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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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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			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 **9 Hrs.**

Magnetostatics

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 **8 Hrs.**

Time Varying Fields

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 **9 Hrs.**

Electromagnetic Waves

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 **10 Hrs.**

Transmission Lines

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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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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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS403	CS	Data Structures and Algorithms	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):

1. To teach 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 teach the concept of protection and management of data.

Course Outcomes(COs):

Upon completion of the subject, 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 **10 Hrs.**

Introduction, Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Algorithms. Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays. Strings, Array of Structures, Drawbacks of linear arrays, Pointer and Arrays, Pointers and Two Dimensional Arrays, Array of Pointers, Pointers and Strings.

UNIT II **9 Hrs.**

The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation .

The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue, & De-queue, Application of Queues.

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UNIT III **9 Hrs.**

Linked List as an ADT, Linked List vs. Arrays, and Memory Allocation & De-allocation for a Linked List, Linked List operations, Types of Linked List, Implementation of Linked List, Application of Linked List polynomial.

UNIT IV **9 Hrs.**

Definitions and Concepts, Binary trees, operations on binary trees, Binary tree and tree traversal algorithms, operations on binary trees, List, representation of Tree. Graph Representation, Graph traversal (DFS & BFS).

UNIT V **9 Hrs.**

Sort Concept, Shell Sort, Radix sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, List Search, Linear Index Search, Index Sequential Search Hashed List Search, Hashing Methods, and Collision Resolution.

Text Books:

1. Ashok N. Kamthane, "Introduction to Data structures", Pearson Education India.
2. Tremblay & Sorenson, "Introduction to Data- Structure with applications", Tata Mc- Graw Hill.
3. Bhagat Singh & Thomas Naps, "Introduction to Data structure", Tata Mc- Graw Hill.
4. Robert Kruse, "Data Structures and Program Design", PHI.
5. Aaron M. Tanenbaum & Moshe J. Augenstein, "Data Structure using PASCAL", PHI.

References:

1. Rajesh K. Shukla, Data Structures Using C & C++, Wiley- India.
2. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill.
3. Balagurusamy, Data Structure Using C.
4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Dreamtech press.
5. Data Structures, Adapted by: GAV PAI, Schaum's Outlines.

List Of Experiments:

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 develop an algorithm that implements push and pop stack operations and implement the same using array.
4. To perform an algorithm that can insert and delete elements in queue and implement the same using array.
5. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
6. To develop an algorithm for binary tree operations and implement the same.
7. To design an algorithm for sequential search, implement and test it.
8. To develop an algorithm for binary search and perform the same.
9. To implement an algorithm for Insertion sort method.
10. To develop an algorithm that sorts number of elements using bubble sort method.
11. To design an algorithm for Merge sort method and implement the same.

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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;
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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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