INSTITUTE OF SCIENCE, NAGPUR

(An Autonomous Institute of Government of Maharashtra)

DEPARTMENT OF ELECTRONICS

Syllabus

Bachelor of Science (B.Sc.) Semester Pattern

Electronics

(ELE/UG/2021/01)

(To be Implemented from 2021-2022)

INSTITUTE OF SCIENCE, NAGPUR

(An Autonomous Institute of Government of Maharashtra)

Department of Electronics

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INSTITUTE OF SCIENCE, NAGPUR

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Department of Electronics

Program and Course Codes

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INSTITUTE OF SCIENCE, NAGPUR

(An Autonomous Institute of Government of Maharashtra)

Department of Electronics

UG Structure

Bachelor of Science (B. Sc.) Electronics

Implemented from Academic Year 2021 -2

Semester	Paper	Name of the Paper	Paper Code	Credits
I	I	BASIC CIRCUIT COMPONENTS AND NETWORK ANALYSIS	**BELEFS11**	**06**
	II	FUNDAMENTALS OF DIGITAL ELECTRONICS	**BELEFS12**	
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	II	ANALOGUE AND DIGITAL CIRCUITS	**BELESS42**	
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VI	I	PROGRAMMING IN ‘C’	**BELETS61**	**06**
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	Laboratory Coursework Practical		**BELETS63**	

Marking Scheme of Syllabus

Faculty of Science B.Sc. Semester-I to VI (Electronics)

Semester	Paper	Total Periods / Week		Marks		Total Marks	Total Marks
				Theory / Practical	Internal		
I to II	I	**3**	**01 (Tutorial)**	50	10	60	150
	II	**3**		50	10	60	
	Laboratory Course (Practical)	**06**		30	--	30	
III to VI	I	**3**	**01 (Tutorial)**	50	10	60	150
	II	**3**	**01 (Tutorial)**	50	10	60	
	Laboratory Course (Practical)	**06**		30	--	30	

1. Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment; @ = Tutorials wherever applicable; * = If required, for two days.

2. Minimum marks for passing will be 40% of the total marks allotted to that paper / practical.

3. Candidate has to pass theory papers and practical separately

Guidelines for Internal Assessment, Theory paper pattern and Practical

a) The internal assessment marks assigned to each theory paper as mentioned shall be awarded on the basis of assignments like class test, attendance, project assignments, seminar, group discussions or any other innovative practice / activity.

b) There shall be one / two assignments (as described above) per Theory paper.

c) The theory question papers shall be of 3 hours duration and comprise of 5 questions with equal weightage to all units.

d) The pattern of question papers is

• Each theory paper will be of 50 marks

• All questions are compulsory and will carry equal marks.

• Question paper for any theory paper will comprise of five questions of 10 marks

• Question No. 1 to 4 will be from four units each with an internal choice. The questions can be asked in the form of long answer type for 10 marks or two questions / short notes of 5 marks each or four questions / short notes of 2½ each

• Question No. 5 shall be compulsory with three questions / notes of very short answer type from each of the four units having 1 mark each. The student shall have an option of answering any 10 questions out of the 12 questions.

e) Practical:

Practical exam shall be of 4 to 8 hours duration for one or two days, depending on subject and number of students.

Valuation Pattern-

In practical examination a student has to perform any one exercise from the list prescribed in the syllabus and it is to be executed on machine.

The valuation scheme of practical examination will be as under.

Record	-	06
Viva	-	06
Writing	-	09
Execution	-	09
TOTAL	**-**	**30**

SUBJECT: ELECTRONICS

B.SC.–I SEMESTER - I

BELEFS11: PAPER- I (BASIC CIRCUIT COMPONENTS AND NETWORK ANALYSIS)

OBJECTIVES:

1. To enrich the students with the basic requirement of digital electronics.
2. To describe the use of Boolean Algebra for circuit operations.
3. To elaborate the use of flip flops as memory in data processing system.
4. To explore the use of binary circuits in digital system.
5. To familiarize about the basic building blocks required for digital system.

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyze and interpret data
2. Utilize the basic knowledge of science Electronics and Communication

Unit-I **7.5 Hrs.**

Passive Elements

Resistors, capacitors and inductors; their symbol, unit, types, construction and characteristics, Colour code system, Series and parallel combination. Voltage and Current divider circuits. Transformer: classification, construction, working and applications. Relays and Switches, Introduction to Surface mounting devices.

Unit-II **7.5 Hrs.**

Circuit Analysis

Energy sources AC & DC, Kirchhoff's Current & Voltage Laws, Node and loop analysis method, Network Theorems: Statements with explanation and problems (Dc only): Principal of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Millman's Theorem and Maximum Power Transfer Theorem.

Unit-III **7.5 Hrs.**

Transient Behavior of circuit elements under initial and final conditions in RL, RC and RLC circuits for AC and DC excitations

AC Circuit Analysis: Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values

Resonant Circuits: Series and parallel resonance, frequency-response of series and Parallel circuits, Q–Factor, Bandwidth

Unit-IV **7.5 Hrs.**

Transducer

Definition, Classification, characteristics of transducers,

Construction and working of Resistive transducer- Potentiometer,

Capacitive transducer-by changing dielectrics & changing distance between the plates, piezoelectric transducer, LVDT,strain gauges, temperature transducers- thermistors, RTDS and thermocouples.

BELEFS12: PAPER-II: FUNDAMENTALS OF DIGITAL ELECTRONICS

OBJECTIVES:

1. To enrich the students with the basic requirement of digital electronics.
2. To describe the use of Boolean Algebra for circuit operations.
3. To elaborate the use of flip flops as memory in data processing system.
4. To explore the use of binary circuits in digital system.
5. To familiarize about the basic building blocks required for digital system.

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication

Unit I **7.5 Hrs.**

Number Systems: Decimal, Binary, Octal and Hexadecimal number systems, inter conversions. Representation of signed and unsigned numbers. Binary, octal and hexadecimal arithmetic; addition, subtraction by 1's and 2's complement method.

Binary Codes: BCD, Grey, XS3, parity and Alphanumeric codes.

Unit II **7.5 Hrs.**

Logic Gates: Study of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates.

Boolean algebra: Boolean laws, simplification of equation, De'Morgan's Theorems, logic structures.

Unit III **7.5 Hrs.**

Logic functions: Standard logic functions, SOP and POS forms, minterms and maxterms, Minimization Techniques; Karnaugh's map minimization up to 4 variables for SOP only.

Combinational circuit: Adder, Subtractor, 4- bit Adder/ Subtractor, Decoder, Encoder, Multiplexers De-multiplexer (Basic circuits).

Unit IV **7.5 Hrs.**

Sequential Circuits: Bi-stable multivibrator, SR, CKSR, D Flip-Flops and JK Flip-Flop; Race-around condition, Construction using Universal gates, Properties of FFS, Preset and Clear operations, Clocked FFS (Level and Edge Triggered), JK Master-Slave Flip-Flop, and T Flip-Flop.

BELEFS13: LABORATORY COURSE

At the time of Examination every student has to perform Total 2 Experiments compulsorily 1 from Practical I & 1 from Practical II

Practical- I (BASIC CIRCUIT COMPONENTS AND NETWORK ANALYSIS)

At least any 05 from the followings list.

1. To study components used in electronics circuits.
2. To study Transformer.
3. To Study & verify Thevenin's theorem.
4. To Study & verify Norton's theorem.
5. To Study & verify Maximum Power Transfer theorem.
6. To Study & verify Millman's theorem.
7. To study Potentiometer transducer for the measurement of displacement.
8. Study of RC and RL circuit
9. To study LVDT transducer for the measurement of displacement.
10. To study Thermistor & its properties.

Practical- II (FUNDAMENTALS OF DIGITAL ELECTRONICS)

At least any 05 from the followings list.

1. To study identification of Logic gates and verification of its truth table.
2. To realize and verify the operation of basic gates from Universal gates.
3. To Study De'Morgan's Theorems.
4. To construct & verify logic structure for given Boolean expression.
5. To Study construction of Half adder And Full adder.
6. To Study 4 bit parallel binary adder operation.
7. To Study decoder and encoder circuit.
8. To study multiplexer and de-multiplexer circuit.
9. To study SR, CKRS and D FFS.
10. To study JK and JKMS Flip-Flop.

REFERENCES

1. Basic Electronics (Solid State): B. L. Theraja S. Chand & Company, 2000.
2. Electronics Instrumentation: A. K. Sawney, Dhanpat Rai Publications.
3. A Textbook of Applied Electronics: R. S. Sedha, S. Chand Publications.
4. Basic Electronics and linear circuits: Bhargava and Gupta, TMH.
5. Electric Circuits: S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004).
6. Electrical Circuit Analysis: Mahadevan and Chitra, PHI.
7. Electronic instruments and measurement techniques: W. D. Cooper and A. D. Helfrick (PHI).
8. Network analysis by G. K. Mittal
9. Analogue and Digital Techniques: G. N. Navneet.
10. Digital Principles and Applications: A. P. Malvino, D. P. Leach and Saha, 7th Ed., 2011, Tata McGraw Hill.
11. Fundamentals of Digital Circuits: Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
12. Digital Circuits and systems: Venugopal, 2011, Tata McGraw Hill.
13. Digital Systems: Principles & Applications, R. J. Tocci, N. S. Widmer, 2001, PHI.
14. Digital Fundamentals: Thomas L. Flyod, Pearson Education Asia (1994).
15. Digital Principles: R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994).

B.SC.–I SEMESTER - II

BELEFS21: PAPER- I (SEMICONDUCTOR DEVICES)

OBJECTIVES:

1. To explain about semiconductors used for the fabrication of semiconductor devices.
2. To acquire the knowledge of transistor used in many electronic circuits.
3. To familiarize about the field effect transistor and its operation.
4. To explore the use of power devices required in electronics circuits.
5. To familiarize about the applications of diode, transistor and power devices.

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication
3. To provide opportunity to students to learn the latest trends in Electronics

Unit I **7.5 Hrs.**

Semiconductors: Classification and types, PN junction; Formation, depletion region, barrier potential, symbol, biasing modes, V-I characteristics, , diode current equation, effect of temperature on diode current, ideal diode, basic diode ratings, Zener diode, LED construction, working, characteristics & uses.

Unit II **7.5 Hrs.**

Transistor Basics: Formation of transistor; PNP and NPN, symbols, working principle, transistor current equation. Modes of operation; CB, CE and CC, input output and transfer characteristics in CB and CE configuration, definition of α, ß and relation between them, simple problems, comparison of CB, CE and CC mode Regions of operation (active, cut off and saturation), Leakage currents, load line and Q point, Transistor as an amplifier and switch in CE configuration.

Unit III **7.5 Hrs.**

Field Effect Transistors: Construction, working and characteristics of JFET, FET Parameters rd, gm, μ and their relation.

MOS Field Effect Transistors: Types of MOSFETs, Circuit symbols, Construction, Working and Characteristic curves of Depletion type MOSFET (both N channel and P Channel) and Enhancement type MOSFET (both N channel and P channel). Comparison between JFET and MOSFET.

Unit IV **7.5 Hrs.**

Switching Devices: Construction, Working principle, characteristic curves, symbol and Applications of UJT, SCR, DIAC and TRIAC.

BELEFS22: PAPER- II (ADVANCED DIGITAL ELECTRONICS)

OBJECTIVES:

1. To enrich the students with the digital ICS used in electronics circuits.
2. To enhance the use of Flip-Flops in the construction of counters.
3. To familiarize the use of Counters & Registers in data processing system.
4. To explore the use of binary memory in digital system.
5. To disseminate about the building blocks required for digital system.

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication
3. To provide opportunity to students to learn the latest trends in Electronics
4. To provide opportunities to the students to formulate, analyse and resolve the problems in Electronics Industry

Unit I **7.5 Hrs.**

Logic Families: Introduction to ICs Scale of Integration, Classification digital ICs, Construction and Working of TTL, NAND and NOR gates, Construction and Working of CMOS NAND and NOR gates, Tristate logic, Comparison of TTL and CMOS

Unit II **7.5 Hrs.**

Binary Counters: Types, Asynchronous; up/down, Decade, Modified and Synchronous counter, Ring Counter, Johnson counter; Construction, working, Truth tables and timing diagrams (4 bits), Uses.

Unit III **7.5 Hrs.**

Shift Registers: Introduction, Buffer Register, Controlled Buffer Register, Data Transmission in shift registers; Construction and Working of Serial-in serial-out, serial-in parallel-out, Parallel-in serial-out, Parallel-in Parallel-out, Right Shift and Left Shift, Uses.

Unit IV **7.5 Hrs.**

Memory Organization: Types of RAM and ROM, Characteristics of Memory Systems, Memory Hierarchy, Main Memory, Organization; Address & data bus, Static and dynamic RAM, Memory expansion; address and data size using address table method.

BELEFS23: LABORATORY COURSE

At the time of Examination every student has to perform Total 2 Experiments compulsorily 1 from Practical I & 1 from Practical II

Practical- I (SEMICONDUCTOR DEVICES)

At least any 05 from the followings list.

1. To study V-I characteristics of diode, Zener diode and LED.
2. To study characteristics of transistor in CB mode and calculate α
3. To study characteristics of transistor in CE mode and calculate β.
4. To study the operation of transistor as an amplifier and switch.
5. To study output characteristics of FET and calculate rd, gm and μ.
6. To study output characteristics of MOSFET.
7. To study V-I characteristics of SCR.
8. To study V-I characteristics of DIAC.
9. To study V-I characteristics of UJT.
10. To study V-I characteristics of TRIAC.

Practical- II (ADVANCED DIGITAL ELECTRONICS)

At least any 05 from the followings list.

1. To study CMOS NAND gate and verify its operation.
2. To study CMOS NOR gate and verify its operation.
3. To Study the working of 4-bit Asynchronous counter.
4. To Study 4-bit Asynchronous counter as UP/Down counter.
5. To Study the working of Asynchronous modified counter.
6. To Study the working of Jonson's counter.
7. To Study the working of ring counter.
8. To Study Serial-in register as serial-out and parallel-out.
9. To Study Parallel-in register as serial-out and parallel-out.
10. To study RAM and ROM Structure.

REFERENCES

1. Basic Electronics (Solid State): B. L. Theraja S. Chand & Company, 2000.
2. A Textbook of Applied Electronics: R. S. Sedha, S. Chand Publications.
3. Electronic Devices and Circuits: Allen Mottershed.
4. Basic Electronics and linear circuits: Bhargava- Gupta, TMH.
5. Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004).
6. Electronic Devices and Circuits: David A. Bell, 5th Edition 2015, Oxford University Press.
7. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, TMH.
8. Electrical Circuit Analysis: Mahadevan and Chitra, PHI Learning.
9. Integrated Electronics: J. Millman and C. C. Halkias, Tata McGraw Hill (2001).
10. Learning Microelectronic circuits: A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn, Oxford University Press.
11. Digital Principles and Applications: A. P. Malvino, D. P. Leach and Saha, 7th Ed., 2011, Tata McGraw Hills.
12. Fundamentals of Digital Circuits: Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
13. Digital Circuits and systems: Venugopal, 2011, Tata McGraw Hill.
14. Digital Systems: Principles & Applications, R. J. Tocci, N. S. Widmer, 2001, PHI.
15. Digital Fundamentals: Thomas L. Flyod, Pearson Education Asia (1994).
16. Digital Principles: R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994).

B.SC.–II SEMESTER - III

BELESS31: PAPER- I (ANALOG CIRCUITS)

OBJECTIVES:

1. To illustrate applications of diode as clippers, clamper and rectifier.
2. To describe the role of transistor in amplification, signal analysis and two port hybrid circuit for testing amplifier parameters.
3. To elaborate the concept of feedback and construction of feedback amplifier and oscillators.
4. To explore the use of power amplifier in electronics circuits.
5. To familiarize about the applications of diode and transistor.

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication
3. To provide opportunity to students to learn the latest trends in Electronics
4. To provide opportunities to the students to formulate, analyze and resolve the problems in Electronics Industry

Unit I **7.5 Hrs.**

Diode Circuits: Clipping, two level clipping and clamping circuits.

Rectifiers: HWR, FWR (center tapped and bridge). Circuit diagrams, construction and working, AC and DC voltages, PIV rating, Form factor, Ripple factor & Efficiency, comparison.

Filters: types, circuit diagram and explanation of shunt capacitor filter with waveforms.

Unit II **7.5 Hrs.**

Transistor biasing and Stability: Factors affecting stability & Thermal runaway, Stability factor, Fixed Bias, collector to base bias and Voltage Divider bias circuits. Transistor as a two port network, Short circuit and open circuit tests, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier. Current and Voltage gains, Input and Output impedance, Simple problems.

Unit III **7.5 Hrs.**

Power Amplifiers: Difference between voltage and power amplifier, classification of power amplifiers, Class A, Class B, Class AB, Class C and their comparisons. Construction and Operation of Transformer

coupled Class A power amplifier, its overall efficiency. Complementary symmetry Class B push pull power amplifier construction, Circuit operation and calculation of efficiency, crossover distortion.

Unit IV **7.5 Hrs.**

Feedback Amplifiers: Negative and Positive feedback, Theory of feedback using block diagram, advantages and disadvantages of negative feedback.

Oscillators: Principle of operation, Analysis and derivation of frequency of oscillation of phase shift oscillator, Wien bridge oscillator, crystal oscillator and frequency stability.

BELESS32: PAPER- II (LINEAR INTEGRATED CIRCUITS)

OBJECTIVES:

1. To study DC & AC characteristics of operational amplifier
2. To elucidate and design linear and nonlinear circuits of OP-AMP.
3. To study timer IC and its applications.
4. To elaborate the role of filters in electronics circuits.
5. To explore the knowledge of linear integrated circuits and its uses.

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication
3. To provide opportunity to students to learn the latest trends in Electronics
4. To provide opportunities to the students to formulate, analyse and resolve the problems in Electronics Industry

Unit I **7.5 Hrs.**

Basic Operational Amplifier: Concept of differential amplifiers (Dual input balanced and unbalanced output), construction and working, Block diagram of an operational amplifier (IC 741) Op-Amp parameters: input offset voltage, input offset current, input bias current, differential input resistance, input capacitance, offset balancing, input voltage range, common mode rejection ratio, slew rate, supply voltage rejection ratio, Open and closed loop configuration, Frequency response of an op-amp in open loop and closed loop configurations.

Unit II **7.5 Hrs.**

Op-Amp Circuits: concept of virtual ground, Inverting and Non-inverting amplifier, sign changer, voltage follower, Summing and difference amplifier, Integrator and Differentiator, simple problems.

Unit III **7.5 Hrs.**

Comparator: Basic types of comparator and Schmitt Trigger using OP-AMP.

IC 555: Pin diagram, Block diagram, Applications as Monostable, Astable multivibrator, PAM and PWM.

Unit IV **7.5 Hrs.**

Signal conditioning circuits: Necessity, Sample and hold circuit systems.

Active filters: First order low pass and high pass Butterworth filter, second order filters, Band pass filter, Band reject filter.

BELESS33: LABORATORY COURSE

At the time of Examination every student has to perform Total 2 Experiments compulsorily 1 from Practical I & 1 from Practical II

Practical- I (ANALOG CIRCUITS)

At least any 05 from the followings list.

1. To study diode clipper circuits.
2. To study diode clamper circuits.
3. To Study half wave & Full wave rectifier.
4. To Study the effect of C- filter on the output of Full wave rectifier.
5. To study h-parameters of CE transistor amplifier.
6. To study Single Stage CE amplifier and its gain-frequency response.
7. To study transformer coupled class A power amplifier & calculation of its efficiency.
8. To study push-pull class B power amplifier & calculation of its efficiency.
9. To study RC Phase shift Oscillator & calculation of its frequency.
10. To study Wien bridge Oscillator & calculation of its frequency.

Practical- II (LINEAR INTEGRATED CIRCUITS)

At least any 05 from the followings list.

1. To Design inverting amplifier using OP-AMP & calculation of its gain.
2. To Design Non-inverting amplifier using OP-AMP & calculation of its gain.
3. To Design and study Op-Amp as adder.
4. To Design and study Op-Amp as Difference amplifier
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as Differentiator
7. To design an Astable Multivibrator using IC 555 Timer & calculation of its frequency.
8. To design a Monostable Multivibrator using IC 555 Timer& calculation of its pulse width.
9. To study the zero-crossing detector and comparator.
10. To study Schmitt trigger circuit using OP-AMP.

REFERENCES

1. Basic Electronics (Solid State): B. L. Theraja S. Chand & Company, 2000
2. A Textbook of Applied Electronics: R. S. Sedha , S. Chand Publications
3. Electronic Devices and Circuits: Allen Mottershed
4. Basic Electronics and linear circuits: Bhargava- Gupta , TMH
5. Electric Circuits: S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
6. Electronic Devices and Circuits: David A. Bell, 5th Edition 2015, Oxford University Press.
7. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, TMH
8. Integrated Electronics: J. Millman and C. C. Halkias, Tata McGraw Hill (2001)
9. Digital Principles and Applications: A.P. Malvino, D. P. Leach and Saha, 7th Ed., 2011, Tata McGraw Hill.
10. Fundamentals of Digital Circuits: Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
11. Digital Circuits and systems: Venugopal, 2011, Tata McGraw Hill.
12. Digital Systems: Principles & Applications: R. J. Tocci, N.S.Widmer, 2001, PHI.
13. Digital Fundamentals: Thomas L. Flyod, Pearson Education Asia (1994).
14. Digital Principles: R. L. Tokheim, Schaum's Outline Series, Tata McGraw Hill (1994).
15. A monograph on Electronics Design Principle: Integrated Circuits: K. R. Botkar.

B.SC.–II SEMESTER - IV

BELESS41: PAPER- I (BASIC COMMUNICATION ELECTRONICS)

OBJECTIVES:

1. To understand functioning of basic processes in communication systems.
2. To understand analogue modulation & demodulation techniques.
3. To understand transmission and reception systems.
4. To understand propagation of radio waves in communication systems.
5. To understand the process of analogue signal communication system.

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication
3. To provide opportunity to students to learn the latest trends in Electronics
4. To provide opportunities to the students to formulate, analyze and resolve the problems in Electronics Industry

Unit I **7.5 Hrs**

Communication systems: Introduction, Elements of communication system, Need of modulation, types of modulation, Frequency spectrum, TDM, FDM, Noise, signal to noise ratio, noise figure, and noise temperature, noise calculation in single and cascaded stages.

Unit II **7.5 Hrs.**

Modulation techniques: Time domain equation of AM wave, Modulation index, effects of over modulation, frequency spectrum and bandwidth, power and voltage calculations of AM signal, Suppressed carrier and single side band techniques, Time domain equation of FM wave, Modulation index, frequency spectrum and bandwidth, side bands, power of side bands, frequency deviation, merits and demerits of FM over AM.

Unit III **7.5 Hrs.**

Transmitters and Receivers: Specifications of transmitters, low level modulation, high level modulation, heterodyne type transmitters, SSB transmitter, FM transmitter, Armstrong method of FM generation, sensitivity, selectivity, fidelity of receiver, TRF receiver, super heterodyne AM receiver, selection of IF, IF amplifier circuits, AVC, FM receiver, Comparison of AM receiver and FM receiver

Unit IV **7.5 Hrs.**

Transmission Lines and Wave Propagation: Electrical equivalent of transmission lines, characteristic impedance, reflection coefficient, SWR, transmission line losses, impedance matching, Electromagnetic waves, wave polarization and its types, ground wave propagation, space wave propagation; LOS, sky wave propagation, ionosphere layers, critical frequency, MUF, virtual height.

BELESS42: PAPER- II (ANALOGUE AND DIGITAL CIRCUITS)

OBJECTIVES:

1. To study DAC and ADC used for data conversions in electronics system.
2. To elucidate and design regulated DC power supply for operating electronic devices.
3. To study PLL IC 565 and its applications.
4. To elaborate the role of transducers in Bioelectronics circuits.
5. To explore the knowledge of Analogue and Digital circuits and its uses.

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication
3. To provide opportunity to students to learn the latest trends in Electronics
4. To provide opportunities to the students to formulate, analyze and resolve the problems in Electronics Industry

Unit I **7.5 Hrs.**

D/A Converters: Need of converters, D/A converter parameters; range, resolution, linearity and speed, weighted and R-2R ladder type D/A using OP-AMP, its limitations.

A/D Converters: Single and dual slope, Counter type, successive approximation and flash type A/D converters, sampling theorem.

Unit II **7.5 Hrs.**

DC Power Supply: Concept of regulation, regulated PS, Zener regulator, feedback type regulated power supply, Series pass transistor, short circuit protection,

General features of IC regulators, advantages, Design of fixed and variable power supply, 78xx and 79xx series of ICS, LM 317, design of dual power supply, LM 317 as variable regulator, Limitations of linear regulator, Switching regulator; SMPS, Concept of Low Drop Out regulator; LDO.

Unit III **7.5 Hrs.**

PLL and its Applications: Operation of basic PLL circuit, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation, demodulation, Frequency synthesizing and Clock synchronization.

Unit IV **7.5 Hrs.**

Applications of Transducer: Tachometer types and principle of operation, Lux meter and Colorimeter using LDR, Insect Repellent using Piezobuzzer.

Biomedical Instrumentation: Introduction, electrodes, Man Instrument system, Block diagram and working of ECG, EEG and EMG, Shock hazards.

BELESS43: LABORATORY COURSE

At the time of Examination every student has to perform Total 2 Experiments compulsorily 1 from Practical I & 1 from Practical II

Practical- I (BASIC COMMUNICATION ELECTRONICS)

At least any 05 from the followings list.

1. To study Amplitude Modulator using Transistor/ Op-amp.
2. To study Frequency Modulator using Transistor/ Op-amp.
3. To study envelope of AM signal and calculation of ma.
4. To study AM Transmitter and Receiver.
5. To study FM Transmitter and Receiver.
6. To study TRF receiver.
7. To study super heterodyne receiver.
8. To study Time Division Multiplexing (TDM).
9. To study Frequency Division Multiplexing (FDM).
10. Study of transmission line and impedance matching.

Practical- II (ANALOGUE AND DIGITAL CIRCUITS)

At least any 05 from the followings list.

1. To study weighted resistor ADC using OP-AMP.
2. To study R-2R ladder ADC using OP-AMP.
3. To study counter DAC.
4. To study flash type DAC.
5. To design power supply using LM317.
6. To design power supply using 78xx and 79xx.
7. To study PLL AM detector.
8. To study FSK modulator.
9. To study characteristics of LDR.
10. To Study Insect Repellent using Piezobuzzer.
11. Study of VCO

REFERENCES

1. Communication Electronics: A. Kumar
2. Electronic Communications: D. Roddy and J. Coolen, Pearson Education India.
3. Advanced Electronics Communication Systems: Tomasi, 6th edition, Prentice Hall.
4. Electronic Communication systems: G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
5. Principles of Electronic communication systems: Frenzel, 3rd edition, McGraw Hill
6. Wireless communications: Andrea Goldsmith, 2015, Cambridge University Press
7. Electromagnetic waves and radiating systems: Jordan and Balmian, PHI.
8. Antenna and Wave propagation: K. D. Prasad, Pragati Prakashan, 2009
9. Microwave Devices and Circuits: Liao Y., Prentice Hall of India.
10. Microwave Engineering: S. Kulkarni, Umesh Publication, 2009.
11. Microwave principles: Reich, CBS, 1996.
12. Foundation of Microwave Engineering: Collin, 2nd cd. McGraw Hill, 1992.
13. Microwave Semiconductor Devices and Their Circuit Applications: Watson, McGraw Hill.
14. Antennas: J. D. Krauss, TMH.
15. Instrumentation, Measurements and Analysis: B.S. Nakara and K K Chaudhry (TMH)
16. Analog and Digital Techniques: G. N. Navneet
17. Electronic instruments and measurement techniques: W. D. Cooper and A.D.Helfrick (PHI)
18. Electronic Instruments: K.S. Kalsi (Tata Mc-Graw Hill)
19. Op-Amps and Linear circuits: Ramakant Gaikwad (PHI)
20. Operational Amplifiers and Linear ICs: Caughlin and Driscoll (PHI)
21. Operational Amplifier with Linear Integrated Circuit:W. D. Stanley (CBS Publications)
22. Integrated Electronics: K. R. Boatkar

B.SC.–III SEMESTER - V

BELETS51: PAPER- I (MODERN COMMUNICATION SYSTEMS)

OBJECTIVES:

1. To understand the concept optical communication and its operation
2. To understand various digital modulation and demodulation techniques.
3. To analyse the performance of digital communication system in terms of error rate and spectral efficiency
4. To understand the telecommunication traffic, channel and cellular capacity
5. To understand various application of cellular technology

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication
3. To provide opportunity to students to learn the latest trends in Electronics
4. To provide opportunities to the students to formulate, analyze and resolve the problems in Electronics Industry

Unit I **7.5 Hrs.**

Optical Sources and detector: Working principle and characteristics of LASER and Photo-detector, The evolution of fiber optic systems, block diagram, advantages of optical fiber communication and its applications

Transmission characteristics of optical fiber : Attenuation, absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion

Unit II **7.5 Hrs.**

Digital Communication and Digital Modulation: Introduction to digital communication, Sampling theorem, pulse modulation, pulse code modulation, delta modulation, Data coding, asynchronous transmission, synchronous transmission, error detection and correction, Amplitude shift keying(ASK), frequency shift keying (FSK), phase shift keying (PSK)

Unit III **7.5 Hrs.**

Satellite Communication: Introduction, Satellite orbits, geostationary satellites, Application of geostationary satellites, Satellite in Low & medium earth orbits, Satellite Telephone systems using LEO & MEO Satellites.

Unit IV **7.5 Hrs.**

Mobile Communication : Evolution of Mobile Radio Communication - Cellular concepts – Cellular systems operation – AMPS operation – Digital cellular mobile system – GSM standard and service aspects – GSM architecture, CDMA systems

BELETS52: PAPER- II (INTRODUCTION TO MICROPROCESSOR)

OBJECTIVES:

1. To understand importance of Microprocessors as a programmable digital system element in computer system.
2. To understand architecture and features of 8085 Microprocessor.
3. To explore some basic concepts of microprocessors through assembly language programming.
4. To grown-up the in-depth understanding of the operation of microprocessors and machine language programming & interfacing techniques.
5. To augmented the knowledge of interfacing the peripheral to increase the flexibility of microprocessor

OUTCOMES:

1. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
2. Utilize the basic knowledge of science Electronics and Communication
3. To provide opportunity to students to learn the latest trends in Electronics
4. To provide opportunities to the students to formulate, analyse and resolve the problems in Electronics Industry

Unit I **7.5 Hrs.**

8085 Microprocessor Architecture:

Introduction, Main features of 8085, Pin diagram and Architecture of 8085 Microprocessor, Internal registers Organization, Address and Data bus multiplexing, Flags, Instruction fetch and execution cycles.

Unit II **7.5 Hrs.**

Instruction Set:

Instruction Format 1 byte, 2 byte and 3 byte, Data transfer group, arithmetic group, logic group, branch control group, I/O and machine control group, Addressing modes.

Unit III **7.5 Hrs.**

Stack and Subroutines: Stack and its PUSH, POP operations, Need of subroutine, Subroutine calls and return operations, Delay loops.

Interfacing: Need of Interfacing, Address space portioning; memory mapped I/O and I/O mapped I/O, IN and OUT instruction.

Unit IV **7.5 Hrs.**

Interrupts: Hardware interrupts, software interrupts, priority structure of 8085 interrupts.

Modes of data transfer: Programme data transfer -synchronous and asynchronous, interrupt driven, DMA- cycle stealing and burst mode

PPI 8255: Block diagram of 8255 PPI, modes of operation, control word formats.

BELETS53: LABORATORY COURSE

At the time of Examination every student has to perform Total 2 Experiments compulsorily 1 from Practical I & 1 from Practical II

Practical- I (MODERN COMMUNICATION SYSTEMS)

At least any 05 from the followings list.

1. To Study of characteristics of LASER diode
2. To Study of characteristics of Photo detector
3. To Study of ASK
4. To Study of FSK
5. To Study of PSK
6. To perform time division multiplexing of four signals
7. To perform the characteristics of frequency synthesizer using PLL
8. To study the DTMF based load control system

Practical- II (INTRODUCTION TO MICROPROCESSOR)

Assembly Language Programming could be done using 8085 Microprocessor Kit OR on standard IDE simulator.

At least any 05 from the followings list.

List of experiment:-

1. Program based on data transfer group
2. Program based on arithmetic group
3. Program based on logical group
4. Program based on branch instruction group
5. Program based on stack operation.
6. Program based on subroutine.
7. Program based on machine control group
8. Study of PPI- 8255

REFERENCES

1. Communication Electronics: A. Kumar
2. Electronic Communications: D. Roddy and J. Coolen, Pearson Education India.
3. Advanced Electronics Communication Systems: Tomasi, 6th edition, Prentice Hall.
4. Electronic Communication systems: G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
5. Principles of Electronic communication systems: Frenzel, 3rd edition, McGraw Hill
6. Optical fibre communication by V S Bagad
7. Mobile Communication by John Schiller
8. Satellite communication by Gerard Maral and Michel Bousquets
9. Microprocessor Architecture Programming & applications with 8085: Ramesh S. Goankar, Prentice Hall.
10. Introduction to Microprocessor: Aditya. P. Mathur. Tata McGraw, New Delhi
11. Fundamentals of Microprocessor: Bedari Ram. Dhanpat Rai Publications, New Delhi
12. 8085 Microprocessor Architecture Prodgramming And Interfacing by Kumar and B S Umashankar, PEARSON INDIA
13. Microprocessor Organisation and Architecture, Leventhal L.A, Prentice Hall India.

B.SC.–III SEMESTER - VI

BELETS61: PAPER- I (PROGRAMMING IN 'C')

OBJECTIVES:

1. Develop their programming skills
2. Familiar with elements of C language
3. Understand operators, Expression and Pre-processors
4. Understand different decision making and concept of looping in C
5. Understand Array, Structure, Function and Pointers, their declaration and use

OUTCOMES:

1. Students will be able to use programming skills for solving problems which takes takes longer time otherwise
2. Able to see the application of programming for testing and validation.

Unit I **7.5 Hrs.**

Basics: History of C, Character set, C tokens, Constant, Variables, Keyword, Identifiers, C-operators, C-expressions, formatted input, formatted output instruction (simple program based on C)

Unit II **7.5 Hrs.**

Decision making and branching statement: simple if statement, if-else statement, else-if ladder statement, nested if-else statement, switch statement, break statement

Decision making and looping: while loop, do-while loop, for loop, continue statement

(Simple program based on above topic)

Unit III **7.5 Hrs.**

Array, strings, structure and union

Array: declaration and initialization of one dimensional and two dimensional arrays, Character array, accessing array element,

Standared string handling functions: strlen(), strcpy(), strcat(), strcmp()

Structure: defining, declaring and accessing, initialization of structure, array of structure

Union: defining, declaring and accessing, initialization of union

Unit IV **7.5 Hrs.**

Functions and Pointers

Function: Need of function, scope and lifetime of variable, delay function, function call, call by value, call by reference, return values, category of function, recursion

Pointers: defining pointer, declaring pointer variable, initialization of pointer variable, accessing address of variable, pointer expression, pointer arithmetic.

File Handling: concept of file Handling.

BELETS62: PAPER- II (MICROCONTROLLER 8051 AND ITS APPLICATIONS)

OBJECTIVES:

1. To understand architecture and features of 8051 Microcontroller.
2. To learn Programming of 8051 microcontroller.
3. To learn interfacing of 8051 Microcontroller with real world input and output devices.
4. To understand the coding and interfacing of 8051 with various IO devices.
5. To understand importance of Microcontrollers in atomization and control system

OUTCOMES:

5. Ability to design and conduct electronics experiments, as well as to analyse and interpret data
6. Utilize the basic knowledge of science Electronics and Communication
7. To provide opportunity to students to learn the latest trends in Electronics
8. To provide opportunities to the students to formulate, analyse and resolve the problems in Electronics Industry

Unit I **7.5 Hrs.**

8051 Microcontroller: Introduction, Difference between microprocessor and Microcontroller, Salient features of microcontroller 8051, Pin description, Block diagram, General purpose RAM, Bit addressable RAM and Register bank, Special function registers, Flags and PSW, A, B registers, Stack and Stack Pointer, Data Pointer, port registers, timer registers, serial port registers, interrupt registers, Oscillator & Clock, Program Counter, , Reset operation. I/O port structure.

Unit II **7.5 Hrs.**

Memory organization in 8051: Internal RAM /ROM and External RAM /ROM

Instruction Set of 8051: Data Transfer Instructions, Logical Operation, Arithmetic Operations, Boolean instructions, conditional and unconditional branching instructions, Various addressing modes.

Unit III **7.5 Hrs.**

Stack: stack operation and stack instruction

Subroutine; Concept and related instructions**-ACALL, LCALL RET, RETI,**

Delay subroutine and calculations for delay generation

Interrupts in 8051: Sources of interrupts, vector table, enabling and disabling, TCON and IE registers, interrupt priority, IP register, handling external interrupts;, **Timmers in 8051**: use of timers, programming concept of timers.

Unit IV **7.5 Hrs.**

Interfacing with 8051: Key bouncing, hardware and software debouncing techniques, interfacing of 4x 4 key matrix, LED, Seven segment display,16x2 LCD, ADC (0804), DAC (0808), Relay, interfacing of switch and LED, serial communication using 8051 microcontroller, programming concept for receiving and transmitting data serially

BELETS63: LABORATORY COURSE

At the time of Examination every student has to perform Total 2 Experiments compulsorily 1 from Practical I & 1 from Practical II.

Practical- I (PROGRAMMING IN 'C')

At least any 05 from the followings list.

1. Program related to use of scanf(), printf(), variable, initialization and declaration
2. Program related to use of arithmetic, relational, conditional and logical operators
3. Program related to use of if, if-else, nested if, switch statement
4. Program related to use of for loop, while loop, do-while loop, continue, goto, break statement
5. Program related to use of one dimensional array
6. Program related to use of two dimensional array
7. Program related to use of function
8. Program related to use of recursion function
9. Program related to use of standard string function
10. Program related to structure in C
11. Program related to pointer in C

Practical- II (MICROCONTROLLER 8051 AND ITS APPLICATIONS)

At least any 05 from the followings list.

1. Arithmetic operations using 8051.
2. Logical operations using 8051.
3. Study of timers of 8051 in mode 1 and mode 2.
4. Use one of the four ports of 8051 for O/P interfaced to eight LED's.
5. LED blink.
6. Single blink on key I/P
7. 16x2 LCD interface
8. Simulate binary counter (8 bit) on LED's.
9. DAC 0808 interfacing to 8051.
10. ADC 0804 interfacing to 8051.
11. Relay interfacing to 8051
12. Stepper Motor Interface.

REFERENCES

1. Let us C Y.Kanetkar
2. Gate to C programming Kishor S B, Vilas Ghodki and Madhavi
3. C in depth Shrivastava BPB publication
4. Programming in ANSI C Balgurusamy Tata McGraw Hill
5. Programming with C Byron Gottfried Schaums outline series Tata McGraw Hill
6. Microcontroller, Architecture, Programming and Applications: Kenneth J. Ayala
7. The 8051 Microcontroller, Architecture, Programming and Application: Myke Predko.
8. The 8051 Microcontroller and Embedded Systems: M. A. Mazadi, J. G. Mazadi, Pearson Education, Asia.
9. The 8051 Microcontroller And Embedded Systems, Using Assembly and C: Kenneth J. Ayala, Dhanjay V. Gadre.
10. PIC microcontroller and Embedded Systems using assembly and C for PIC 18: Muhammad Ali Mazadi et al. Pearson Education publication, 1st Edition, Fourth Impression 2011(Indian Edition).
11. C and the 8051: Programming and Multitasking: Schultz, P T R Prentice-Hall, Inc. Embedded C, Michael J. Pont.