Rayat Shikshan Sanstha's

Sadguru Gadage Maharaj College, Karad.

(An Autonomous College)

Department of Electronics

Syllabus for Bachelor of Science (Electronics) Part II

1. **SUBJECT: Electronics**

2. **YEAR OF IMPLEMENTATION:** New Syllabi for the B.Sc. II Electronics will be implemented from June 2023 onwards.

3. **STRUCTURE OF COURSE:**

THIRD SEMESTER

Sr. No.	SUBJECT TITLE	Theory		
		Paper No. & Paper Code	No. of lectures per week	Credits
1	Electronics	Paper-V: DSC C9 (BET22-301)	6	4
		Paper-VI: DSC C10 (BET22-302)		

FORTH SEMESTER

Sr. No.	SUBJECT TITLE	Theory			Practical		
		Paper No. & Paper Code	No. of lectures Per week	Credits		No. of lectures Per week	Credits
1	Electronics	Paper-VII: DSC D9 (BET22-401)	6	4	Practical DSC CP DSC DP (BEP22-403)	8	8
		Paper-VIII: DSC D10 (BET22-402)					

Structure and Title of Papers of B. Sc. II Course:

B. Sc. II Semester III

Paper V: Analog Communication

Paper VI: Wave Shaping and Operational Amplifier

B. Sc. II Semester IV

Paper VII: Digital Communication

Paper VIII: 8085 microprocessor and 8051 microcontroller

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Syllabus Introduced from June, 2023.

B.Sc. Part II: **Electronics**

Semester III

DSC C9

Paper V: BET22-301: Analog Communication

Learning Objectives:

1. To learn basics of electronic communication system: need, development and Advantages
2. To study various types of modulation and demodulation techniques.
3. To understand working of Transmitters and Receivers.
4. To get familiarize with Pulse Modulation techniques

Unit I: Electronic Communication (10)

Introduction to communication – means and modes, Brief idea of frequency allocation for radio communication system in India (TRAI), Electromagnetic communication spectrum, band designations, usage and applications, Channels and base-band signals.

Block diagram of an electronic communication system, need for modulation, concept of channels and base-band signals. Concept of Noise, Types of Noise, Signal to noise ratio, Noise Figure, Noise Temperature, Friss formula

Unit II: Amplitude Modulation (12)

Amplitude Modulation, modulation index and frequency spectrum, Generation of AM, Amplitude Demodulation (diode detector), Concept of Double side band suppressed carrier, Single side band suppressed carrier, other forms of AM (Pilot Carrier Modulation, Vestigial Side Band modulation, Independent Side Band Modulation). Block diagram of AM Transmitter and Receiver

Unit III: Frequency Modulation (12)

Frequency and Phase modulation, frequency spectrum diagram equivalence between FM and PM, bandwidth requirements, frequency deviation and carrier swing, Generation of FM (direct and indirect methods FM generator-Varactor diode modulator.

FM detector: principle, PLL, slope detector circuit, principle of working and waveforms. Qualitative idea of Super heterodyne receiver, Block diagram of FM transmitter and Receiver. Comparison between AM, FM and PM

Unit IV: Analog Pulse Modulation (11)

Analog Pulse Modulation: Channel capacity, Sampling theorem, Basic Principles-PAM, PWM, PPM, PCM modulation and detection technique for PAM only, Multiplexing. Introduction to pulse and digital communications, digital radio, advantages and applications of PAM, PWM, PPM, PCM

Learning Outcomes:

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

1) Avail the skill of design and development of Modulation and Demodulation.
2) Implement the circuits of AM, FM, PM Modulators.
3) Design and build applications of PAM, PWM, PPM, PCM.
4) Understand the communication systems.

Reference Books:

1. Electronic Communication Systems: Fundamentals through Advanced, W. Tomasi, Pearson Education, 3rd Edition (Unit I, II, III, IV)

2. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India. (Unit II, III, IV)
3. Modern Digital and Analog Communication systems- B. P. Lathi, 4rd Edition 2009Oxford University press.(Unit II, III, IV)
4. Principles of Electronic Communication Systems, Frenzel,3rd edition, McGraw Hill, (Unit II, III)
5. Communication Systems, S. Haykin, 2006, Wiley India (Unit IV)
6. Electronic Communication Systems, G. Kennedy, 3rd Edn, 1999, Tata McGraw Hill.
7. Electronic Communication System, Blake, Cengage, 5th edition.

Semester III

DSC C10

Paper VI: BET22-302: Wave Shaping circuits and Operational Amplifier

Learning Objectives:

1. To learn wave shaping circuits and its Advantages in electronics systems
2. To study various types of modulation and demodulation techniques.
3. To understand working of Transmitters and Receivers.
4. To get familiarize with Pulse Modulation techniques

Unit I: Wave Shaping Circuits **(10)**

RC circuits: High pass and Low pass, Differentiator and integrator
Diode clippers, Clipping, Clamping Circuits: Basic operation of diode clamper with waveform,
Time base Circuits: Voltage time base generators: General feature of Time Base Signals, Sweep circuits using transistor and UJT, Constant – Current Sweep generator (Miller integrator)
Current Time Base Generators: Definition, A simple current sweep, Transistor current time base generator, Application of sweep generators

Unit II: Multivibrator **(12)**

BJT as a switch, **Astable Multivibrator:** Collector coupled astable multivibrator, circuit operation, Study of waveform, Expression for output frequency, Duty cycle.
Monostable Multivibrator: Collector coupled monostable multivibrator, circuit operation, study of wave forms, Expression for gate width,
Bistable Multivibrator: Collector coupled bistable multivibrator, circuit operation, study of wave forms, Schmitt Trigger: Circuit operation and applications
IC555 timer: Astable and Monostable Multivibrator, 555timeras variable duty cycle (10% to 90%)

Unit III: Differential Amplifier **(12)**

Transistor dc amplifier, Differential amplifier, Emitter coupled differential amplifier, Operations, characteristics and parameters (Input Impedance, Output Impedance, Common Mode and Differential Mode Gain, CMRR), AC and DC analysis for dual inputs and single ended output, Constant Current Bias and Current Mirror Bias

Unit IV: Operational Amplifier **(11)**

Introduction to Op-Amp, Block diagram of typical Op-Amp, Offset error voltages and currents, offset balancing techniques, Effect of temperature on offset voltages, currents and CMRR, Slew Rate, Frequency response of Op-Amp. Study of IC 741 and Comparative study of ICs LM324, LM308, LF 356

Learning Outcomes:

Student should able to:
1) Design various wave shaping circuits for different applications
2) Design and build transistor and IC555 based multivibrator for various applications
3) Make AC and DC analysis of differential amplifier
4) Study of op amp IC 741 characteristics

Reference Books:

1. Op-amp and Linear Integrated Circuits-Ramakant Gaikwad (Unit III, IV)
2. A Text Book of Applied Electronics-R. S. Sedha (S. Chand & Co) (Unit I, II)
3. Linear Integrated Circuits-D Roy Choudhari(Unit IV)
4. Op-Amp with Linear integrated circuits-William D Stanley(Pearson) (Unit III)
5. Basic Electronics- Bernard Grob (Unit III),
6. Electronics Devices and Circuits:An Introduction- Allen Mottershed (Unit II)
7. A Course in Circuit Analysis- Soni and Gupta
8. Linear Circuits- M. E. Valkenburg an Kinariwala

Semester IV

DSC D9

Paper VII: BET22-401: Digital Communication

Learning Objectives:

1. To learn basic concepts of digital modulation techniques
2. To learn advanced digital modulation techniques
3. To study various cellular communication techniques.
4. To understand working of satellite communication system and other wireless techniques.

Unit I: Digital Modulation Techniques (10)

Need for digital transmission, Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK), Advantage and disadvantages of digital transmission, characteristics of data transmission circuits, Shannon limit for information capacity, bandwidth requirements, data transmission speed, noise, cross talk, echo suppressors, distortion and equalizer, MODEM– modes, classification, TDM, FDM concepts, comparison of TDM and FDM

Unit II: Advanced Digital Modulation Technique (12)

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. Binary Line Coding Technique, Multi-level coding, QAM (Modulation and Demodulation)

Unit III: Cellular Communication (12)

History of wireless communication, Wireless Generation and Standards, Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers(ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, CDMA technology, CDMA overview, simplified block diagram of cellular phone handset, Comparative study of GSM and CDMA, 2G, 3G, 4G LTE and 5G concepts.

Unit IV: Satellite communication (11)

Introduction, need, satellite orbits, advantages and disadvantages of geostationary satellites. Satellite visibility, satellite system – space segment, block diagrams of satellite sub systems, up link, down link, cross link, transponders (C- Band),effect of solar eclipse, path loss, ground station, simplified block diagram of earth station. Satellite access, TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA, Satellite antenna (parabolic dish antenna), GPS-services like SPS & PPS

Local area networks (LAN): Primary characteristics of Ethernet-mobile IP, OSI model, wireless LAN requirements-concept of Bluetooth, Wi-Fi and WiMAX.

Learning Outcomes:

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

1) Make Digital data transmission circuits of ASK,FSK,PSK,PCM.
2) Perform the time and frequency domain analysis of the signals in a digital communication system.
3) Analyze Performance of Satellite and Cellular communication.
4) Understand communication systems design

Reference Books:

1. Electronic Communication Systems: Fundamentals through Advanced, W. Tomasi, Pearson Education, 3rdEdition(Unit I, II, III, IV)
2. Principles of Electronic communication systems – Frenzel, 3rdedn, McGraw Hill
3. Martin S. Roden, Analog & Digital Communication Systems, Prentice Hall, Englewood Cliffs, 3rdEdn(Unit I, II, III, IV)
4. Modern digital and analog Communication systems- B. P. Lathi, 4th Edition 2009 Oxford University press. (Unit I, II, III, IV)
5. Telecommunication Switching Systems and Networks, Thiagarajan Vishwanathan, Prentice Hall of India. (Unit I, II, III, IV)
6. Communication Systems, S. Haykin, 2006, Wiley India
7. Wireless Communications Principles and Practice, Theodore S. Rappaport, 2nd Edition, Pearson Education Asia. (Unit I, II, III, IV)
8. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.

Semester IV

DSC D10

Paper VIII: BET402: 8085 microprocessor and 8051 microcontroller

Learning Objectives:

1. To learn the principles of programming
2. To learn ALP for I/O port, timer, counter and interrupt operations
3. To learn the fundamentals of C programming
4. To learn ALP for I/O port, timer, counter and interrupt operations

Unit I: Microcomputer Organization **(12)**

Introduction, Applications, Basic block diagram, Speed, Word size, Memory capacity, Classification of microprocessors (mention of different microprocessors being used)

Review of 8085 microprocessor: Features, Architecture-block diagram, ALU General Purpose registers, register pairs, flags, stack pointer, program counter, types of buses, Multiplexed address and data bus, Memory mapped I/O and I/O mapped I/O, Addressing modes

D-A and A-D Conversion: 4 bit binary weighted and R-2R D-A converters, circuit and working. Accuracy and Resolution, A-D conversion characteristics, successive approximation ADC, (Mention of relevant ICs)

Unit II: Introduction to Microcontrollers **(09)**

Basic block diagram, comparison of microcontroller with microprocessors, comparison of 8 bit, 16 bit and 32 bit microcontrollers

Microcontroller 8051: architecture internal block diagram, key features of 8051, memory organization, Internal RAM memory, Internal ROM, General purpose data memory, special purpose/function registers, pin diagram, clock and reset circuit, minimum connection of 8051, I/O port Handling.

Unit III: Programming 8051 **(12)**

Addressing modes, Instruction Set, simple programs in assembly language: data transfer, delay generation, I/O operations and manipulation, for arithmetic and logic operations, interfacing of LED, switch, relay, opt-coupler,DC motor.

Unit IV: Features of 8051 **(12)**

Timers / Counters:8051 timers, TMOD, TCON registers, timer modes of operation, programming timers 0 and 1 (8 bit and 16 bit mode)

Serial Communication: Serial data input/output– SCON, PCON, serial data transmission modes

Interrupts: IE, IP, time flag interrupts, Sources of interrupts, enabling and disabling the interrupts, Timer, serial port interrupt, external interrupts, reset, interrupt control, interrupt priority, interrupt destinations & software generated interrupts

Learning Outcomes:

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

1) Understand architecture of 8085 microprocessor.
2) Understand architecture of 8051 Microcontroller
3) Program to perform I/O port, basic peripherals interfacing operations
4) Program timer/counter, serial communication and interrupt operations

Reference Books:

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

Semester III Practical III

DSC C9 & C10: Analog Communication, Wave Shaping circuits and Operational Amplifier Lab (Hardware and Circuit Simulation Software)

Course Objectives:

1. To study modulation and demodulation circuits.
2. To understand working of Transmitters and Receivers.
3. To get familiarize with Pulse Modulation circuits
4. To learn the computer architecture and basic programming concepts.
5. To learn different wave shaping circuits and their applications.

GROUP A

1. Study of Amplitude Modulator and demodulator using Transistor
2. Study of FM – Modulator and Demodulator circuit
3. Study of phase modulation Circuits
4. Study of AM Transmitter/Receiver Circuits
5. Study of FM Transmitter/Receiver Circuits
6. Study Pulse Amplitude Modulation (PAM)
7. Study Pulse Width Modulation (PWM)
8. Study Pulse Position Modulation (PPM)

9. Study of Pulse Code Modulation (PCM)
10. Study of RF tuned amplifier
11. Study of DTH

GROUP B

1. Study of RC integrator and Differentiator
2. Study of clipping and clamping circuits.
3. Study of UJT as a sweep generator
4. Study of Miller integrator
5. To design transistorized astable multivibrator
6. To design transistorized monostable multivibrator
7. To design transistorized bistable multivibrator
8. Study of IC 555 as astable multivibrator
9. Study of IC 555 as mono stable mult-vibrator.(measure long time period using LED)
10. Study of Schmitt trigger
11. Study of op amp characteristics I
12. Study of op amp characteristics II
13. Study offset balancing technique

Learning Outcomes:

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

1) Design various wave shaping circuits for different applications
2) Study of op amp IC 741 characteristics.
3) Design the modulators, demodulators for amplitude and frequency modulated systems and analyze in time and frequency domain.
4) Compare analog communication systems on the basis of bandwidth, power requirement and the performance in the presence of noise.
5) Study the Pulse modulators, demodulators for progressive communication systems.

Semester IV Practical IV

DSC D9 & D10: Digital Communication,8085 microprocessor and 8051 microcontroller Lab (Hardware and Circuit Simulation Software)

Learning Objectives:

1. To learn the fundamental digital techniques for Communication
2. To understand Digital Communication applications in Satellite and Cellular Communication
3. To learn the principles of programming
4. To learn ALP for I/O port, timer, counter and interrupt operations
5. To learn the fundamentals of C programming

GROUP A

1. Study of Amplitude Shift Keying
2. Study of Phase Shift Keying.
3. Study of Frequency Shift Keying
4. Modulation of LED and detection through Photo detector.
5. Study of 16 QAM modulation and Detection with generation of Constellation Diagram
6. Study of TDM, FDM
7. Study of DPCM and demodulation.
8. Study of DM, ADM

9. Study of architecture of Mobile phone.

10. Study of Satellite Communication System.

GROUP B

1. Arithmetic operations using 8051 microcontroller (Addition and Multiplication)

2. Arithmetic operations using 8051 microcontroller (Subtraction and Division)

3. Stack Operations in 8051 microcontroller

4. Use of timer 0/1 in mode 1/2 to generate time delay

5. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's .

6. To interface seven segment display with 8051 microcontroller

7. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.

8. Serial communication for data transfer

9. Serial communication for data receive

10. Interfacing of ADC

11. Interfacing of DAC

12. Application of embedded systems: Temperature measurement & display on LCD

Learning Outcomes:

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

1. Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
2. Perform the time and frequency domain analysis of the signals in a digital communication system.
3. Select the blocks in a design of digital communication system.
4. Analyze Performance Satellite and Cellular communication.
5. Understand architecture of 8085 microprocessor.

Nature of Question Paper:

1. **CCE-Paper V & VI : Marks =10:**
   Unit 1, 2, 3: Home Assignment/Unit Test

2. **CCE-Paper VII & VIII: Marks =10:**
   Unit 1, 2, 3: Home Assignment

3. **ESE: Marks =40:**
   Unit 1 to 4:
   Multiple Choice questions (1 X08)
   Attempt any two out of three (2X8=16)
   Attempt any four out of six (4X4=16)

(**CCE**- Comprehensive Continuous Evaluation, **ESE** – End Semester Examination)

Mr. D. R. Dixit
Chairman
B.O.S. (Electronics)