 1 is compulsory and Attempt any four questions from question number 2 to 7.</i>	



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 - VIII

Type: DSC

Marks: 100

Credits: 4

From: A. Y. 2026-27

Name of the Course: BET482: Applied Electromagnetics and Microwaves

Course Objectives: Students will be able to:

1. understand the concepts of electromagnetics.
2. explain the theory of transmission lines and waveguides.
3. analyse various antenna parameters.
4. study methods of microwave generation.

Course Outcomes: Student should be able to:

1. calculate power output and efficiency of microwave tubes.
2. evaluate microwave devices and their characteristics.
3. determine microstrip line characteristics.
4. measure microwave parameters.

Module	Title and Contents	Hrs.
Module -1:	Electromagnetic Waves 1.1 Physical quantities as vectors, gradient, curl, and divergence, rotation operator, covariant and contra-variant vectors, line, surface and volume – integrals, 1.2 Gauss and Stokes theorem complex plane, polar form of complex number, complex functions, Cauchy-Riemann conditions, orthogonal functions and relation with Laplace equation 1.3 Maxwell's equations, continuity equation, electric and magnetic wave equations in time domain and frequency domain, wave propagation in conducting and non-conducting media, skin depth and high frequency propagation, 1.4 boundary conditions at the interface between two mediums, Pointing theorem and its applications.	(15)
Module -2:	Transmission Lines 2.1 Types of transmission lines, microstrip lines, two wire transmission line, transmission line equations for voltages and currents, inductance and capacitance per unit length of two wire and coaxial cable transmission line, 2.2 characteristic impedance, propagation constants, attenuation and phase constants, phase velocity, reflection and transmission coefficients, SWR, line impedance, normalized impedance and admittance, 2.3 Smith chart construction and applications, single stub and double stub matching, 2.4 applications to reflection of EM-waves at interfaces for normal incidence	(15)

Module -3:	Waveguides and Components 3.1 Concept of waveguides, frequency range, relation to transmission lines. 3.2 Rectangular Waveguides: TM and TE Modes, concept of cut-off frequency, guide impedance, phase velocity, guide wavelength for TE and TM modes, 3.3 Applications to TE mode in rectangular waveguide, power losses in rectangular waveguide Circular waveguide introduction only 3.4 Optical Fiber: Principles of Operation and construction, difference between conducting circular waveguide and fiber Different methods of. excitation of TE and TM modes in waveguides Cavity Resonators, Q factor of cavity resonators	(15)
Module -4:	Electromagnetic Radiation 4.1 Potentials of electromagnetic fields, retarded potential, radiation from oscillating dipole, concept of near zone and radiation zone, radiation resistance, role of antenna in exciting different TE, TM modes in wave guides. 4.2 Antenna Parameters: gain, directivity, power, aperture, Friis equation, radiation pattern Application Areas: antenna temperature, Signal to Noise Ratio (SNR), remote sensing, RADAR Equation 4.3 Antenna Types: $\lambda/2$ antenna, antenna arrays, horn antennas, parabolic dish antennas, End fire antenna – Yagi Uda, patch antenna, microstrip antennas EMI and EMC 4.4 Generation of Microwaves: Principle, physical structure and working of -Gunn effect diodes, magnetron oscillator, reflex Klystron oscillator	(15)
Reference Books: - Liao, Samuel Y. <i>Microwave Devices and Circuits</i>. 3rd ed. Upper Saddle River, NJ: Prentice Hall, 2002. - Sadiku, Matthew N. O. <i>Principles of Electromagnetics</i>. New York: Oxford University Press, 2015. - Kraus, John D., and Ronald J. Marhefka. <i>Electromagnetics with Applications</i>. 5th ed. New York: McGraw-Hill, 1999. - Kraus, John D., and Daniel A. Fleisch. <i>Electromagnetics with Applications</i>. 5th ed. New York: McGraw-Hill, 1999. - Pozar, David M. <i>Microwave Engineering</i>. 4th ed. Hoboken, NJ: John Wiley & Sons, 2012.		
Evaluation Pattern:60:40		
Total Marks: 100		
Internal Continuous Evaluation (40 Marks): - CCE - I : 20 Marks: - CCE - II: 20 Marks: - CCE III- 20 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc. Note: <i>The best two scores will be considered for final mark entry.</i>		End Semester Examination (60 Marks): - Question -1: Answer the following questions (Six questions of 2 Marks) - Question -2: (Two questions of 6 Marks) - Question -3: (Two questions of 6 Marks) - Question -4: (Two questions of 6 Marks) - Question -5: (Three questions of 4 Marks) - Question -6: (Three questions of 4 Marks) - Question -7 (Three questions of 4 Marks) Note: <i>Question No. 1 is compulsory and Attempt any four questions from question number 2 to 7.</i>



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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Electronics

Programme: B.Sc.

Semester - VIII

Type: DSC

Marks: 100

Credits: 4

From: A. Y. 2026-27

Name of the Course: BET483: 8-bit Microcontrollers and Applications

Course Objectives: Students will be able to:

1. understand the architecture of 8-bit microcontrollers.
2. learn software techniques for embedding code into systems.
3. explain advanced architectures for embedded systems.
4. perform I/O, timer, counter, and interrupt operations.

Course Outcomes: Student should be able to:

1. explore the architecture of 8-bit microcontrollers.
2. write programs for microcontroller-based applications.
3. design and test embedded systems using microcontrollers.
4. interface real-world devices with microcontrollers.

Module	Title and Contents	Hrs.
Module -1:	8-bit Microcontroller Architecture 1.1 Review of 8051 architectures, on chip peripherals of 8051 1.2 Introduction to PIC microcontrollers, PIC architecture, Concept of pipelining, RISC, I/O ports, timers/counters and other peripherals, memory mapping, Interrupt structure, 1.3 Comparison of PIC with other microcontrollers and microprocessors	(15)
Module -2:	Programming and Interfacing 2.1 Instruction Set: addressing modes, assembly language programming, 2.2 Programs for bit manipulation, generation of delay and wave forms. PWM control etc. Hardware interface for LEDs, 2.3 7segment display, LCD, Keypad, interfacing, dc and stepper motor.	(15)
Module -3:	Introduction to AVR Microcontroller 3.1 Architecture (Atmega16), instruction set, addressing modes, memory organization, timers, PWM, I/O ports, ADC, interrupts, serial communication. 3.2 Basic Assembly Programs: arithmetic, logical, code converter, block data transfer, I/O programming for ADC, timer and I/O ports	(15)

Module -4:	Applications of AVR Microcontroller 4.1 Design of General-Purpose Target Board: reset, oscillator circuit, derivatives of AVR, 4.2 Real world interfacing with the microcontrollers and programming in C for interfacing LED, Seven Segment Display, dot matrix display and LCD displays (text and graphic), keyboard and motors (DC, stepper, and servo), I2C and SPI based RTC, EEPROM, DAC and ADC	(15)
Reference Books: 1. Chuck Helebuyck, Programming PIC microcontrollers with PIC basic, 2003 2. Milan Verle, PIC microcontrollers-programming in basic, 2009 3. Kirk Zurell, C Programming for Embedded Systems, Pearson Education. 2000 4. Mazidi and Naimi, AVR Microcontroller and Embedded Systems using Assembly and C, Pearson education, 2011. 5. Barnett, Larry D. O’Cull and Sarah A. Cox, Delmar, Embedded C Programming and the Atmel AVR, Cengage Learning, 2007. 6. Mazidi, Mckinlay and Causey, PIC Microcontroller and Embedded Systems, Pearson Education. 2008 7. Stephen Kochan, Hayden, Programming in C, Books/Macmillan. 2004		
Evaluation Pattern: 60:40		
Total Marks: 100		
Internal Continuous Evaluation (40 Marks): • CCE - I : 20 Marks: • CCE - II: 20 Marks: • CCE III- 20 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc. Note: <i>The best two scores will be considered for final mark entry.</i>	End Semester Examination (60 Marks): • Question -1: Answer the following questions (Six questions of 2 Marks) • Question -2: (Two questions of 6 Marks) • Question -3: (Two questions of 6 Marks) • Question -4: (Two questions of 6 Marks) • Question -5: (Three questions of 4 Marks) • Question -6: (Three questions of 4 Marks) • Question -7 (Three questions of 4 Marks) Note: <i>Question No. 1 is compulsory and Attempt any four questions from question number 2 to 7.</i>	

	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 - VIII
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BET484: HDL and MOS technology		
Course Objectives: Students will be able to: 1. understand key concepts of digital system design. 2. design CMOS-based circuits for VLSI technology. 3. solve problems in digital systems and CMOS design. 4. Prepare for industry aptitude tests in VLSI/embedded design.		
Course Outcomes: Student should be able to: 1. explore digital system design using HDL. 2. design CMOS-based circuits for VLSI applications. 3. analyse combinational and sequential logic circuits. 4. simulate digital circuits using HDL tools.		
Module	Title and Contents	Hrs.
Module -1:	HDL for Digital System Design 1.1 VERILOG: design flow, EDA tools, data types, modules and ports, operators, 1.2 gate- level modeling, data flow modeling,behavioral modelling, 1.3 tasks and functions, timing and delays, test bench, types of test bench, comparison between VERILOG and VHDL language..	(7)
Module -2:	HDL Simulation and Synthesis 2.1 HDL Flow, The concept of Simulation, Types of simulation, HDL Simulation and Modeling, 2.2 Simulation Vs Synthesis result, The Synthesis Concept, Synthesis of high level constructs, Timing Analysis of Logic circuits, Clock Skew, Clock Jitter, Combinatorial Logic Synthesis, 2.3 State machine synthesis, Efficient coding styles, partitioning for synthesis, Pipelining, Resource sharing, Optimizing arithmetic expressions, 2.4 The Simulation and Synthesis Tools, FPGA synthesis and implementation	(7)
Module -3:	Introduction & foundation of MOS technology 3.1 IC fabrication Process, Introduction to Integrated Circuit Technology, Types of IC's, Custom and semicustom designs, standard cell, gate array, FPGA, CPLD and PLDs, FPGA Design Flow, design center and foundry. 3.2 Moore's law Basic principle of MOS transistor, CMOS logic, Construction of p-MOS and n-MOS, MOS Logic Characteristics, Concept of Feature Size, Comparison between TTL and CMOS Technology, CMOS Series Characteristics, TTL Driving CMOS and CMOS Driving TTL.	(8)
Module -4:	CMOS Based Logic Design 4.1 MOS SPICE model and simulation, CMOS layout: design rules, Transistor layout, 4.2 CMOS inverter, transfer characteristics, Inverter layout, Noise margins, switching characteristics, Propagation Delay, Power Consumption 4.3 Logic Design:Designing CMOS Structure for Logic Gates and for given	(8)

	Boolean Equations, CMOS based combinational circuit design for Decoder Encoder Half Adder and Full Adder. 4.4 Subsystem design, Design styles, design concepts: Hierarchy, Regularity, Modularity, Locality. CMOS Sub system design: Adders, Multipliers.	
• Reference Books: 1. John G. Proakis and Masoud Salehi, “Digital Communications”, Tata McGraw Hill, 5th Edition.2007 2. Bernard Sklar and Pabitra Kumar Ray, “Digital Communications: Fundamentals and Applications”, Pearson Education Asia, 2nd Edition.2009 3. John R. Barry, Edward A. Lee and David G. Messerschmitt, “Digital Communication”, Springer 2003, 3rd edition. 4. Andrew J. Viterbi, “CDMA: Principles of Spread Spectrum Communications”, Prentice Hall,2000		
Evaluation Pattern:60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: • CCE - II: 10 Marks: • CCE III- 10 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc. Note: <i>The best two scores will be considered for final mark entry.</i>	End Semester Examination (30 Marks): • Question -1: Answer the following questions (Five questions of 2 Marks) • Question -2: (Two questions of 5 Marks) • Question -3: (Two questions of 5 Marks) • Question -4: (Two questions of 5 Marks) Note: Question No. 1 is compulsory and Attempt any two questions from question number 2 to 4.	

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	Board of Studies in Electronics	
	Programme: B.Sc.	Semester - VIII
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BET485: Computer Networks		

Course Objectives: Students will be able to:

1. understand the principles of the Linux operating system.
2. explain computer networking topologies.
3. describe the OSI reference model.
4. understand internet addressing schemes.

Course Outcomes: Student should be able to:

1. work with Linux OS and perform shell scripting.
2. explore network topologies and LAN concepts.
3. apply the OSI reference model to network architecture.
4. design various internet protocols.

Module	Title and Contents	Hrs.
Module -1:	UNIX Operating System 1.1 Introduction, applications Unix Shell, Kernel and Application layer, file system features and benefits, 1.2 File Management in utilities: pwd, cd, ls, cat, mv, ln, rm, rmdir, find, cut and paste etc., Internal file structure, Directory and directories used by Unix system, The Shell: Shell commands, 1.3 I/O redirection, pipes and filters, pipe fitting, wildcard, matching background processing, shell script shell variables, shell as programming language, Unix vi editor.	(7)
Module -2:	Computer Networking 2.1 LAN, Cabling and Topologies: Various transmission media, Twisted and untwisted pairs, coaxial cables, fiber-optic cables and characteristics, wireless LAN, 2.2 Cabling Topologies: hierarchical, bus, ring, star, collapsed star, mesh. 2.3 Origin and definition of LAN, types and uses of LAN, LAN components: NIC N/W cables, hubs, and OS, LAN types: MAP, ARCnet, Apple Talk etc., MAN and WAN, repeaters, Bridges, Routers, Gateways, Backbones etc.	(7)
Module -3:	The O. S. I. reference model 3.1 N/W architecture, OSI reference model, data transmission, FDM, TDM, circuit switching, message switching, packet switching, hybrid switching, 3.2 LAN static and dynamic channel allocation, LAN protocols, IEEE standard 802 for LAN, 3.3 comprises of LAN's, The Internet: Introduction, Architecture.	(8)
Module -4:	Internet addresses 4.1 Three primary classes of IP addresses, dotted decimal notation, network, broadcast and loopback address. 4.2 Internet Protocol (IP) – Connectionless Datagram Delivery, Routing, Error and Control Messages.	(8)

	4.3 User Datagram Protocol (UDP): Introduction, Format of UDP Messages, UDP encapsulation, UDP port numbers. Transmission Control Protocol (TCP): Reliability of transmission, ports, connections and endpoints, Concept of sliding windows, TCP segment format, Establishing, closing and resetting a TCP connection, TCP port numbers, ATM Network. 4.4 Applications: Remote Login (TELNET), File transfer (FTP), Electronic Mail, (SMTP), Future of TCP/IP – Ipv6 (introduction)	
• Reference Books: 1. Andrew S. Tanenbaum, Computer Networks, Fourth Edition,2003 2. Behrouz A Forouzan, TCP/IP Protocol Suite, McGraw-hill,2006 3. Brian W. Kernighan, Rob Pike, The UNIX Programming Environment, PHI Learning PVT LTD,2016 4. Pramod Koparkar, UNIX for You, Tata McGraw-Hill,1991		
Evaluation Pattern:60:40		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: • CCE - II:10 Marks: • CCE III- 10 Marks : Objective CCE-I and CCE-II: Class test/Assignments/ Record books/tutorials/Seminars/case studies/ fieldworks/project work.quizzes etc. Note: <i>The best two scores will be considered for final mark entry.</i>	End Semester Examination (30 Marks): • Question -1: Answer the following questions (Six questions of 2 Marks) • Question -2: (Two questions of 5 Marks) • Question -3: (Two questions of 5 Marks) • Question -4: (Two questions of 5 Marks) Note: <i>Question No. 1 is compulsory and Attempt any two questions from question number 2 to 4.</i>	

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	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Electronics		
	Programme: B.Sc.	Semester - VIII	
	Type: Practical	Marks: 50	
	Credits: 2	From: A. Y. 2026-27	
	Name of the Course: Lab XIII: MEP 486: Electronics Design Lab (Hardware and Software Lab) (Based on BET481, 482, 483 courses)		
Course Objectives: Students will be able to: 1. understand advanced power electronics circuits. 2. design choppers, inverters, and converters. 3. study standing wave ratio and reflection coefficients. 4. explain electromagnetic wave propagation and polarization.			
Course Outcomes: Student should be able to: 1. analyse power electronics circuits. 2. determine losses in optical fibers. 3. explore coefficients in waveguides. 4. plot smith charts for transmission lines.			
Section	Title and Contents (Any 15)	Hrs.	
Section -1:	1) To simulate AC voltage control using PSIM simulator 2) To simulate half wave rectifier using PSIM simulator 3) To study PCB Designing 4) To simulate SCR firing circuit using PSIM simulator 5) To study and design series voltage regulator using PSIM software 6) To simulate BUCK regulator circuit using PSIM 7) To simulate BOOST regulator circuit using PSIM 8) TO study and design PCB of IC 555 using PROTEL 9) To study DC motor using chopper 10) To study the ON/OFF using RTD 11) To determine the standing wave ratio and reflection coefficient of a given waveguide 12) To determine a characteristic of a microstrip transmission line 13) Measurement of primary-secondary coupling factor of a given transformer using LCR meter (calculation of transformer model parameters expected) 14) To plot Equipotential contours and field lines for given charge distribution 15) Use of Smith chart for transmission line pattern and verify using C 16) Study of V-I characteristics of Gunn Diode 17) Study of O/P power and freq. as a function of voltage characteristic of Gunn Diode 18) Study of Square wave modulation through PIN diode characteristic of Gunn Diode 19) Study of Attenuator 20) To study the substitution method for attenuation measurement and determine	(60)	

	the attenuation due to a component under test	
• Reference Books: 1. P. C. Sen, Power Electronics, McGraw Hill, 2008 2. C. K. Dubey, S. R. Doradla, A. Joshi & R.M. Sinha, Thyristor power Controllers.1986 3. Power Electronics – By M. Rashid,2007 4. S. B. Dewan, G.R. Sleman, A. Strauphan, Power Semiconductor drives- (Wiley Int. Pub.- John Wiley Sons.)1975 5. John M., Optical Fiber Communication Senior Pearson,2026 6. Subir Kumar Sarkar, Optical Fiber & Fiber Optic Communication, S Chands,2007 7. N. Sadiku, Principles of Electromagnetics, Oxford University Press.2015 8. Kraus and Fleiseh, Electromagnetics with Applications, McGraw Hill, 5th Edn, 1999. 9. J. D. Kraus, Electromagnetics, 4th Edn, McGraw Hill, 1992		
Evaluation Pattern:60:40		
Total Marks: 50		
Journal, Students' Performance Viva, (20 Marks): • Journa1: 10 Marks • Students' Performance: 10 Marks	Practical Exam Paper (30 Marks): • Section I: Perform an one Complete experiment 25 M • Viva:05 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 - VIII
	Type: Practical	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: Lab XIIIIV:MEP 487: General Electronics Lab (Hardware and Simulation) (Based on BET484/485 courses)		
Course Objectives: Students will be able to: 1. learn interfacing techniques using 8-bit microcontrollers. 2. study HDL simulators and their applications. 3. design microcontroller-based interfacing circuits. 4. simulate digital circuits using HDL tools.		
Course Outcomes: Student should be able to: 1. design circuits for microcontroller-based applications. 2. apply microcontroller concepts to real-time applications. 3. develop programs ranging from simple to complex tasks. 4. design HDL descriptions for digital logic circuits.		
Section	Title and Contents (Any 15)	Hrs.
Section -1:	1) Dot matrix rolling display 2) Use of timer for time delay generation 3) LCD / keyboard Interfacing 4) Bidirectional stepper motor interfacing / Stepper motor Interfacing 5) DC motor control using PWM / intensity control of LED 6) Real Time Clock display on LCD / HyperTerminal (I2C) 7) Use of internal EEPROM/ Serial EEPROM / EEPROM interface using SPI protocol 8) DAC interfacing (square wave, staircase, triangular, sine) use of timer 9) On-off controller with hysteresis (ADC) 10) Two-digit frequency counter or event counter using timer / interrupt 11) Design All logic gates with HDL 12) Design 4 bit binary to gray converter with HDL 13) Design Half adder with HDL 14) Design Full adder with HDL 15) Design 4:1 mux with HDL 16) Design 2:4 decoder with HDL 17) Design SR, JK flip flop with HDL 18) Design D, T flip flop with HDL 19) Design 4 bit ring counter with HDL 20) Design 4 bit register with HDL	(60)

- **Reference Books:**

1. Chuck Helebuyck, Programming PIC microcontrollers with PIC basic.2003
2. Milan Verle., PIC microcontrollers-programming in basic.2009
3. Kirk Zurell, C Programming for Embedded Systems, Pearson Education.2000
4. R. J. Tocci, Digital Systems Principles and Applications, PHI Pvt. Ltd.2022
5. N. G. Palan, Digital Electronics, Technova Publications.1997

Evaluation Pattern:60:40

Total Marks: 50

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

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

Practical Exam Paper (30 Marks):

- Section I: Perform an one Complete experiment
25 M
- Viva:05 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 - II
	Type: OJT	Marks: 100
	Credits: 4	From: A. Y. 2026-27
	Name of the Course: BEPOJT488: On Job Training	
Course Objectives: Students will be able to: 1. understand workplace practices and the industry environment. 2. apply academic knowledge to real-world tasks. 3. develop professional and technical skills through hands-on training. 4. explore employability and career opportunities in the field.		
Course Outcomes: Student should be able to: 1. demonstrate workplace skills and professional conduct. 2. apply theoretical knowledge to practical industry tasks. 3. analyse real-world problems encountered during training. 4. prepare a report on the on-job training experience.		
Credits	Title and Contents	Hrs.
	Training Organization: • Government/Semi-Government organizations • Private industries and companies • Start-ups, R&D centres and laboratories • Centres of Excellence and approved organizations Student Rules: 1. Students must complete OJT for the prescribed duration. 2. Minimum attendance shall be as per University/Institute rules. 3. Students must follow the working hours and discipline of the host organization. 4. Students must follow all safety and confidentiality rules. 5. Regular attendance and punctuality are compulsory. 6. Students must maintain a Daily Diary/Logbook. 7. Students must submit a Final OJT Report and give a presentation/viva, if prescribed. 8. Leave/absence must be approved by the Industry Supervisor and Institute Mentor. 9. Students must obtain an OJT Completion Certificate from the organization. Supervision: • One Institute Mentor shall monitor the student's progress. • One Industry Supervisor/Mentor shall guide and evaluate the student. Assessment: • Attendance and discipline • Daily Diary/Logbook • Practical/Technical work • Industry Supervisor's evaluation • Final Report • Presentation/Viva	
2	On Job Training Appreciation by Trainer	(120)
2	On Job Training Reporting On Job Training Presentation	

Evaluation Pattern:60:40	
Total Marks: 100	
Internal Evaluation (40 Marks):	Practical End Semester Exam Paper (60 Marks):