# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

## Name of Program: Bachelor of Technology in Electronics & Communication

| SUBJECT CODE | Category | SUBJECT NAME | TEACHING & EVALUATION SCHEME | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | THEORY | | | PRACTICAL | | L | T | P | CREDITS |
| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | | | | |
| BTEC401 | EC | Linear Integrated Circuits | 60 | 20 | 20 | 30 | 20 | 3 | 1 | 2 | 5 |

**Legends**: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

## Course Educational Objectives(CEOs):

This course provides the foundation education in operational amplifier and other linear integrated circuits and also familiarizes students with applications of various ICs.

## Course Outcomes(COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The student will be able to:

1. Inculcate the basic principles, configurations and practical limitations of op-amp.
2. Explain and design the linear and non-linear applications of an Op-Amp and special application ICs.
3. To analyze, design and explain the characteristics and applications of active filters.
4. Elucidate and compare the working of Multivibrators, Oscillators.
5. Illustrate the function of application specific ICs such as Voltage regulators, PLL and its application in communication.
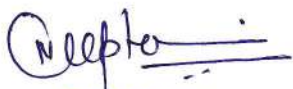
## Syllabus

### UNIT I
**10 Hrs.**

**Op Amps:** Block diagram of Op-Amp, Basic Differential amplifier using transistors and its operation, characteristics and equivalent circuits of an ideal op-amp, Power supply configurations for OPAMP applications, Voltage Transfer Curve, open loop op-amp configurations: inverting, non-inverting and differential amplifier configurations, Closed loop op-amps or feedback amplifiers.

**Linear Applications of Op-Amp:** Voltage follower, Summing amplifier, Scaling and averaging amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Log/ Antilog amplifier, V-I and I-V converter, analog multiplier-MPY634.

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## UNIT II
**9 Hrs.**

**The Practical Op-Amp:** Introduction, Input offset voltage, offset current, Bias Current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain –bandwidth product, frequency limitations and compensations, interpretation of TL082 datasheet.

## UNIT III
**8 Hrs.**

**Active Filters:** Characteristics of filters, Classification of filters, Magnitude and frequency response, Design of Butterworth 1st and 2nd order Low pass, High pass filters, Band pass and Band reject filters, All pass filters.

## UNIT IV
**9 Hrs.**

**Signal Generators and Waveform Shaping Circuits:** Oscillator-Phase-shift oscillators, Wein bridge oscillator, Quadrature Oscillator, Monostable and Astable Multivibrator, Precision rectifiers, Square and Triangular wave generator, VCO. Comparator, Zero Crossing Detector, Schmitt Trigger, Voltage limiters, Clipper and clampers, Absolute value output circuit, Peak detector, Sample and hold Circuit.

## UNIT V
**9 Hrs.**

**Advanced IC applications:** Applications as Frequency Divider, PLL, AGC, AVC using op-AMP, simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210

**Text Books:**
1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICS", PHI, 4th edition, 1987.
2. D. Roy Chowdhury, " Linear Integrated Circuits", New Age International (P) Ltd, 2nd Edition, 2003.

**References:**
1. R.F. Coughlin & Fredrick Driscoll, "Operational Amplifiers & Linear Integrated Circuits" , 6thEdition, PHI
2. David A. Bell, "Operational Amplifiers & Linear ICs", Oxford University Press, 2nd edition, 2010.
3. Sergio Franco, "Design with Operational Amplifiers & Analog Integrated Circuits" Mcgraw Hill, 1988.
4. C.G. Clayton , "Operational Amplifiers " , Butterworth & Company Publ. Ltd./Elsevier, 1971.
5. K. Lal Kishore, " Operational Amplifiers and Linear Integrated Circuits", Pearson
6. Education, 2007.
7. L. k. Maheshwari, M M S Anand , Analog Electronics, PHI
8. TL082:Data Sheet:http://www.ti.com/lit/ds/symlink/t1082.pdf
9. Application Note:http://www.ti.com/lit/an/sloa020a/sloa020a.pdf

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10. MYP634: Data Sheet:http://www.ti.com/lit/ds/symlink/mpy634.pdf
11. Application Note:http://www.ticom/lit/an/sbfa006/sbfa006.pdf

## List of Experiments:
1. Introduction of ASLKv2010 starter-kit & Simulation software
2. Measurements of Op-Amp parameters- CMRR, slew rate ,open loop gain.
3. To develop an understanding of Inverting and non-inverting Op-Amp.
4. To Learn about AC electrical characteristic of Op-Amp.
5. To Learn about Integrator and Differentiator.
6. To Learn about Instrumentation Amplifier.
7. To learn about Analog low pass and high pass filter.
8. To learn about Astable Multivibrator.
9. To learn and study about frequency generation using VCO.
10. To learn and study ADC/DAC circuits.
11. Design a function generator capable of generating a square wave and a triangular wave of a known frequency f.
12. Perform an experiment to plot the Input Vs Output characteristics for the AGC/AVC.


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## Name of Program: Bachelor of Technology in Electronics & Communication

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | THEORY | | | PRACTICAL | | L | T | P | CREDITS |
| | | | END SEM University Exam | Two Term Exam | Teachers Assess-ment* | END SEM University Exam | Teachers Assess-ment* | | | | |
| BTEC402 | EC | Digital Electronics | 60 | 20 | 20 | 30 | 20 | 2 | 1 | 2 | 4 |

**Legends**: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives(CEOs):-
The objective of this course is to-
1. Use of Boolean algebra and Karnaugh Map to simplify logic function.
2. Describe the operation of different Combinational and Sequential Logic Circuits.

### Course Outcomes(COs):-
After completion of this course the students will be able to-
1. Design an optimal digital logic circuit to meet the given specifications.
2. Evaluate the performance of the given digital logic circuit based on specific criteria for reliable system implementation.

### Syllabus

### UNIT 1                                                                 9 Hrs.
**Logic Function Optimization and Arithmetic Circuits**
Logic Function, Sum of Product and Product of Sum form, Karnaugh Map minimization, Incompletely specified functions. Arithmetic Circuits- Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel Adders/Subtractors- Ripple Carry Adder, Carry Look Ahead Adder, Serial Adders /Subtractors.

### UNIT 2                                                                 9 Hrs.
**Combinational Circuits**
Multiplexers, Demultiplexers, Encoders- Binary Encoders, Priority Encoders, Decoders, Synthesis of logic functions using Multiplexers and Decoders. Structural modeling of higher order circuits using lower order circuits, Code converters.

### UNIT 3
**Sequential Design Elements**                                            10 Hrs.
S-R Latch, D- Latch, Flip Flops- Master Slave and Edge Triggered, S-R, D, J-K, T , State Table, State Equation, Timing Diagram, Excitation Table, Flip Flop Conversions, Setup and Hold Time. 555 Timer chip and its application in multivibrators.

### UNIT 4

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**Sequential Circuits**                                                                              **9 Hrs.**

Registers, Shift Registers, Counters- Synchronous and Asynchronous counters, Design Examples, Synchronous Sequential Circuits, State Machines, Mealy and Moore Model, State Diagram, State Table, State Assignment, State Minimization, Design Examples.

## UNIT 5
**Logic Families**                                                                                   **8 Hrs.**

Characteristics of Digital ICs- Voltage Levels, Speed, Power, Noise Margin, Fan In, Fan Out. Logic Families- TTL, MOS- NMOS, PMOS, CMOS, ECL, IIL.

**Text Books:**
1. M. Morris Mano: Digital Logic Design, Pearson Education
2. Salivahanan and Ari Vahagan: Digital Circuits and Design,Vikas Publishing House

**References**:
1. Anand Kumar: Fundamentals of Digital Circuits, PHI.
2. Floyd and Jain: Digital Fundamentals, Pearson Education.
3. Roland J. Tocci, Widmer, Moss: Digital Systems Principles and Applications, Pearson Education.
4. Stephen Brown I Zvanko Vranesic: Fundamentals of Digital Logic Design, The Mc Graw Hill

**List of experiments**
1. Implementation of Adders and Subtractors.
2. Realization of multiplexers and demultiplexers.
3. Synthesis of logic function using multiplexer.
4. Design and analysis of Encoder and Decoders.
5. Analysis of various flip flops with Preset and Clear capability.
6. Design of Astable , Monostable and Bistable multivibrator using 555 Timer.
7. Design of various Shift registers.
8. Design of Johnson and Ring counter.
9. Design of synchronous and asynchronous up/down counters.
10. Design of logic functions using PLDs.
11. Design of some minor projects based on digital circuits to solve real life problems.

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| | | | THEORY | | | PRACTICAL | | L | T | P | CREDITS |
| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | | | | |
| BTEC403 | EC | **Electro Magnetic Theory** | 60 | 20 | 20 | 0 | 0 | 3 | 1 | 0 | 4 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
**\*Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives(CEOs):-
1. Obtain an understanding of physical laws governing electromagnetic effects in the form of Maxwell's equations
2. Understand the concepts of static and time varying fields with an emphasis on wave propagation

### Course Outcomes:-
After completion of this course students should be able to
1. Apply vector calculus to determine the electric and magnetic fields and energy stored due to specified charge and current distribution.
2. Apply Maxwell's equation in Differential and integral forms for the solution of appropriate problems involving static as well as time varying fields.
3. Discuss and analyze propagation of electromagnetic waves in free space, dielectric and conducting media

### Syllabus

### UNIT I                                                                                          10 Hrs.
### Electrostatics
Introduction to various Co-ordinate systems and Co-ordinate transformations, Vector calculus, Divergence and Stokes theorem, Laplacian of a scalar and vector, Coulomb's law, Electric field intensity, Electric fields due to: point, line, surface and volume charge distributions, Electric flux density, Gauss's law and its application, Electric potential, Potential gradient, Electric dipole: dipole moment, potential & electric field intensity due to dipole, Energy stored in electrostatic fields, Method of images. Poisson's and Laplace's equations, Solution of Laplace's equation, Uniqueness theorem, Electric boundary conditions, Equation of continuity and relaxation time.

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## UNIT II
### Magnetostatics
**9 Hrs.**

Magnetic field intensity, Magnetic flux, Magnetic flux density, Biot-Savart Law, Magnetic field due to: straight conductors, circular loop, infinite sheet of current, Ampere's circuital law and its application, Magnetic scalar and vector potential; Force on a moving charge and current elements, Force and torque on closed circuit, Magnetic dipole, Magnetic polarization, Self and mutual inductance, Energy stored in magnetic fields, Magnetic boundary conditions.

## UNIT III
### Time Varying Fields
**8 Hrs.**

Faraday's Law, Induced EMF for time varying fields, Displacement current, Maxwell's equation in point form, Maxwell's equation in integral form, Concept of retarded potential, Poynting vector theorem, Complex poynting vector.

## UNIT IV
### Electromagnetic Waves
**9 Hrs.**

Solution of wave equation, Propagation of plane EM wave in: perfect dielectric, lossy medium and good conductor, Media-attenuation, Phase velocity, Group velocity, Skin depth. Reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence, Snell's law of refraction, Brewster angle, Polarization of electromagnetic wave: linear, circular and elliptical polarization.
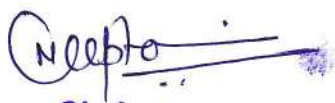
## UNIT V
### Transmission Lines
**10 Hrs.**

Transmission Line parameters and equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR, UHF Lines as Circuit Elements, Impedance Transformations. Smith Chart – Configuration and Applications, Single and Double Stub Matching.

### Text Books:
1. Matthew. N.O. Sadiku, "Elements of Electromagnetics", Oxford University Press, First Indian Edition, 2010.
2. Shankar Prasad Ghosh, Lipika Datta, "Electromagnetic Field Theory", McGraw Hill, 1st edition, 2012
3. Gangadhar.K.A, "Field theory", Khanna Publishers, New Delhi, 15th edition, 2004.
4. Umesh Sinha , "Transmission Lines and Networks", Satya Prakashan, 2003.

### References :
1. William Hayt, "Engineering Electromagnetics", McGraw Hill, 7th edition, 2011.
2. David K Cheng, "Field and Wave Electromagnetics", Pearson Education, 2nd edition, 2004.
3. John D. Kraus, "Electromagnetics" McGraw Hill, 5th edition, 1999.
4. Narayana Rao N, "Elements of Engineering Electro Magnetics", Prentice Hall of India, 6th edition, 2008.

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | THEORY | | | PRACTICAL | | Th | T | P | CREDITS |
| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | | | | |
| BTEC404 | EC | Analog Communication | 60 | 20 | 20 | 30 | 20 | 3 | 0 | 2 | 4 |

**Legends**: **Th** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; **\*Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

## Course Objective:

To provide the basic fundamentals, principles, concepts of communication systems, various modulation techniques of analog communication systems and basic concepts from noise analysis.

## Course Outcome:

After completion of this course the students are expected to be able to demonstrate following attributes:

1. Ability to analyze signals in the time domain and frequency domains.
2. Ability of demonstrating various analog modulation and demodulation techniques and apply suitable modulation techniques for various applications.
3. Ability to analyze the noise signal.

## Syllabus

## UNIT-I

**Signals:** Classification of signals, Time Domain and Frequency Domain Representation, singularity functions for continuous time.
**Spectral Analysis**: Fourier series analysis, Fourier Transform and its Properties, Transform of various signals. Parseval's Theorem, Energy and Power Spectral Density of various types of signals.
**Systems**: Classification of systems, Impulse Response and Convolution integral.

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techniques, SSB: generation and detection techniques. Radio Receiver and its characteristics, TRF receivers, Super-heterodyne Receiver, Image frequency signal and its rejection, Intermediate frequency selection, frequency mixer, AVC.

## UNIT III
**9 Hrs.**

### Angle modulation Techniques
Frequency and phase modulation, spectrum and bandwidth, Narrowband FM, Wideband FM, FM Modulators: Direct and Indirect method of frequency modulation, FM Detectors: Slope Detector, Foster Seeley Discriminators, Ratio-Detectors and PLL detectors, AFC, Pre-Emphasis and De-Emphasis filters.

## UNIT IV
**9 Hrs.**

### Noise
Sources and types of noise, White Noise, Noise in linear system: single and multiple noise source, Super Position of Power Spectrum, Equivalent Noise Bandwidth, Noise Figure, and Equivalent Noise Temperature, their Relationship, Calculation of Noise Figure and Noise Temperature for Cascade Systems.

## UNIT V
**9 Hrs.**

### Pulse Modulation Techniques
Pulse amplitude modulation and demodulation, Pulse width modulation and demodulation, Pulse position modulation and demodulation, Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, comparison of FDM and TDM, PAM-TDM signaling rate and bandwidth.

**Text Books:**

1. B.P. Lathi and Zhi Ding, "Modern Digital and Analog Communication System"; 4th Edition, Oxford University Press, 2011.
2. R.P. Singh and S.D. Sapre, "Communication Systems: Analog and Digital", McGraw Hill Education; 3rd Edition, 2012.
3. Herbert Taub, Donald L Schilling, Gautam Saha, "Principles of Communication Systems, McGraw Hill Education; 4th Edition, 2013.

**References:**

1. P Ramakrishna Rao, "Analog Communication", McGraw Hill Education, 1st Edition, 2011.
2. Simon Haykin, Michael Moher, "Communication System", John Wiley, 5th Edition, 2010.
3. H P. Hsu: "Schaum's Outline of Signals and Systems", McGraw Hill Education, 3rd Edition, 2014.
4. H P. Hsu: "Schaum's Outline Analog and Digital Communications", McGraw Hill Education, 3rd Edition, 2009.
5. John G. Proakis, Masoud Salehi, "Fundamental of Communication Systems", Pearson Edition, 2nd Edition, 2014.

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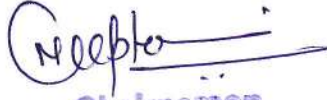Board of Studies

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6. Wayne Tomasi, "Electronic Communication Systems: Fundamentals Through Advanced", Pearson Edition, 5th Edition, 2008.

## List of Experiment:
1. To study various types of signals using Matlab.
2. To understand and analyze the Fourier Series Decomposition and Reconstruction for periodic Signals.
3. To analyze, understand the Amplitude modulation and obtain the value of modulation index.
4. To understand Amplitude demodulation and analyze the effect of Modulation Index.
5. To analyze and understand frequency modulation.
6. To analyze and understand frequency demodulation.
7. To obtain and analyze the spectrum of Amplitude modulated signals using Matlab.
8. To obtain and analyze the spectrum of Frequency modulated signals using Matlab.
9. To understand various pulse modulation schemes and analyze the effect of sampling frequency.
10. To design the Pre-emphasis and De-emphasis Filters.
11. To study the effect of noise in AM & FM Systems.

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| COURSE CODE | CATEGORY | COURSE NAME | L | T | P | CREDITS | THEORY | | PRACTICAL | |
| | | | | | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BTCS403** | UG | **Data Structure and Algorithms** | 3 | 1 | 2 | 5 | 60 | 20 | 20 | 30 | 20 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

## Course Objectives:
1. To understand efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To understand the concept of protection and management of data.

## Course Outcomes:
**Upon the completion of the course, students will be able to:**
1. Get a good understanding of applications of Data Structures.
2. Develop application using data structures.
3. Handle operations like searching, insertion, deletion, traversing mechanism etc.on various data structures.
4. Decide the appropriate data type and data structure for a given problem.
5. Select the best algorithm to solve a problem by considering various problem characteristics, such as the data size, the type of operations, etc.

**Syllabus:**

### UNIT I
**Introduction:** Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations. Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays. Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

### UNIT II
**Linked List:** Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

## UNIT III

**Stack:** The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi

**The Queue** :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

## UNIT IV

**Tree**: Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion.

**Graph:** Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's  & Kruskal's  Algorithm.

## UNIT V

**Sortings**: Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

**Text Books:**
1. Ashok N. Kamthane, "Introduction to Data structures", 2nd Edition, Pearson Education India,2011.
2. Tremblay & Sorenson, "Introduction to Data- Structure with applications", 8th Edition, Tata McGrawHill,2011.
3. Bhagat Singh & Thomas Naps, "Introduction to Data structure", 2nd  Edition, Tata Mc-GrawHill 2009.
4. Robert Kruse, "Data Structures and Program Design",2nd  Edition,PHI,1997.
5. Lipschutz Seymour,"Data structures with C" ,1st  Edition ,Mc- GrawHill,2017.

**References:**
1. Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.
2. ISRD Group ,Data Structures Using C,  TataMcGraw-Hill 2015.
3. E. Balagurusamy ,"Data Structure Using C" ,Tata McGraw-Hill 2017.
4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015 .
5. Gav Pai, Data Structures, Tata McGraw-Hill, 2015.

**List of Practical:**

1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.
3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list
10. Program for implementation of Bubble sort
11. Program for Insertion sort
12. Program for Merge Sort
13. Program to implement Heap sort
14. Program to implement Quick sort
15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. To develop an algorithm for binary tree operations and implement the same.
17. To design an algorithm for sequential search, implement and test it.
18. To develop an algorithm for binary search and perform the same.

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | THEORY | | | PRACTICAL | | | | | |
| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | Th | T | P | CREDITS |
| BTEC405 | EC | Programming with Arduino | 0 | 0 | 0 | 60 | 40 | 0 | 0 | 4 | 2 |

**Legends: L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;  **C** - Credit;
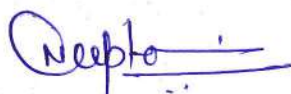**\*Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

## Syllabus
Study of Arduino and various programs based on Arduino.

## Experiment List

| E.N. | Aim |
|---|---|
| 1. | Understanding Arduino IDE and Arduino board family. |
| 2. | Understanding I/O access on ATMega328p |
| 3. | Interfacing LED and Seven Segment. |
| 4. | Interfacing Switch and Keypad. |
| 5. | Program based on Timers. |
| 6. | Experimenting data transfer using SPI Communication. |
| 7. | Establishing i2c interface with ATMega328p |
| 8. | Program based on Interrupts. |
| 9. | Program based on Serial Communication. |
| 10. | Interfacing GSM, RFID, Wi-Fi. |

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