



**Rayat Shikshan Sanstha's**

**Yashwantrao Chavan Institute of Science,Satara (Autonomous)**

**Reaccredited by NAAC (3rdCycle) with 'A+' grade (CGPA 3.57).**

**ISO 9001:2015 Certified**

**Bachelor of Science**

**Part - II**

**ELECTRONICS**

**Syllabus**

**to be implemented w .e. f. June, 2022**

**1. STRUCTURE OF COURSE:****III SEMESTER**

Sr. No.	SUBJECT TITLE	Theory			Practical		
		Course No. & Course Code	No. of lectures per week	Credits	Course No. & Course Code	No. of lectures Per week	Credits
1	Electronics	Course -V: BET301	6	4	Course III: BEP303	8	4
		Course -VI: BET302					

**IV SEMESTER**

Sr. No.	SUBJECT TITLE	Theory			Practical		
		Course No. & Course Code	No. of lectures per week	Credits		No. of lectures Per week	Credits
1	Electronics	Course -V: BET401	6	4	Course Course III: BEP 403	8	4
		Course -VI: BET402					

**Structure and Title of Courses of B. Sc. Course:****\* B. Sc. II Semester III \***

<b>Course Number</b>	<b>Course Code</b>	<b>Course Name</b>
V	BET301	Electronics communication
VI	BET302	Wave-Shaping Circuits and Timer IC
III	BEP303	Electronics communication, Wave-Shaping Circuits and Timer IC Lab (Hardware)

**\* B. Sc. II Semester IV\***

<b>Course Number</b>	<b>Course Code</b>	<b>Course Name</b>
VII	BET401	Operational amplifier and its applications
VIII	BET402	Fundamentals of 8051 microcontroller
IV	BEP403	Operational amplifier and 8051 microcontroller Lab (Hardware and Circuit Simulation Software)

**Semester III**

**Course V: BET 301: Electronics Communication****Course Objectives:** Student will able to...

1. Study of electronic communication system
2. Study and Familiarize with Analog and Digital Communication System.
3. Study of Digital Modulation Technique.
4. Understand basic element and expose working of Multi User Radio Communication Techniques

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BET 301 Electronics communication</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Analog Communication</b>	<b>(14)</b>
	A) Electromagnetic communication spectrum, band designations, usage and applications. B) Noise: External Noise, Internal Noise. C) Introduction to Communication System, Modulation, Types, Need for Modulation, Concept of Demodulation, Theory of Amplitude Modulation, The Concept of Angle Modulation and Its Waveform, Frequency and Phase Modulation D) Comparison between AM, FM and PM.	
<b>UNIT - II</b>	<b>Digital Communication</b>	<b>(08)</b>
	A) Introduction, Frequency Shift Keying (FSK), Amplitude Shift Keying (ASK), Phase Shift Keying (PSK), Concept of Binary Phase Shift Keying to BPSK, 8 PSK, 16 PSK, Quadrature Amplitude modulation (QAM), Quadrature Phase Shift Keying (QPSK) Techniques and its Block Diagram. B) TDM, FDM concepts and its comparison.	

<b>UNIT - III</b>	<b>Advanced Digital Modulation Technique</b>	<b>(11)</b>
	<p>A) Sampling theorem, Nyquist theorem</p> <p>B) Analog pulse Basic Principles-PAM, PWM, PPM, modulation.</p> <p>C) Pulse Code Modulation: Digital Carrier Modulation Techniques, Sampling, Quantizing, Quantization and Encoding, Uniform and Nonuniform Quantization, Quantization Noise, Companding, Coding, Decoding, Regeneration, DPCM, DM, ADM.</p> <p>D) Binary Line Coding Technique, Multi-level coding, QAM (Modulation and Demodulation)</p>	
<b>UNIT - IV</b>	<b>Radio Communication Techniques</b>	<b>(12)</b>
	<p>A) Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency reuse, roaming and hand off, concept of SIM card, GSM and CDMA Technology. Comparative study of GSM and CDMA, 2G, 3G, 4G LTE and 5G concepts.</p> <p>B) Satellite communication: Introduction, need, satellite orbits, advantages and disadvantages, block diagrams of satellite sub systems, TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA,</p> <p>C) Overview of Multiple Access Schemes: GPS, Bluetooth, Wi-Fi and WiMAX.</p>	

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

- 1 Understand basic components of Communication system.
- 2 Illustrate the importance of Analog and Digital communication.
- 3 Apply Digital Modulation Technique.
- 4 Utilize Skills in Radio Communication Technology.

**Reference Books:**

1. Electronic Communication Systems: Fundamentals through Advanced, W.Tomasi,Pearson Education, 6<sup>th</sup> Edition, 2014.
2. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.4<sup>th</sup> edition, 2008.
3. Modern digital and analog Communication systems, B. P. Lathi,Oxford University press, 4<sup>th</sup> Edition 2009
4. Principles of Electronics communication systems, Frenzel,McGraw Hill3rdedition, 2012.
5. Communication Systems, S. Haykin, Wiley India , 2006
6. Electronic Communication systems, G. Kennedy,Tata McGraw Hill. 5<sup>th</sup> edition 2011
7. Electronic Communication system, Roy Blake, Cengage, 5th edition, 2015
8. Communication Systems:, Sanjay Sharma,S.K. Kataria& Sons, 6<sup>th</sup> Edition,2012

**Semester III****Course VI: BET 302: Wave-Shaping Circuits and Timer IC**

**Course Objectives:** Student will able to...

1. Understand Comprehension with wave shaping circuits and its Advantages in electronics systems.
2. Study ability of Analyzing and Designing BJT switching circuit for various application.
3. Study the designing Sweep Generators.
4. Understanding of facts, ideas about Timer IC and its applications.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BET 302 Wave-Shaping Circuits and Timer IC</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Wave shaping Circuits</b>	<b>(11)</b>
	<p>A) Linear wave shaping circuits: Differentiator - High pass R-- C circuits, Response to triangular input &amp; square wave, Numerical problems based designing. Integrator-- Low pass RC circuit –Response to square input &amp; rectangular input, Numerical problems-based designing.</p> <p>B) 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.</p>	
<b>UNIT - II</b>	<b>BJT Switching Circuits</b>	<b>(11)</b>
	<p>A) Transistor as a switch, Transistor Switching Times.</p> <p>B) Transistorized Multivibrators and its types: -Circuit Diagram, Operation, timing equations&amp; applications of following:-, Astable multivibrator, Monostable multivibrator, Bistable Multivibrator, Schmitt Trigger, Numerical problems based on timing Equations.</p>	

<b>UNIT - III</b>	<b>Sweep Generators</b>	<b>(10)</b>
	A) Voltage time base generator: Exponential sweep circuit, Transistor switch sweep generator, UJT switch sweep generator Miller sweep generator, Bootstrap sweep generator B) Current sweep generator: - Transistorized	
<b>UNIT - IV</b>	<b>Timer IC and its applications</b>	<b>(13)</b>
	A) Timer IC555: Features, Pin Diagram, Block Diagram, B) Applications: Astable Multivibrator, Monostable Multivibrator, PWM, PAM, PPM, FSK C) PLL IC 565: Introduction Block diagram, Pin diagram.	

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

- 1 Design various wave shaping circuits for different applications.
- 2 Utilize transistor as a switch for Wave-Shaping Circuits.
- 3 Analyze sweep generators in electronics circuits.
- 4 Utilize Timer IC applications

**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, 5<sup>th</sup>Multicolour Edition, 2018
4. Basic Electronics- Bernard Grob, 8<sup>th</sup> Edition 2010
5. Electronics Devices and Circuits: An Introduction- Allen mottershed, 11<sup>th</sup> Edition 2015
6. A Course in Circuit Analysis- M.L. Soni, 4<sup>th</sup> Edition, Dhanpat RaiPublications,2016
7. Linear Circuits- M. E. Valkenburg an Kinariwala, 1982



**Semester III****Practical III: BEP303: Electronics Communication and Wave-Shaping Circuits and Timer IC Lab (Hardware)****Course Objectives:** Student will able to...

1. Understand and relate concepts learned in classroom to the real-world situations
2. Study ability of designing practical circuits through conceptual, analytical stages.
3. Study of scientific, analytical skills about Electronics communication.
4. Understand and design wave shaping circuits, Multivibrators, sweep generators.
5. Study and design and develop applications of Timer IC.

<b>Credits (Total Credits 4)</b>	<b>Semester III Practical III BEP303: Electronics Communication and Wave-Shaping Circuits and Timer IC Lab (Hardware)</b>		<b>No. of hours per (60)</b>
	<b>Group A</b>		
	1	Study of DSO	
	2	Study of Amplitude Modulator and demodulator	
	3	Study of FM – Modulator and Demodulator	
	4	Study Pulse Amplitude Modulation (PAM)	
	5	Study Pulse Width Modulation (PWM)	
	6	Study Pulse Position Modulation (PPM)	
	7	Study of RF tuned amplifier	
	8	Study of Amplitude Shift Keying	
	9	Study of Frequency Shift Keying	
	10	Study of TDM, FDM	
	11	Study of DM, ADM	
	12	Study of Satellite Communication System.	
	<b>Group B</b>		
	1	Study RC circuit as differentiator and High pass filter.	
	2	Study RC circuit as an integrator and Low pass filter.	
	3	Study of clipping and clamping circuits.	
	4	Design Voltage Doublers circuit.	

	5	Study Switching char. of a transistor.
	6	Design transistorized astable multivibrator.
	7	Study transistorized monostable multivibrator.
	8	Study transistorized bistable multivibrator.
	9	Study IC 555 Timer Application
	10	Study IC 555 Square wave generator Application
	11	UJT switch sweep generator
	12	Miller sweep generator

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

- 1 Utilize and Demonstrate advance Lab Instruments
- 2 Demonstrate modulation and demodulation techniques.
- 3 Design various wave shaping circuits for different applications.
- 4 Design different types of switching circuits for various applications.
- 5 Design and Explain working of Timer IC 555 application.

**Reference Books:**

1. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India. 4<sup>th</sup> edition 2008.
2. Electronic Communication systems, G. Kennedy,Tata McGraw Hill, 5<sup>th</sup> edition 2011
3. Principles of Electronics communication systems, Frenzel,McGraw Hill 3<sup>rd</sup>edition, 2012.
4. Communication Systems, S. Haykin, 4<sup>th</sup> Edition, 2006, Wiley India
5. A Text Book of Wave-Shaping Circuits and 555 Timers-R. S. Sedha (S. Chand & Co),Multicolour Edition 3/e, 2018.
6. A Course in Circuit Analysis- M.L. Soni, 4<sup>th</sup> Edition, Dhanpat RaiPublications,2016.
7. Linear Circuits- M. E. Valkenburg an Kinariwala, 1982
8. Basic Electronics- Bernard Grob, 8<sup>th</sup> Edition 2010

**Semester IV****Course VII: BET 401: Operational Amplifier and its Applications****Course Objectives:** Student will able to...

1. Study Conceptual Knowledge of Operational Amplifier.
2. Understand and analyzing various applications of Operational Amplifier.
3. Study of various applications of Operational Amplifier.
4. Understand Basic Concept and techniques of Active filters.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BET401 Operational amplifier and its applications</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Basics of Operational Amplifier</b>	<b>(10)</b>
	<p>A) Differential amplifier:- basics, Circuit Diagram, and circuit description only: DIBO,DIUO,SIBO, SIUO.</p> <p>B) Ideal Op-Amp: Equivalent Circuit, Circuit Symbols and Terminals, Block diagram, Characteristics.</p> <p>C) 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</p> <p>D) Op- Amp IC- 741: pin diagram and function, Electrical parameters</p>	
<b>UNIT - II</b>	<b>Op-Amp Configuration and Feedback Amplifiers</b>	<b>(11)</b>
	<p>A) Open Loop and closed loop configuration of op-amp comparison, Virtual ground, virtual short concept</p> <p>B) 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.</p>	

<b>UNIT - III</b>	<b>Op-Amp. Applications</b>	<b>(12)</b>
	A) 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, Three op amp Instrumentation amplifier(Circuit diagram, operation, advantages& application), Inverting & non inverting Voltage comparator, Inverting & Non inverting Zero crossing detector, Window comparators(Detector), Schmitt Trigger, Comparison between voltage comparator and Schmitt trigger.	
<b>UNIT - IV</b>	<b>Waveform Generator and Active filters</b>	<b>(12)</b>
	A) 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. B) 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, BP, notch filters, Order of filter and Need of higher order filter.	

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

- 1 Understand parameters of Operational Amplifier.
- 2 Illustrate various applications using Operational Amplifier.
- 3 Design various applications using Operational Amplifier.
- 4 Utilize Operational Amplifier as filters.

**Reference Books:**

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

**Semester IV****Course VIII: BET 402: Fundamentals of 8051 Microcontroller****Course Objectives:** Student will able to...

1. Study of Comprehension with microcomputer organization and 8051 family
2. Understand Factual and Conceptual Knowledge of 8051 microcontroller architecture.
3. Understand and familiarize with Instruction set and programming.
4. Study about I/O port, timer, counter and external interfaces programming.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BET402 Fundamentals of 8051 microcontroller</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction and Overview of 8051 family</b>	<b>(08)</b>
	<p>A) Microcomputer Organization: Introduction, Block Diagram, Elements of Microcomputer. (Buses, Microprocessor, memory, I/O devices), Different types of buses: address, Data, and control bus, General block diagram of microprocessor and microcontroller, Comparison of Microprocessors and Microcontrollers.</p> <p>B) Types of architectures- Harvard and Von- Neumann, Selection factors of microcontroller(Architecture type, speed, Word size, instruction set, memory, and I/O capability)</p> <p>C) 8051 family members and its comparison -8052, 8031, 8751, AT89C51, DS89C4x0</p>	
<b>UNIT - II</b>	<b>8051 Architecture</b>	<b>(15)</b>
	<p>A) 8051 Architecture: Features, Architectural block diagram, Pin description, Accumulator and B register, PSW, Stack, I/O ports, Timers/Counters, Interrupts</p> <p>B) Memory Organization and Programming model: Internal RAM and ROM</p> <p>C) Special Features of 8051: Power saving options- idle and power down mode. clock and reset.</p>	

<b>UNIT - III</b>	<b>Instruction set and programming</b>	<b>(11)</b>
	A) Instruction format and addressing modes, Data transfer instructions, Logical and rotate instructions, Arithmetic instructions, Jump and call instructions, subroutine, delay generation simple programs.	
<b>UNIT - IV</b>	<b>Programming of 8051</b>	<b>(12)</b>
	A) Parallel Port- I/O port Structure and its Programming: Interfacing of LED, Relay B) Timer/Counter programming: 8051 timers, TMOD, TCON registers, timer modes of operation, programming timers 0 and 1 (8 bit and 16 bit mode)	

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

- 1 Distinguish microcontrollers based on their features.
- 2 Identify and illustrate the architectural details of 8051 microcontroller.
- 3 Utilize instructions of 8051 microcontroller.
- 4 Design program for data transfer, delay generation, I/O operations and manipulation, arithmetic and logic operations, interfacing of LED, relay.

**Reference Books:**

1. The 8051 Microcontroller, Kenneth Ayala, 3rd edition, CENGAGE Learning, 2005
2. The 8051 Microcontroller and Embedded Systems Using Assembly and C, M. A. Mazidi, J. G. Mazidi, and R. D. McKinlay, 2nd Ed, Pearson Education India, 2007.
- 3 Microprocessor Architecture, Programming and Applications with 8085, Ramesh S.Gaonkar – Wiley Eastern Limited- 6<sup>th</sup> edition, 2013
4. Microcontrollers ( Theory and Applications ), Ajay V. Deshmukh, Tata McGraw Hill, 2005
5. An Embedded Software Primer by David E Simon, Addison Wesley,1999.
6. Embedded Systems: Design & applications, S.F. Barrett, Pearson Education India, 2008.
7. Introduction to embedded system, K.V. Shibu, 1st edition,McGraw Hill 2009,
8. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano, Cengage Learning, 2011.
9. Embedded system Design - Frank Vahid and Tony Givargis, John Wiley, 2002.

**Semester IV**  
**Practical IV: BEP 403: Operational amplifier and 8051 Microcontroller Lab**  
**(Hardware and Circuit Simulation Software)**

**Course Objectives:** Student will able to...

1. Study of designing practical circuits through conceptual, analytical and simulation stages
2. Understand scientific, analytical skills about Operational amplifier and microcontroller.
3. Study of software/tools for professional practices.
4. Understand the fundamental and applications of Operational amplifier.
5. Understand the techniques of designing microcontroller assembly language Programming.

Credits (Total Credits 4)	Semester IV Practical IV BEP403: Operational amplifier and 8051 microcontroller Lab (Hardware and Circuit Simulation Software)		No. of hours per (60)
	<b>Group A</b>		
	1	Study of op amp characteristics.	
	2	Study Op-amp comparator and Zero crossing detector.	
	3	Study Op-amp as Inverting amplifier	
	4	Study Op-amp Non-Inverting amplifier.	
	5	Study Op-amp as Integrator and Differentiator.	
	6	Study Op-amp as Adder.	
	7	Study Op-amp as Subtractor.	
	8	Study Schmitt trigger using Op-amp.	
	9	Study Phase shift oscillator using Op-amp.	
	10	Study Astable Multivibrator using Op-amp.	
	11	Study of Instrumentation amplifier.	
	12	Study of Precision Rectifier using Op-amp.	
	<b>Group B</b>		
	1	Study of Microcontroller Lab Tools Keil uVision and Flash Magic, proteus	
	2	Arithmetic operations	
	3	Logical Operations.	
	4	Move a block of data from one internal memory location to other.	
	5	Exchange a block of data from one internal memory location to other.	



	6	Program to arrange numbers in ascending/ descending order.
	7	Use of timer 0 in mode 1 and 2 to generate time delay.
	8	Use of timer 1 in mode 1 and 2 to generate time delay.
	9	Program to toggle all the bits of port 1 continuously by sending the values XX H and YY H using Call and return instructions.
	10	Program to generate Square wave and generate triangular wave.
	11	Program to generate triangular wave.
	12	Interfacing of LED/RELAY with 8051 microcontroller (Simulation using proteus / Hardware)

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

- 1 Design practical circuits through conceptual, analytical and simulation stages.
- 2 Develop various applications of Operational amplifier.
- 3 Demonstrate and utilize software/tools for professional practices.
- 4 Design and explain Various applications of Operational amplifier .
- 5 Develop various Assembly language programs for microcontroller.

**Reference Books:**

1. Op-amp and -Ramakant Gaikwad, 11<sup>th</sup> Edition, 2015
2. Operational Amplifiers and Linear Integrated Circuits, K. Lal Kishore, Pearson Education, 2016.
3. Op Amp Applications, Walt Jung, Pearson education, 2009.
4. Op Amps for Everyone, Bruce Carter, 2<sup>nd</sup> Edition, Texas Instrument, 2020.
5. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano, Cengage Learning,2011.
6. An Embedded Software Primer by David E Simon, Addison Wesley, 1999.
7. Embedded system Design - Frank Vahid and Tony Givargis, John Wiley, 2002
8. Microcontrollers (Theory and Applications), Ajay V. Deshmukh, Tata McGraw Hill, 2005

**BoS Chairman  
Electronics**