MANGALORE UNIVERSITY

CHOICE BASED CREDIT SYSTEM

COURSE PATTERN AND SCHEME OF EXAMINATION

CORE SUBJECT: ELECTRONICS

		Particulars	Instruction Hours/ week	Duration of the Examination (Hrs)	Max. Marks			Credits
					IA	Exam	Total	
I Semester								
Group I Core Subject	Theory BSCELC 131	Basic Circuit Theory and Network Analysis	4	3	20	80	100	2
	Practical BSCELP 132	Practical 1	3	3	10	40	50	1
Group II Elective	BSCELCE 133	General Electronics	2	3	10	40	50	1*
Total Number of Credits for Core Subject in I Semester: 04								
II Semester								
Group I Core Subject	BSCELC 181	Electronics Circuits	4	3	20	80	100	2
	BSCELP 182	Practical 2	3	3	10	40	50	1
Group II Elective	BSCELCE 183	Electronic Applications	2	3	10	40	50	1*
Total Number of Credits for Core Subject in II Semester: 04								
III Semester								
Group I Core Subject	BSCELC 231	Operational Amplifiers and Applications	4	3	20	80	100	2
	BSCELP 232	Practical 3	3	3	10	40	50	1
Group II Elective	BSCELCE 233	Basic Electronics	2	3	10	40	50	1*
Total Number of Credits for Core Subject in III Semester: 04								
IV Semester								
Group I Core Subject	BSCELC 281	Digital Electronics and VHDL	4	3	20	80	100	2
	BSCELP 282	Practical 4	3	3	10	40	50	1
Group II Open Elective	BSCELOE 283	Electronic Communication	2	3	10	40	50	1*
Total Number of Credits for Core Subject in IV Semester: 04								
V Semester								
Group I Core Subject	BSCELC 331	C Programming and Data Structures	4	3	20	80	100	2
	BSCELP 333	Practical 5	3	3	10	40	50	1
Group I Core Subject	BSCELC 332	Microprocessor and Microcontroller	4	3	20	80	100	2
	BSCELP 334	Practical 6	3	3	10	40	50	1
Total Number of Credits for Core Subject in V Semester: 06								

VI Semester								
Group I Core Subject	BSCELC 381	Communication Electronics	4	3	20	80	100	2
	BSCELP 383	Practical 7	3	3	10	40	50	1
Group I Core Subject	BSCELC 382	Digital Signal Processing	4	3	20	80	100	2
	BSC ELP 384	Practical 8	3	3	10	40	50	1
Total Number of Credits for Core Subject in VI Semester: 06								
OR								
	Subject code	**Title**	**Marks**					**Credits**
			IA	**Dissertation/Viva**			**Total**	
Project Work	BSCELP 385	Project Work	40	160			200	4
		Project Demonstration+ Report	20	80			100	2
Total Number of Credits for Core Subject in VI Semester:06								
Total number of Credits for Core Subject in I – VI Semester : 28								

* Credits for Elective paper will be considered for the entire B Sc Programme

I Semester

BSCELC 131 : BASIC CIRCUIT THEORY AND NETWORK ANALYSIS

Total 48 Hours

Unit- 1

Basic Circuit Concepts: Voltage and Current Sources, Resistors: Fixed and Variable resistors, Construction and Characteristics, Color coding of resistors, resistors in series and parallel. Inductors: Fixed and Variable inductors, Self and mutual inductance, Faraday's law and Lenz's law of electromagnetic induction, Energy stored in an inductor, Inductance in series and parallel, Testing of resistance and inductance using multimeter. Capacitors: Principles of capacitance, Parallel plate capacitor, Permittivity, Definition of Dielectric Constant, Dielectric strength, Energy stored in a capacitor, Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic capacitor, Construction and application, capacitors in series and parallel, factors governing the value of capacitors, testing of capacitors using multimeter. **(12 Hours)**

Unit- 2

Circuit Analysis: Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis, Star-Delta Conversion. **DC Transient Analysis:** RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits With Sources, DC Response of Series RLC Circuits. **(12 Hours)**

Unit-3

AC Circuit Analysis: Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Voltage-Current relationship in Resistor, Inductor and Capacitor, Phasor, Complex Impedance, Power in AC Circuits: Instantaneous Power, Average Power, Reactive Power, PowerFactor. Sinusoidal Circuit Analysis for RL, RC and RLC Circuits Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth. Passive Filters: Low Pass, High Pass, Band Pass and Band Stop. **(12 Hours)**

Unit-4

Network Theorems: Principal of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem,Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem. AC circuit analysis using Network theorems. Two Port Networks: Impedance (Z) Parameters, Admittance (Y) Parameters, Transmission (ABCD) Parameters. **(12-Hours)**

Text books:

1. S. A. Nasar, Electric Circuits, Schaum's outline series, Tata McGraw Hill (2004)
2. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill.(2005)
3. Robert L. Boylestad, Essentials of Circuit Analysis, Pearson Education (2004)
4. W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill(2005)
5. Alexander and M. Sadiku, Fundamentals of Electric Circuits , McGraw Hill (2008)

I Semester

BSCELP 132 : PRACTICAL 1

Note: Using Hardware and Circuit Simulation Software

1. Familiarization with
   a) Resistance in series, parallel and series – Parallel.
   b) Capacitors & Inductors in series & Parallel.
   c) Multimeter – Checking of components.
   d) Voltage sources in series, parallel and series – Parallel
   e) Voltage and Current dividers

2. Measurement of Amplitude, Frequency & Phase difference using CRO.
3. Verification of Kirchoff's Law.
4. Verification of Norton's theorem.
5. Verification of Thevenin's Theorem.
6. Verification of Superposition Theorem.
7. Verification of the Maximum Power Transfer Theorem.
8. RC Circuits: Time Constant, Differentiator, Integrator.
9. Designing of a Low Pass RC Filter and study of its Frequency Response.
10. Designing of a High Pass RC Filter and study of its Frequency Response.
11. Study of the Frequency Response of a Series LCR Circuit and determination of its
    (a) Resonant Frequency
    (b) Impedance at Resonance
    (c) Quality Factor Q
    (d) Band Width.

I Semester

BSCELCE 133 : GENERAL ELECTRICALS

Total 24 Hours

Unit 1

Generation and distribution of electricity: Introduction to Electricity. Difference between electrical systems and electronics. Mention of hydro electric generator, diesel generator, thermal generator, wind power, solar, ocean waves.
Circuit Breaker: Air Break Circuit Breaker, Bulk oil and Minimum Oil Circuit Breaker, Vacuum Circuit Breaker. **(12 Lectures)**

Unit 2

Generation of DC power – Mention of batteries. Characteristics of AC – Voltage (rms, peak, peak to peak), Current (rms, peak, peak to peak), Power, Energy, frequency and period. Single phase, Two phase and Three phase. Transformers. Highlight the importance of transformers in transmission and distribution of electric power. Power transmission and distribution. **(12 Lectures)**

Text books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, TMH, 1st Edition, Revised
2. Electrical Technology, Edward Hughes, Pearson, 10th Edition, 2014.
3. Fundamentals of Electrical Engineering, Rajendra Prasad PHI, Third Edition 2014.
4. Basic Electrical Engineering, AbhijitChakrabarti, Chandan Kumar Chanda, Sudiptanath TMH, 1st Edition 2010.
5. Fundamentals of Electrical Engineering and Electronics, B. L. Theraja S. Chand & Company Ltd, Reprint Edition 2013.

II Semester

BSCELC 181 - ELECTRONICS CIRCUITS

Total 48 Hours

Unit- 1

Diode Circuits: Ideal diode, piecewise linear equivalent circuit, dc load line analysis, Quiescent (Q) point. Clipping and clamping circuits. Rectifiers: HWR, FWR (center tapped and bridge). Circuit diagrams, working and waveforms, ripple factor & efficiency, comparison. Filters: types, circuit diagram and explanation of shunt capacitor filter with waveforms. Zener diode regulator circuit diagram and explanation for load and line regulation, disadvantages of Zener diode regulator.

(12 Hours)

Unit- 2

Bipolar Junction Transistor: PNP and NPN Transistors, Basic Transistor Action, CE, CB Characteristics and regions of operation. Hybrid parameters. Transistor biasing, DC load line, operating point, thermal runaway, stability and stability factor, Fixed bias without and with RE, collector to base bias, voltage divider bias and emitter bias (+VCC and –VEE bias), circuit diagrams and their working. Transistor as a switch, circuit and working**,** Darlington pair and its applications. BJT amplifier (CE), dc and ac load line analysis, hybrid model of CE configuration, Quantitative study of the frequency response of a CE amplifier, Effect on gain and bandwidth for Cascaded CE amplifiers (RC coupled). (**12 Hours)**

Unit- 3

Feedback Amplifiers: Concept of feedback, negative and positive feedback, advantages and disadvantages of negative feedback, voltage (series and shunt), current (series and shunt) feedback amplifiers, gain, input and output impedances . Barkhausen criteria for oscillations, Study of phase shift oscillator, Colpitts oscillator and Hartley oscillator. **(12 Hours)**

Unit- 4

Field Effect Transistors: JFET, Construction, Idea of Channel Formation, Pinch-Off and Saturation Voltage,Current-Voltage Output Characteristics. MOSFET, types of MOSFETs, Circuit symbols, Working and Characteristic curves of Depletion type MOSFET (both N channel and P Channel) and Enhancement type. **Power Amplifiers:** Difference between voltage and power amplifier, classification of power amplifiers, ClassA, Class B, Class C and their comparisons. Operation of a Class A single ended power amplifier. Operation of Transformer coupled Class A power amplifier, overall efficiency. Circuit operation of complementary symmetry Class B push pull power amplifier, crossover distortion, heat sinks. **(12 Hours)**

Text Books:

1. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013, PHI
2. Electronic devices, David A Bell, Reston Publishing Company
3. D. L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, Tata McGraw Hill (2002)
4. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill (2002)
5. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
6. J. R. C. Jaegar and T. N. Blalock, Microelectronic Circuit Design, Tata McGraw Hill (2010)
7. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)
8. Allen Mottershed, Electronic Devices and Circuits, Goodyear Publishing Corporation

II Semester

BSCELP 182 : PRACTICAL 2

Note: Using Hardware and Circuit Simulation Software

1. Study of the half wave rectifier and Full wave rectifier.
2. Study of power supply using C filter and Zener diode.
3. Designing and testing of 5V/9 V DC regulated power supply and find its load-regulation
4. Study of clipping and clamping circuits .
5. Study of Fixed Bias, Voltage divider and Collector-to-Base bias Feedback configuration For transistors.
6. Designing of a Single Stage CE amplifier.
7. Study of Class A, B and C Power Amplifier.
8. Study of the Colpitt's Oscillator.
9. Study of the Hartley's Oscillator.
10. Study of the Phase Shift Oscillator
11. Study of the frequency response of Common Source FET amplifier.

II Semester

BSCELCE 183 : ELECTRIC APPLICATIONS

Total 24 Hours

Unit 1

Domestic electrical wiring – connection from AC line to the meter, mention of switch, purpose of fuse, sockets. Elementary discussion on Circuit protective devices: fuse and Miniature Circuit Breaker (MCB's). Mention of phase neutral and the need of earthing, types of earthing: pipe and plate earthing. Electric shock, precautions against shock, Residual current circuit breaker (RCCB).

(12 Lectures)

Unit 2

Mention of power type (ac or dc) and current ratings for home appliances (lighting bulbs, iron box, mixer grinder, refrigerator, mobile charger, TV, microwave oven, washing machine, fan, induction stove etc.,)., simple calculations of power consumptions of various electric home appliances, mention of tester. Electric motor working principle. Construction and working principle of microphone and loud speaker. Power saving measures. **(12 Lectures)**

Reference books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, TMH, 1st Edition, Revised
2. Electrical Technology, Edward Hughes, Pearson, 10th Edition, 2014.
3. Fundamentals of Electrical Engineering, Rajendra Prasad PHI, Third Edition 2014.
4. Basic Electrical Engineering, AbhijitChakrabarti, Chandan Kumar Chanda, Sudiptanath TMH, 1st Edition 2010.
5. Fundamentals of Electrical Engineering and Electronics, B. L. Theraja S. Chand & Company Ltd, Reprint Edition 2013.

III Semester

BSCELC 231 : OPERATIONAL AMPLIFIERS AND APPLICATIONS

Total 48 Hours

Unit-1

Basic Operational Amplifier: Concept of differential amplifiers (Dual input balanced and unbalanced Output) block diagram.

Op-Amp parameters: Block diagram of an operational amplifier (IC 741), input offset voltage, input offset current, input bias current, differential input resistance, input capacitance, offset voltage adjustment range, input voltage range, common mode rejection ratio, slew rate, supply voltage rejection ratio. **(12 Hours)**

Unit-2

Op-Amp Circuits: Open and closed loop configuration, Frequency response of an op-amp in open loop and closed loop configurations, Inverting, Non-inverting, Summing and difference amplifier, Integrator, Differentiator, Voltage to current converter, Current to voltage converter. **Comparators:** Basic comparator, Level detector, Voltage limiters, Schmitt Trigger. **(12 Hours)**

Unit-3

Signal generators: Phase shift oscillator, Wein bridge oscillator, Square wave generator, triangle wave generator, saw tooth wave generator, and Voltage controlled oscillator(IC 566).

Signal Conditioning circuits: Sample and hold systems, Active filters: First order low pass and high pass butterworth filter, Second order filters, Band pass filter, Band reject filter, All pass filter.

(12 Hours)

Unit-4

Multivibrators (IC 555): Block diagram, Astable and monostable multivibrator circuit, Applications of Monostable and Astable multivibrators. Phase locked loops (PLL): Block diagram, phase detectors, IC565.

Fixed and variable IC regulators: IC 78xx and IC 79xx -concepts only, IC LM317- output voltage equation (**12 Hours**)

Text Books:

1. R. A. Gayakwad, Op-Amps and Linear IC's, Pearson Education (2003)
2. R. F. Coughlin and F. F. Driscoll, Operational amplifiers and Linear Integrated circuits, PearsonEducation (2001)
3. J. Millman and C.C. Halkias, Integrated Electronics, Tata McGraw-Hill,(2001)
4. A.P.Malvino, Electronic Principals,6th Edition , Tata McGraw-Hill,(2003)
5. K.L.Kishore,OP-AMP and Linear Integrated Circuits, Pearson(2011)

III Semester

BSCELP 232: PRACTICAL 3

1. Study of op-amp characteristics: CMRR and Slew rate.
2. Designing of an amplifier of given gain for an inverting and non-inverting configuration using an opamp.
3. Designing of analog adder and subtractor circuit.
4. Designing of an integrator using op-amp for a given specification and study its frequency response.
5. Designing of a differentiator using op-amp for a given specification and study its frequency response.
6. Designing of a First Order Low-pass filter using op-amp.
7. Designing of a First Order High-pass filter using op-amp.
8. Designing of a RC Phase Shift Oscillator using op-amp.
9. Study of IC 555 as an astable multivibrator.
10. Study of IC 555 as monostable multivibrator.
11. Designing of Fixed voltage power supply using IC regulators using 78 series and 79 series

III Semester

BSCELCE233 : BASIC ELECTRONICS

Total 24 Hours

Unit 1

Introduction to Electronics: Evolution of Electronics, Analog and Digital Electronics, Mention of analog and digital devices. Advantages of digital systems and devices.
Electronic components: Resistor, Capacitor, Inductor, rectifier diode, Zener diode, Light Emitting Diode, BJT, Integrated Circuit. **(12 Lectures)**

Unit 2

Measuring devices: Voltmeter, Ammeter, Multimeter, Cathode Ray oscilloscope (Analog and Digital), Power meter, Watt – hour meter.
Regulated power supply: Bridge rectifier, Filter, Regulator IC (by mentioning 7805, 7809, 7812), Inverter, Uninterrupted Power supply (UPS) – online and off line UPS, SMPS. **(12 Lectures)**

Text books:

1. A Text book of Electronics, R.S.Sedha, S Chand and Co., Multicolour,3rdedition, 2012.
2. Electronic Principles , Albert Malvino& David J Bates, TMH, 7th edition-2010
3. Introductory circuit analysis, Robert Boylstead, PHI 5th edition-2010.
4. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9thEdition, 2013, PHI
5. Basic electronics- B.L. Theraja - S. Chand and Co. 3rd edition -2012.
6. Basic Electronics and Linear circuits, N.N. Bhargava, D.C. Kulshresta and D.C Gupta-TMH.
7. Electronic devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ.
8. Electronic devices, applications and Integrated circuits, Mathur, Kulshreshta and Chadha, Umesh Publications

IV Semester

BSCELC 281 : DIGITAL ELECTRONICS AND VHDL

Total 48 Hours

Unit-1

Number System and Codes: Decimal, Binary, Hexadecimal and Octal number systems, base conversions, Binary, octal and hexadecimal arithmetic (addition, subtraction by complement method, multiplication), representation of signed and unsigned numbers, Binary Coded Decimal code. **Logic Gates and Boolean algebra**: Introduction to Boolean Algebra and Boolean operators, Truth Tables of OR, AND, NOT, Basic postulates and fundamental theorems of Boolean algebra, Truth tables, construction and symbolic representation of XOR, XNOR, Universal (NOR and NAND) gates. **(12 Hours)**

Unit-2

Digital Logic families: Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit, Speed power product, TTL and CMOS families and their comparison. **Combinational Logic Analysis and Design**: Standard representation of logic functions (SOP and POS), Karnaugh map minimization, Encoder and Decoder, Multiplexers and Demultiplexers, Implementing logic functions with multiplexer, binary Adder, binary subtractor, parallel adder/subtractor. **(12 Hours)**

Unit-3

Sequential logic design: Latches and Flip flops , S-R Flip flop, J-K Flip flop, T and D type Flip flop, Clocked and edge triggered Flip flops, master slave flip flop, Registers, Counters (synchronous and asynchronous and modulo-N), State Table, State Diagrams, counter design using excitation table and equations. , Ring counter and Johnson counter **(12 Hours)**

Unit-4

Introduction to VHDL: A Brief History of HDL, Structure of HDL Module, Comparison of VHDL and Verilog, Introduction to Simulation and Synthesis Tools, Test Benches. VHDL Modules, Delays, data flow style, behavioral style, structural style, mixed design style, simulating design. Introduction to Language Elements, Keywords, Identifiers, White Space Characters, Comments, format. VHDL terms, describing hardware in VHDL, entity, architectures, concurrent signal assignment, event scheduling, statement concurrency, structural designs, sequential behavior, process statements, process declarative region, process statement region, process execution, sequential statements, architecture selection, configuration statements, power of configurations. **Behavioral Modeling**: Introduction to behavioral modeling, inertial delay, transport delay , inertial delay model, transport delay model, transport vs inertial delay, simulation delta drivers, driver creation, generics, block statements, guarded blocks. **Sequential Processing:** Process statement, sensitivity list, signal assignment vs variable assignment, sequential statements, IF, CASE ,LOOP, NEXT, ,EXIT and ASSERT statements, assertion BNF, WAIT ON signal, WAIT UNTIL expression, WAIT FOR time expression, multiple wait conditions, WAIT Time-Out, Sensitivity List vs WAIT Statement Concurrent Assignment, Passive Processes. **Data types:** Object types-signal, variable, constant, Data types –scalar types, composite types, incomplete types, File Type caveats, subtypes, Subprograms and functions **(12 Hours)**

Text Books:

1. M. Morris Mano Digital System Design, Pearson Education Asia,(Fourth Edition)
2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
3. W H Gothmann, Digital Electronics: An Introduction To Theory And Practice, Prentice Hall of India(2000)
4. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)
5. A Verilog HDL Primer – J. Bhasker, BSP, 2003 II Edition.
6. Verilog HDL-A guide to digital design and synthesis-Samir Palnitkar, Pearson, 2nd edition.

IV Semester

BSCELP 282 : PRACTICAL 4

Note: Using Hardware

1. To verify and design AND, OR, NOT and XOR gates using NAND gates.
2. To convert a Boolean expression into logic gate circuit and assemble it using logic gate IC's.
3. Design a Half and Full Adder.
4. Design a Half and Full Subtractor.
5. Design a seven segment display driver.
6. Design a 4 X 1 Multiplexer using gates.
7. To build a Flip- Flop Circuits using elementary gates. (RS, Clocked RS, D-type).
8. Design a counter using D/T/JK Flip-Flop.
9. Design a shift register and study Serial and parallel shifting of data.

Experiments in VHDL

Note: Using Circuit Simulation Software

1. Write code to realize basic and derived logic gates.
2. Half adder, Full Adder using basic and derived gates.
3. Half subtractor and Full Subtractor using basic and derived gates.
4. Clocked D FF, T FF and JK FF (with Reset inputs).
5. Multiplexer (4x1, 8x1) and Demultiplexer using logic gates.
6. Decoder (2x4, 3x8), Encoders and Priority Encoders.
7. Design and simulation of a 4 bit Adder.
8. Code converters (Binary to Gray and vice versa).
9. 2 bit Magnitude comparator.
10. 3 bit Ripple counter.

IV Semester

BSCELOE 283 : ELECTRONIC COMMUNICATION (OPEN ELECTIVE)

Total 24 Hours

Unit 1

Basic concept of AM and FM systems with discussion on advantages and disadvantages, Modes of radio wave communication, AM radio, FM radio with emphasis on frequency (wave-length) bands, **Satellite communication:** Introduction, advantages and disadvantages of satellite communication, Kepler'slaws of planetary motion,Basic block diagram, earths orbit, explanation of geo-stationary satellites. **(12 Lectures)**

Unit 2

RADAR. Software defined radio, Mobile Cellular Communications: Evolution to cellular networks – Cellular systems generations and standards: 1G, 2G, 3G, and 4G - Cellular network components. **(12 Lectures)**

Text books:

1. S.Haykin, ―Communication Systems, 4/e, John Wiley 2007
2. B.P.Lathi, ―Modern Digital and Analog Communication Systems, 3/e, Oxford University Press,2007
3. Rappaport Theodore S - Wireless Communications: Principles and Practice, 2/E, Pearson . Education India, 2010
4. Vijay. K. Garg, ―Wireless Communication and Networking, Morgan Kaufmann, Publishers, 2007.
5. T.Pratt, C. Bostian and J.Allnutt; ―Satellite Communications, John Wiley and Sons, Second Edition., 2003
6. M. I .Skolnik ―Introduction to Radar Systems, Tata McGraw Hill 2006.
7. Myron Kyton and W.R.Fried ―Avionics Navigation Systems, John Wiley & Sons 1997.

V Semester

BSCELC 331 : C PROGRAMMING AND DATA STRUCTURES

Total 48 Hours

Unit- 1

C Programming Language: Introduction, Importance of C, Character set, Tokens, keywords, identifier, constants, basic data types, variables: declaration & assigning values. Structure of C program Arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bit wise operators, expressions and evaluation of expressions, type cast operator, implicit conversions, precedence of operators. Arrays-concepts, declaration, accessing elements, storing elements, two-dimensional and multi-dimensional arrays. Input output statement and library functions**.** **(12 Hours)**

Unit-2

Decision making, branching & looping: Decision making, branching and looping: if, if-else, else-if, switch statement, break, for loop, while loop and do loop. Functions: Defining functions, function arguments and passing, returning values from functions.
Structures: defining and declaring a structure variables, accessing structure members, initializing a structure, copying and comparing structure variables, array of structures, arrays within structures, structures within structures, structures and function, pointers. **(12 Hours)**

Unit-3

Introduction to C++: Object oriented programming, characteristics of an object-oriented language.
Data Structures: Definition of stack, array implementation of stack, conversion of infix expression to prefix, postfix expressions, evaluation of postfix expression. Definition of Queue, Circular queues, Array implementation of queues. Linked List and its implementation, Link list implementation of stack and queue, Circular and doubly linked list. **(12 Hours)**

Unit-4

Searching and sorting: Insertion sort, selection sort, bubble sort, merge sort, linear Search, binary search.
Trees : Introduction to trees, Binary search tree, Insertion and searching in a BST, preorder, postorder and inorder traversal (recursive) **(12 Hours)**

Text Books:

1. Yashavant Kanetkar, Let Us C , BPB Publications
2. Programming in ANSI C, Balagurusamy, 2nd edition, TMH.
3. Byron S Gottfried, Programming with C , Schaum Series
4. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, Prentice Hall
5. Yashavant Kanetkar, Pointers in C, BPB Publications
6. S. Sahni and E. Horowitz, “Data Structures”, Galgotia Publications
7. Tanenbaum: “Data Structures using C”, Pearson/PHI.
8. Ellis Horowitz and Sartaz Sahani “Fundamentals of Computer Algorithms”, Computer Science Press.

V Semester

BSCELP 333 : PRACTICAL 5

Note: Programming in C and data structure

1. Generate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. Find minimum and maximum of N numbers.
3. Find the GCD of two integer numbers.
4. Calculate factorial of a given number.
5. Find all the roots of a quadratic equation Ax2 + Bx + C = 0 for non – zero coefficients A, B and C . Else report error.
6. Calculate the value of sin (x) and cos (x) using the series. Also print sin (x) and cos (x) value using library function.
7. Generate and print prime numbers up to an integer N.
8. Sort given N numbers in ascending order.
9. Find the sum & difference of two matrices of order MxN and PxQ.
10. Find the product of two matrices of order MxN and PxQ.
11. Find the transpose of given MxN matrix.
12. Find the sum of principle and secondary diagonal elements of the given MxN matrix.
13. Calculate the subject wise and student wise totals and store them as a part of the structure.
14. Maintain an account of a customer using classes.
15. Implement linear and circular linked lists using single and double pointers.
16. Create a stack and perform Pop, Push, Traverse operations on the stack using Linear Linked list
17. Create circular linked list having information about a college and perform Insertion at front, Deletion at end.
18. Create a Linear Queue using Linked List and implement different operations such as Insert, Delete, and Display the queue elements.
19. Implement polynomial addition and subtraction using linked lists.
20. Implement sparse matrices using arrays and linked lists.
21. Create a Binary Tree to perform Tree traversals (Preorder, Postorder, Inorder) using the concept of recursion.
22. Implement binary search tree using linked lists. Compare its time complexity over that of linear search.
23. Implement Insertion sort, Merge sort, Bubble sort, Selection sort.

V Semester

BSCELC 332 : MICROPROCESSOR AND MICROCONTROLLER

Total 48 Hours

Unit-1

Microcomputer Organization: Input/Output Devices. Data storage (idea of RAM and ROM), Computer memory, Memory organization & addressing, Memory Interfacing, Memory Map.
8085 Microprocessor Architecture: Main features of 8085. Block diagram. Pin-out diagram of 8085. Data and address buses. Registers. ALU. Stack memory. Program counter. **(12 Hours)**

Unit-2

8085 Programming : Instruction classification, Instructions set (Data transfer including stacks. Arithmetic, logical, branch, and control instructions). Subroutines, delay loops. Timing & Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI. Hardware and software interrupts. **(12 Hours)**

Unit-3

8051 microcontroller: Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.
8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description & their functions, I/O port programmingmin 8051 (using assembly language), I/O programming: Bit manipulation**.** **(12 Hours)**

Unit-4

8051 Programming: 8051 addressing modes and accessing memory locations using various addressing modes, assembly language instructions using each addressing mode, arithmetic and logic instructions, 8051 programming in C: for time delay & I/O operations and manipulation, for arithmetic and logic operations, for ASCII and BCD conversions.
Introduction to embedded system: Embedded systems and general purpose computer systems. Architecture of embedded system. Classifications, applications and purpose of embedded systems.
(12 Hours)

Text Books:

1. Microprocessor Architecture Programming & applications with 8085, 2002, R.S. Goankar, Prentice Hall.
2. Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill
3. 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.
4. Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press
5. 8051 microcontrollers, Satish Shah, 2010, Oxford University Press.
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

V Semester

BSCELP 334 : PRACTICAL 6

Experiments using 8051 microcontroller:

1. Write a program to demonstrate addressing modes
2. Write a program to perform arithmetic operation
3. Write a program to find largest and smallest
4. Write a program to sort an given array.
5. To find that the given numbers is prime or not.
6. To find the factorial of a number.
7. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
8. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's .
9. Program to glow the first four LEDs then next four using TIMER application.
10. Program to rotate the contents of the accumulator first right and then left.

VI Semester

BSCELC 381 : COMMUNICATION ELECTRONICS

Total 48 Hours

Unit-1

Electronic communication: Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.

Analog Modulation: Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection. Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super heterodyne receiver

(12 Hours)

Unit-2

Analog Pulse Modulation: Channel capacity, Sampling theorem, Basic Principles- PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing.

Digital Pulse Modulation: Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK). (**12 Hours**)

Unit-3

Introduction to Communication and Navigation systems: Satellite Communication Introduction, need, Geosynchronous satellite orbits, geostationary satellite advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink**.** **(12 Hours)**

Unit-4

Mobile Telephony System – Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only). GPS navigation system (qualitative idea only)

(12 Hours)

Reference Books:

1. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
2. Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
3. Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011,Oxford University Press.
4. Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
5. Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill Communication Systems, S. Haykin, 2006, Wiley India Electronic Communication system, Blake, Cengage, 5th edition.
6. Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press

VI Semester

BSCELP 383 : PRACTICAL 7

COMMUNICATION ELECTRONICS LAB

1. To design an Amplitude Modulator using Transistor
2. To study envelope detector for demodulation of AM signal
3. To study FM - Generator and Detector circuit
4. To study AM Transmitter and Receiver
5. To study FM Transmitter and Receiver
6. To study Time Division Multiplexing (TDM)
7. To study Pulse Amplitude Modulation (PAM)
8. To study Pulse Width Modulation (PWM)
9. To study Pulse Position Modulation (PPM)
10. To study band pass and band stop filter using Op-amp

VI Semester

BSCELC 382 : DIGITAL SIGNAL PROCESSING

Total 48 Hours

Unit-1

Discrete-Time Signals and Systems: Classification of Signals, Transformations of the Independent Variable, Periodic and Aperiodic Signals, Energy and Power Signals, Even and Odd Signals, Discrete-Time Systems, System Properties. Impulse Response, Convolution Sum; Graphical Method; Analytical Method, Properties of Convolution; Commutative; Associative; Distributive; Shift; Sum Property System Response to Periodic Inputs, Relationship Between LTI System Properties and the Impulse Response; Causality; Stability; Invertibility, Unit Step Response

Discrete-Time Fourier Transform: Fourier Transform Representation of Aperiodic Discrete-Time Signals, Periodicity of DTFT, Properties; Linearity; Time Shifting; Frequency Shifting; Differencing in Time Domain; Differentiation in Frequency Domain; Convolution Property.

(12 Hours)

Unit-2

The *z*-Transform: Bilateral (Two-Sided) *z*-Transform, Inverse *z*-Transform, Relationship Between *z*-Transform and Discrete-Time Fourier Transform, *z*-plane, Region-of-Convergence; Properties of ROC, Properties; Time Reversal; Differentiation in the *z*-Domain; Power Series Expansion Method (or Long Division Method); Analysis and Characterization of LTI Systems; Transfer Function and Difference-Equation System.

Filter Concepts: Phase Delay and Group delay, Zero-Phase Filter, Linear-Phase Filter, Simple FIR Digital Filters, Simple IIR Digital Filters, All pass Filters, Averaging Filters, Notch Filters.

(12 Hours)

Unit-3

Discrete Fourier Transform: Frequency Domain Sampling (Sampling of DTFT), The Discrete Fourier Transform (DFT) and its Inverse, DFT as a Linear transformation, Properties; Periodicity; Linearity; Circular Time Shifting; Circular Frequency Shifting; Circular Time Reversal; Multiplication Property; Parseval's Relation, Linear Convolution Using the DFT (Linear Convolution Using Circular Convolution), Circular Convolution as Linear Convolution with aliasing.

Fast Fourier Transform: Direct Computation of the DFT, Symmetry and Periodicity Properties of the Twiddle factor (*WN*), Radix-2 FFT Algorithms; Decimation-In-Time (DIT) FFT Algorithm; Decimation-In-Frequency (DIF) FFT Algorithm, Inverse DFT Using FFT Algorithms

(12 Hours)

Unit-4

Realization of Digital Filters: Non Recursive and Recursive Structures, Canonic and Non Canonic Structures, Equivalent Structures (Transposed Structure), FIR Filter structures; Direct-Form; Cascade-Form; Basic structures for IIR systems; Direct-Form I.

Finite Impulse Response Digital Filter: Advantages and Disadvantages of Digital Filters, Types of Digital Filters: FIR and IIR Filters; Difference Between FIR and IIR Filters, Desirability of Linear-Phase Filters, Frequency Response of Linear-Phase FIR Filters, Impulse Responses of Ideal Filters, Windowing Method; Rectangular; Triangular; Kaiser Window, FIR Digital Differentiators**.**

(12 Hours)

Reference Books:

1. Digital Signal Processing, Tarun Kumar Rawat, 2015, Oxford University Press, India
2. Digital Signal Processing, S. K. Mitra, McGraw Hill, India.
3. Principles of Signal Processing and Linear Systems, B.P. Lathi, 2009, 1st Edn.
4. Oxford University Press.

5. Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L. Harris, 2005, Cengage Learning.
6. Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge University Press.
7. Digital Signal Processing Principles Algorithm & Applications, J.G. Proakis and D.G. Manolakis, 2007, 4th Edn., Prentice Hall.

VI Semester

BSCELP 384 : PRACTICAL 8

DIGITAL SIGNAL PROCESSING LAB

1. Generation of unit sample sequence,
2. Generate unit step, ramp function,
3. Generate discrete time sequence, real sinusoidal sequence.
4. Generate and plot sequences over an interval.
5. Given x[n], write program to find X[z].
6. Plotting spectrum of continuous time periodic signal using continuous time Fourier
7. Design of an IIR filter low pass and high pass
8. Design of an FIR filter low pass and high pass