RayatShikshan Sanstha's

Yashavantrao 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:

THIRD 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 Course -VI: BET302	6	4	Course III: BEP303	8	4

FOURTH 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 Course -VI: BET402	6	4	Course Course III: BEP 403	8	4

B.Sc. II : Evaluation structure

Semester III.

	ESE	Internal Exam		Practical			Submission	Total
		ISE-I	ISE-II		Exam	Journal	Seminar + Student Performance	
Course V	30	5	5	Practical-III(A)	25	5	5	150
Course VI	30	5	5	Practical IV(B)	25	5	5	

Semester IV

	ESE	Internal Exam		Practical			Submission	Total
		ISE-I	ISE-II		Exam	Journal	Seminar + Student Performance	
Course V	30	5	5	Practical -III(A)	25	5	5	150
Course VI	30	5	5	Practical IV(B)	25	5	5	

Structure and Title of Course s of B. Sc. Course:

*** B. Sc. II Semester III ***

Course Number	Course Code	Old Course Name	New Course Name
V	BET301	Analog Communication	Electronicscommunication
VI	BET302	Wave Shaping circuits and Operational Amplifier	Wave-Shaping Circuits and Timer IC
III	BEP303	Analog Communication, Wave Shaping circuits and Operational Amplifier Lab (Hardware and Circuit Simulation Software)	Electronicscommunication, Wave-Shaping Circuits and Timer ICLab (Hardware)

* B. Sc. II Semester IV*

Course Number	Course Code	Old Course Name	New Course Name
VII	BET401	Digital Communication	Operational amplifier and its applications
VIII	BET402	8085 microprocessor and 8051 microcontroller	Fundamentals of 8051 microcontroller
IV	BEP403	Digital Communication,8085 microprocessor and 8051 microcontroller Lab (Hardware and Circuit Simulation Software)	Operational amplifier and 8051 microcontroller Lab (Hardware and Circuit Simulation Software)

Semester III

Course V: BET301: Electronics communication

Learning Objectives: Student will able to

1. To provideFactual Knowledge of electronic communication system
2. To familiarize with Analog and Digital Communication System.
3. To get comprehension withDigital ModulationTechnique.
4. To understand basic element and exposeworking ofMulti User Radio Communication Techniques

Credits (Total Credits 2)	SEMESTER-III BET 301 Electronics communication	No. of hours per unit/credits
UNIT - I	**Analog Communication**	**(14)**
	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.	
UNIT - II	**Digital Communication**	**(08)**
	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.	

UNIT - III	**Advanced Digital Modulation Technique**	**(11)**
	A) Sampling theorem, Nyquist theorem B) Analog pulse Basic Principles-PAM, PWM, PPM, modulation. 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. D) Binary Line Coding Technique, Multi-level coding, QAM (Modulation and Demodulation)	
UNIT - IV	**Radio Communication Techniques**	**(12)**
	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. 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, C) Overview of Multiple Access Schemes: GPS, Bluetooth, Wi-Fi and WiMAX.	

Learning Outcomes: At the end of this course, the students should be able to,

1 Describe basic components of Communication system.

2 Illustratethe 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, 6th Edition, 2014.
2. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.4th edition, 2008.
3. Modern digital and analog Communication systems, B. P. Lathi,Oxford University press, 4th 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. 5th edition 2011
7. Electronic Communication system, Roy Blake, Cengage, 5th edition, 2015
8. Communication Systems:, Sanjay Sharma**,**S.K. Kataria& Sons, 6th Edition,2012

Semester III

Course VI: BET302: Wave-Shaping Circuits and Timer IC

Learning Objectives: Student will able to

1. To comprehension with wave shaping circuits and its Advantages in electronics systems.
2. To develop ability of Analyzing and Designing BJT switching circuit for various application.
3. To develop ability for designing Sweep Generators.
4. To understandingoffacts, ideasaboutTimer IC and its applications.

Credits (Total Credits 2)	SEMESTER-III BET 302 Wave-Shaping Circuits and Timer IC	No. of hours per unit/credits
UNIT - I	**Wave shaping Circuits**	**(11)**
	A) 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. 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.	
UNIT - II	**BJT Switching Circuits**	**(11)**
	A) Transistor as a switch, Transistor SwitchingTimes. B) 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.	

UNIT - III	**Sweep Generators**	**(10)**
	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	
UNIT - IV	**Timer IC and its applications**	**(13)**
	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.	

Learning Outcomes: At the end of this course, the students should be able to,

1 Design various wave shaping circuits for different applications.

2 Utilizetransistor as a switch for Wave-Shaping Circuits.

3 Analyze sweep generators in electronics circuits.

4 Explain and 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, 5thMulticolour Edition, 2018

4. Basic Electronics- Bernard Grob, 8th Edition 2010

5. Electronics Devices and Circuits:An Introduction- Allen mottershed, 11th Edition 2015

6. A Course in Circuit Analysis- M.L. Soni, 4th 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 ICLab(Hardware)

Course Objectives: Student will able to

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

Semester III **Practical III: BEP303: Electronics Communication and Wave-Shaping Circuits and Timer IC Lab (Hardware)**	
GROUP A	**GROUP B**
1. Study of DSO	1. To study RC circuit as differentiator and High pass filter.
2. Study of Amplitude Modulator and demodulator	2.To study RC circuit as an integrator and Low pass filter.
3. Study of FM – Modulator and Demodulator	3. To Study of clipping and clamping circuits.
4. Study Pulse Amplitude Modulation (PAM)	4.To Design Voltage Doublers circuit.
5. Study Pulse Width Modulation (PWM)	5.To Study Switching char. of a transistor.
6. Study Pulse Position Modulation (PPM)	6.To design transistorized astable multivibrator.
7. Study of RF tuned amplifier	7.To Study transistorized monostable multivibrator.
8. Study of Amplitude Shift Keying	8.To Study transistorized bistable multivibrator.
9. Study of Frequency Shift Keying	9.To Study IC 555 Timer Application
10. Study of TDM, FDM	10.To Study IC 555 Square wave generator application
11. Study of DM, ADM	11.UJT switch sweep generator
12. Study of Satellite Communication System.	12.Miller sweep generator

Note: It is mandatory to complete 80% practical's of Group A and Group B each

Learning Outcomes: At the end of this course, 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. 4th edition 2008.
2. Electronic Communication systems, G. Kennedy,Tata McGraw Hill, 5th edition 2011
3. Principles of Electronics communication systems, Frenzel,McGraw Hill 3rdedition, 2012.
4. Communication Systems, S. Haykin, 4th 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, 4th Edition, Dhanpat RaiPublications,2016.
7. Linear Circuits- M. E. Valkenburg an Kinariwala, 1982
8. Basic Electronics- Bernard Grob, 8th Edition 2010

Semester IV

Course VII: BET401:Operational amplifier and its applications

Learning Objectives: Student will able to

1. To provide Conceptual Knowledge of Operational Amplifier.
2. To develop ability of Analyzing various applications ofOperational Amplifier.
3. To design various applications using Operational Amplifier.
4. To Understand Basic Concept and techniques of Active filters.

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

UNIT - III	**Op-Amp. Applications**	**(12)**
	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.	
UNIT - IV	**Waveform Generator and Active filters**	**(12)**
	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.	

Learning Outcomes: At the end of this course, the students should be able to,

1 Define and Explain parameters of Operational Amplifier.

2 Illustratevarious applications using Operational Amplifier.

3 Design various applications using Operational Amplifier.

4 Define and ClassifyOperational Amplifieras filters.

Reference Books:

1. Op-amp and -Ramakant Gaikwad, 11th 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, PearsonEducation, 2001.

5. Integrated Electronics, J. Millman and C.C. Halkias, Tata McGraw-Hill,2001.

6. Electronic Principals, A. P. Malvino, 6thEdition , Tata McGraw-Hill,2003.

7. Op Amps for Everyone, Bruce Carter, 2nd Edition, Texas Instrument, 2020.

Semester IV

Course VIII: BET402: Fundamentals of 8051 microcontroller

Learning Objectives: Student will able to

1. To Comprehension with microcomputer organization and 8051 family
2. To Provide Factual and Conceptual Knowledge of 8051 microcontroller architecture.
3. To Understand and familiarize withInstruction set and programming.
4. To Impart Knowledge about I/O port, timer, counter and external interfacesprogramming.

Credits (Total Credits 2)	SEMESTER-IV BET402 Fundamentals of 8051 microcontroller	No. of hours per unit/credits
UNIT - I	**Introduction and Overview of 8051 family**	**(08)**
	A) MicrocomputerOrganization: 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. B) Types of architectures- Harvard and Von- Neumann, Selection factors of microcontroller(Architecture type, speed, Word size, instruction set, memory, and I/O capability) C) 8051 family members and its comparison –8052, 8031, 8751, AT89C51, DS89C4x0	
UNIT - II	**8051 Architecture**	**(15)**
	A) 8051 Architecture: Features, Architectural block diagram, Pin description, Accumulator and B register, PSW, Stack, I/O ports, Timers/Counters, Interrupts B) Memory Organization and Programming model: Internal RAM and ROM C) Special Features of 8051: Power saving options- idle and power down mode. clock and reset.	

UNIT - III	**Instruction set and programming**	**(11)**
	A) Instruction format and addressing modes, Data transfer instructions, Logical and rotate instructions, Arithmetic instructions, Jump and call instructions, subroutine, delay generationsimple programs.	
UNIT - IV	**Programming of 8051**	**(12)**
	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)	

Learning Outcomes: At the end of this course, the students should be able to,

1 Distinguishmicrocontrollers 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 Microconroller, 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- 6th 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: BEP403: Operational amplifierand 8051 microcontroller Lab

(Hardware and Circuit Simulation Software)

Learning Objectives: Student will able to

1. To develop ability of designing practical circuits through conceptual, analytical and simulation stages
2. To enhance and develop scientific, analytical skills about Operational amplifier andmicrocontroller.
3. To develop ability of software/tools for professional practices.
4. To understand the fundamental and applications of Operational amplifier.
5. To develop techniques of designing microcontrollerassembly language Programming.

Semester IV Practical IV: BEP403: Operational amplifierand 8051 microcontroller Lab (Hardware and Circuit Simulation Software)			
	GROUP A		**GROUP B**
1	To Study of op amp characteristics.	1	Study of Microcontroller Lab Tools Keil uVision and Flash Magic, proteus
2	To Study Op-amp comparator and Zero crossing detector.	2	Arithmetic operations
3	To Study Op-amp as Inverting amplifier	3	Logical Operations .
4	To Study Op-amp Non Inverting amplifier.	4	Move a block of data from one internal memory location to other.
5	To Study Op-amp as Integrator and Differentiator.	5	Exchange a block of data from one internal memory location to other.
6	To Study Op-amp as Adder.	6	Program to arrange numbers in ascending/ descending order.
7	To Study Op-amp as Subtractor.	7	Use of timer 0 in mode 1 and 2 to generate time delay.
8	To Study Schmitt trigger using Op-amp.	8	Use of timer 1 in mode 1 and 2 to generate time delay.
9	To Study Phase shift oscillator using Op-amp.	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	To Study Astable Multivibrator using Op-amp.	10	Program to generate Square wave and generate triangular wave.
11	To Study of Instrumentation amplifier.	11	Program to generate triangular wave.
12	To Study of Precision Rectifier using Op-amp.	12	Interfacing of LED/RELAY with 8051 microcontroller (Simulation using proteus / Hardware)

Note: It is mandatory to complete 80% practical's of Group A and Group B each

Learning Outcomes: At the end of this course, 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 Create various Assembly language programs for microcontroller.

Reference Books:

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

BoS Chairman

Electronics