JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Ananthapuramu–515 002 (A.P) India

B.Tech
Course Structure and Syllabi under R19 Regulations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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Semester - 0 (Theory - 8, Lab -7) Common for All Branches of Engineering				
S.No	**Course No**	**Course Name**	**Category**	**L-T-P-C**
1		Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2		Career Counseling	MC	2-0-2-0
3		Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4		Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5		Proficiency Modules & Productivity Tools	ES	2-1-2-0
6		Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7		Remedial Training in Foundation Courses	MC	2-1-2-0
8		Human Values & Professional Ethics	MC	3-0-0-0
9		Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10		Concepts of Programming	ES	2-0-2-0

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Semester – 1 (Theory - 4, Lab –4)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A15101	Linear Algebra And Calculus	BS	3-1-0	4
2.	19A15201	Applied Physics	BS	2-1-0	3
3.	19A10501	Problem Solving & Programming	ES	3-1-0	4
4.	19A15501	Communicative English 1	HS	2-0-0	2
5.	19A10401	Electronics & Communication Engineering Workshp	LC	0-0-2	1
6.	19A15202	Applied Physics Lab	BS	0-0-3	1.5
7.	19A10506	Problem Solving & Programming Lab	ES	0-0-3	1.5
8.	19A15502	Communicative English Lab-1	HS	0-0-2	1
				Total	**18**

Semester – 2 (Theory - 5, Lab –5)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A10402	Network Theroy	DC	3-0-0	3
2.	19A10403	Electronic Devices	DC	2-0-0	2
3.	19A15102	Differential Equation and Vector Calculus	BS	3-0-0	3
4.	19A15303	Engineering Chemistry	BS	2-1-0	3
5.	19A10503	Data Structures	ES	2-1-0	3
6.	19A10303	Engineering Workshop	LC	0-0-2	1
7.	19A10304	Engineering Graphics	ES	1-0-3	2.5
8.	19A10404	Passive Circuits & Electronic Devices Lab	DC	0-0-2	1
9.	19A15304	Engineering Chemistry Lab	BS	0-0-3	1.5
10.	19A10507	Data Structures Lab	ES	0-0-3	1.5
				Total	**21.5**

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Semester – 3 (Theory - 6, Lab –3)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A20604	Complex Variables & Transforms	BSC	3-0-0	3
2.	19A24201	Signals & Systems	PCC	3-0-0	3
3.	19A20401	Electronic Circuits -I	PCC	3-0-0	3
4.	19A20402	Probability Theory and Stochastic Processes	PCC	3-0-0	3
5.	19A24204	Digital Electronics and Logic Design	PCC	3-0-0	3
6.	19A22401	Electrical Technology	ESC	3-0-0	3
7.	19A20901	Universal Human Values	HE	2-0-0	2
8.	19A20403	Electronic Circuits -I Lab	PCC	0-0-3	1.5
9.	19A20404	Simulation Lab	PCC	0-0-2	1
10.	19A22402	Electrical Technology Lab	PCC	0-0-2	1
11.	19A28801	Biology For Engineers	MC	3-0-0	0
				Total	**23.5**

Semester – 4 (Theory - 6, Lab –3)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A20405	Electromagnetic Waves and Transmission lines	PCC	3-0-0	3
2.	19A20406	Electronic Circuits – II	PCC	3-0-0	3
3.	19A20407	Analog Communications	PCC	3-0-0	3
4.	19A20209	Control Systems	PCC	3-0-0	3
5.	19A25501	Fundamentals of Python Programming	ESC	2-0-0	2
6.	19A20408	Computer Architecture and Organization	PCC	3-0-0	3
8.	19A20409	Electronic Circuits – II Lab	PCC	0-0-3	1.5
9.	19A20410	Analog Communications Lab	PCC	0-0-3	1.5
10.	19A25503	Fundamentals of Python Programming Lab	ESC	0-0-2	1
11.	19A10804	Environmental Science	MC	3-0-0	0
				Total	**21**

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Semester – 5 (Theory - 6, Lab –3)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A50401	Integrated Circuits and Applications	PCC	2-0-0	2
2.	19A50402	Antennas and Wave Propagation	PCC	3-0-0	3
3.	19A50403	Digital Communications	PCC	3-0-0	3
4.	19A55501	English Language Skills	HSMC	3-0-0	3
5.	Professional Elective-I		PEC-1	3-0-0	3
	19A50404	a)Electronic Measurements & Instrumentation			
	19A50405	b) Machine Lerning			
	19A50406	c) sensors and Actuators			
6.	Open Elective-I/ Skill Oriented Course*		OEC-1	3-0-0/	3
	19A50407	Anlog Electronics			
	19A50408	Digitial Electronics			
	19A50513T	Introduction to Java Programming /Lab 19A50513L			
7.	19A50409	Integrated Circuits and Applications Lab	PCC	0-0-2	1
8.	19A55502	English Language Skills Lab	HSMC	0-0-3	1.5
9.	19A50410	Digital Communications Lab	PCC	0-0-3	1.5
10.	19A50411	Socially Relevant Project	PR	0-0-1	0.5
11.	19A55404	Constitution of India	MC	3-0-0	0
				Total	**21.5**

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Semester – 6 (Theory - 6, Lab –2)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A60401	Microprocessors and Micontrollers	PCC	3-0-0	3
2.	19A60402	Digital Signal Processing	PCC	3-0-0	3
3.	19A60403	Digital Design through VHDL	PCC	3-0-0	3
4.	Professional Elective-II		PEC-2	3-0-0	3
	19A60404	a) Speech Processing			
	19A60405	b) Advanced Machine Learning			
	19A60406	c) Data communications and Networks			
5.	Open Elective-II		OEC-2	3-0-0	3
	19A60407	a)Principals of Commmunications			
	19A60408	b) Principalsof Digitial Signal Processing			
6.	Humanities Elective-I		HSMC	3-0-0	3
	19A65401	Managerial Economics and Financial Analysis			
	19A65402	Business Ethics and Corporate Governance			
	19A65403	Entrepreneurship & Incubation			
7.	19A60409	Microprocessors & Microcontrollers Lab	PCC	0-0-2	1
8.	19A60410	Digital Design through VHDL Lab	PCC	0-0-2	1
9.	19A60411	Digital Signal Processing Lab	PCC	0-0-2	1
10.	19A60412	Socially Relevant Project	PR	0-0-1	0.5
11.	19A65404	Research Methodology	MC	3-0-0	0
				Total	**21.5**

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Semester –7 (Theory - 5, Labs -2 ,Seminar &Project–I)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A70401	Microwave Engineering and Optical Communications	PCC	3-0-0	3
2.	19A70402	VLSI Design	PCC	3-0-0	3
3.	Professional Elective-III		PEC-3	3-0-0	3
	19A70403	a)Digital Image processing			
	19A0404	b)Data Science			
	19A760405	c)Embedded Systems			
4.	Open Elective-III		OEC-3	3-0-0	3
	19A70406	Industrial Electronics			
	19A70407	Microcontroller & Applications			
5.	Humanities Elective-II		HSMC	3-0-0	3
	19A75401	1. Management Science			
	19A75402	2. Organizational Behavior			
	19A75403	3. Business Environment			
6.	19A70408	Microwave and Optical Communications Lab	PCC	0-0-3	1.5
7.	19A70409	VLSI Design Lab	PCC	0-0-3	1.5
8.	19A70410	Technical Seminar	----	0-0-1	0.5
9.	19A70411	Project Phase – I	PR	0-0-3	1.5
10.	19A70412	Industrial Training/Skill Development/Research Project/MOOC Subjects*	PR	------	2
				Total	**22**

Semester –8 (Theory - 2, Project–1)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	Professional Elective-IV		PEC-4	3-0-0	3
	19A80401	a)Advanced 3Gand 4GWireless Mobile Communication			
	19A80402	b)Introduction to Internet of Things			
	19A80403	c)System Verilog			
2.		Open Elective-IV	OEC-4	3-0-0	3
	19A80404	a)Electronic Instrumentation			
	19A80405	b)Fundamentals of Integrated Circits Applications			
3.	19A80406	Project Phase - II	PR	0-0-14	7
				Total	**13**

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List of Professional Electives

Professional Elective-I

a) Electronic Measurements & Instrumentation
b) Machine Learning
c) Sensors and Actuators

Professional Elective-II

a) Speech Processing
b) Advanced Machine Learning
c) Data Communications and Networks

Professional Elective-III

a) Digital Image Processing
b) Data Science
c) Embedded Systems

Professional Elective-IV

a) Advanced 3G and 4G Wireless Mobile Communications
b) Introduction to Internet of Things
c) System Verilog

List of Open Electives

Open Elective-I

a) Skill Oriented Course*
b) Analog Electronics
c) Digital Electronics

Open Elective-II

a) Principles of Communications
b) Principles of Digital Signal Processing

Open Elective-III

a) Industrial Electronics
b) Microcontrollers & Applications

Open Elective-IV

a) Electronic Instrumentation
b) Fundamentals of Integrated Circuits Applications

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I B.TECH – I SEMESTER

		L	T	P	C
19A15101	**Linear Algebra and Calculus** (Common to all branches o Engineering)	**3**	**1**	**0**	**4**

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linearalgebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and theirapplications.

Bridge Course: Limits, continuity, Types of matrices

Unit1:Matrices

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Learning Outcomes:

At the end of this unit, the student will be able to

- solving systems of linear equations, using technology to facilitate row reduction determine the rank, eigenvalues and eigenvectors, diagonal form and different factorizations of a matrix;(L3)
- identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics;(L3)

Unit 2: MeanValueTheorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

Learning Outcomes:

At the end of this unit, the student will be able to

- Translate the given function as series of Taylor's and Maclaurin's with remainders(L3)
- Analyzethebehaviourof functions by using mean value theorems(L3)

Unit 3:Multivariablecalculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies.(L3)
- Acquire the Knowledge maxima and minima of functions of several variable(L1)
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)

Unit4:MultipleIntegrals

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates.

Learning Outcomes:

- At the end of this unit, the student will be ableto
- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates(L5)
- Apply double integration techniques in evaluating areas bounded by region(L4)
- Evaluate multiple integrals in Cartesian, cylindrical and spherical geometries(L5)

Unit5:SpecialFunctions

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Learning Outcomes:

At the end of this unit, the student will be able to

- understand beta and gamma functions and its relations(L2)
- Conclude the use of special function in evaluating definite integrals(L4)

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons,2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers,2017.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd.,2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers,2013.

3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers,201.
4. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearsonedn
5. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRCPress
6. Peter O'neil, Advanced Engineering Mathematics, CengageLearning.
7. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, PearsonEducation
8. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education
9. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
10. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

Course Outcomes:

At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- Utilize mean value theorems to real life problems(L3)
- familiarize with functions of several variables which is useful in optimization(L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems(L5)
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of specialfunctions

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I B.TECH – I SEMESTER

		L	T	P	C
19A15201	**Applied Physics (Common to ECE, CSE, EEE)**	3	0	0	3

Course Objectives:

- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineeringapplications.
- To explain the significant concepts of dielectric and magnetic materials this leads to potential applications in the emerging microdevices.
- To impart knowledge in basic concepts of electromagnetic waves and its propagation in optical fibers along with its Engineeringapplications.
- To identify the importance of semiconductors in the functioning of electronicdevices.
- To teach the concepts related to superconductivity which lead to their fascinating applications.
- To familiarize the applications of nanomaterials relevant to engineeringbranches.

Unit-I:WaveOptics

Interference-Principle of Superposition-Interference of light-Conditions for sustained Interference -Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength- Engineering applications ofInterference

Diffraction-Fraunhofer Diffraction-Single and Double slits - Diffraction Grating – Grating Spectrum -Determination of Wavelength - Engineering applications of diffraction

Polarization-Polarization by double refraction-Nicol's Prism--Half wave and Quarter wave plate- Engineering applications of Polarization.

Unit Outcomes:

The students will be able to

- **explain** the need of coherent sources and the conditions for sustained interference(L2)
- **identify** engineering applications of interference including homodyne and heterodyne detection(L3)
- **analyze**the differences between interference and diffraction with applications(L4)
- **illustrate** the concept of polarization of light and its applications(L2)
- **classify** ordinary polarized light and extraordinary polarized light(L2)

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Unit-II : Dielectric andMagneticMaterials

Introduction--Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic and Ionic, (Quantitative), Orientation Polarizations (Qualitative)- Frequency dependence of polarization-Lorentz (internal) field-Claussius - Mosotti equation-Applications of Dielectrics:Ferroelectricity.

Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Magnetic device applications (Magnetic bubble memory).

Unit Outcomes:

The students will be able to

- **explain** the concept of dielectric constant and polarization in dielectric materials(L2)
- **summarize** various types of polarization of dielectrics(L2)
- **interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **explain** the applications of dielectric and magnetic materials(L2)
- **Apply** the concept of magnetism to magnetic devices(L3)

Unit – III: Electromagnetic Waves andFiberOptics

Divergence and Curl of Electric and Magnetic Fields- Gauss' theorem for divergence and Stokes' theorem for curl- Maxwell's Equations (Quantitative)- Electromagnetic wave propagation (Non-conducting medium) - Poynting'sTheorem.

Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile– Propagation of electromagnetic wave through optical fiber – modes -importance of V-number- Attenuation, Block Diagram of Fiber optic Communication -Medical Applications-Fiber optic Sensors.

Unit Outcomes:

The students will be able to

- **apply** the Gauss' theorem for divergence and Stokes' theorem for curl(L3)
- **evaluate** the Maxwell's equations, Maxwell's displacement current and correction in Ampere's law(L5)
- **asses** the electromagnetic wave propagation and its power in non-conducting medium(L5)
- **explain** the working principle of optical fibers(L2)
- **classify** optical fibers based on refractive index profile and mode of propagation(L2)
- **identify** the applications of optical fibers in medical, communication and other fields(L2)

- **Apply** the fiber optic concepts in various fields(L3).

Unit–IV:Semiconductors

Origin of energy bands - Classification of solids based on energy bands – Intrinsic semiconductors - density of charge carriers-Fermi energy – Electrical conductivity - extrinsic semiconductors - P-type & N-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature- Direct and Indirect band gap semiconductors-Hall effect- Hallcoefficient-ApplicationsofHalleffect-DriftandDiffusioncurrents-Continuityequation - Applications ofSemiconductors.

Unit Outcomes:

The students will be able to

- **classify** the energy bands of semiconductors(L2)
- **outline** the properties of n-type and p-type semiconductors and charge carriers(L2)
- **interpret** the direct and indirect band gap semiconductors(L2)
- **identify** the type of semiconductor using Hall effect(L2)
- **identify** applications of semiconductors in electronic devices(L2)

Unit – V: SuperconductorsandNanomaterials

Superconductors-Properties- Meissner's effect-BCS Theory-Josephson effect (AC &DC)-Types of Super conductors-Applications ofsuperconductors.Nano materials – Significance of nanoscale – Properties of nanomaterials: Physical, Mechanical, Magnetic, Optical – Synthesis of nanomaterials: Top-down-Ball Milling, Bottom-up -Chemical vapour deposition – characterization of nanomaterials: X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM) - Applications of Nano materials.

Unit Outcomes:

The students will be able to

- **explain** how electrical resistivity of solids changes with temperature(L2)
- **classify** superconductors based on Meissner's effect(L2)
- **explain** Meissner's effect, BCS theory & Josephson effect in superconductors(L2)
- **identify** the nano size dependent properties of nanomaterials(L2)
- **illustrate** the methods for the synthesis and characterization of nanomaterials(L2)
- **Apply** the basic properties of nanomaterials in various Engineering branches(L3).

TextBooks:

1. M. N. Avadhanulu, P.G. Kshirsagar&TVS ArunMurthy" AText book of Engineering Physics"- S. Chand Publications, 11th Edition2019.

2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning,2012.

Reference Books:

1. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", PearsonEducation,2018
2. David J.Griffiths, "Introduction to Electrodynamics"- 4/e, PearsonEducation

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I B.TECH – I SEMESTER

		L	T	P	C
19A10501	Problem Solving & Programming	2	1	0	3

Course Objectives:

1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm anduse it to solve computational problems
3. Identify the computational and non-computational problems
4. Teach the syntax and semantics of a C Programming language
5. Demonstrate the use of Control structures of C Programming language
6. Illustrate the methodology for solving Computational problems

Unit 1:

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Unit Outcomes:

Student should be able to

1. Identify the different peripherals, ports and connecting cables in a PC (L2)
2. Illustrate the working of a Computer (L3)
3. Select the components of a Computer in the market and assemble a computer (L4)
4. Solve complex problems using language independent notations (L3)

Unit 2:

Types, Operators, and Expressions: Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.

Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Do-while, break and continue, Goto and labels.

Learning Outcomes: Student should be able to

1. Solve Computational problems (L3)
2. Apply Algorithmic approach to solving problems (L3)
3. Analyze the algorithms (L4)

Unit 3:

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

Functions and Program Structure: Basics of functions, functions returning non-integers, external variables, scope variables, header variables, register variables, block structure, initialization, recursion, the C processor.

Learning Outcomes: Student should be able to

1. Recognize the programming elements of C Programming language (L1)
2. Select the control structure for solving the problem (L4)
3. Apply modular approach for solving the problem (L3)

Unit 4:

Factoring methods: Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers, generating prime numbers.

Pointers and arrays: Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions, complicated declarations.

Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the k^{th} smallest element

Learning Outcomes: Student should be able to

1. Solve mathematical problems using C Programming language (L3)
2. Structure the individual data elements to simplify the solutions (L6)
3. Facilitate efficient memory utilization (L6)

Unit 5:

Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.

Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.

Some other Features: Variable-length argument lists, formatted input-Scanf, file access, Error handling-stderr and exit, Line Input and Output, Miscellaneous Functions.

Learning Outcomes: Student should be able to

1. Select sorting algorithm based on the type of the data (L4)
2. Organize heterogeneous data (L6)
3. Design a sorting algorithm (L6)

Text Books:

1. Pradip Dey, and Manas Ghosh, “Programming in C”, 2018, Oxford University Press.
2. R.G. Dromey, “How to Solve it by Computer”. 2014, Pearson.

3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.

Reference Books:

1. P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications
2. RS Bichkar" Programming with C", 2012, Universities Press.
3. Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.

Course Outcomes:

1. Construct his own computer using parts (L6).
2. Recognize the importance of programming language independent constructs (L2)
3. Solve computational problems (L3)
4. Select the features of C language appropriate for solving a problem (L4)
5. Design computer programs for real world problems (L6)
6. Organize the data which is more appropriated for solving a problem (L6)

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I B.TECH – I SEMESTER

		L	T	P	C
19A15501	Communicative English	2	0	0	2

Introduction
The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- ➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- ➢ Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- ➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- ➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- ➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Unit 1
Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Speaking:Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information. Reading for Writing :Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Learning Outcomes
At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce one self/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 2

Lesson: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.Speaking:Discussion in pairs/small groups on specific topics followed by short structured talks. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. Grammar and Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks on general topics
- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well structured paragraphs on specific topics
- identify basic errors of grammar/ usage and make necessary corrections in short texts

Unit 3

Lesson: The Death Trap: Saki Listening: Listening for global comprehension and summarizing what is listened to. Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks and summarize the content with clarity and precision
- participate in informal discussions and report what is discussed
- infer meanings of unfamiliar words using contextual clues
- write summaries based on global comprehension of reading/listening texts
- use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing

Unit4

Lesson: Innovation: Muhammad Yunus

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. Speaking: Role plays for practice of conversational English inacademic contexts (formal and informal) - asking for and giving information/directions. Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. Writing:Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Learning Outcomes

At the end of the module, the learners will be able to

- infer and predict about content of spoken discourse
- understand verbal and non-verbal features of communication and hold formal/informal conversations
- interpret graphic elements used in academic texts
- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

Unit 5

Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevantquestions that test comprehension.**Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.**Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:**Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Learning Outcomes

At the end of the module, the learners will be able to

- take notes while listening to a talk/lecture and make use of them to answer questions
- make formal oral presentations using effective strategies
- comprehend, discuss and respond to academic texts orally and in writing
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors

Prescribed Text:

Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.

- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- Oxford Learners Dictionary, 12th Edition, 2011

Course Outcomes

At the end of the course, the learners will be able to

- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- Create a coherent paragraph interpreting a figure/graph/chart/table

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I B.TECH – I SEMESTER

	Title of the Lab	L	T	P	C
19A10401	**Electronics & Communication Engineering Workshop**	0	0	2	1

List of Exercises / Experiments:

1. Familiarization of commonly used Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
- Provide some exercises so that electronics hardware tools and instruments are learned to be used by the students

2. Familiarization of Electronic Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
- Provide some exercises so that electronic measuring instruments are learned to be used by the students

3. Electronic Components: Familiarization/Identification of electronic components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, color coding, package, symbol, cost etc.

4. Testing of electronic components like Resistor, Capacitor, Diode, Transistor, ICs etc.
- Compare values of components like resistors, inductors, capacitors etc with the measured values by using electronic instruments

5. Study of Cathode Ray Oscilloscope (CRO)
- Find the Amplitude and Frequency of a signal
- Measure the Unknown Frequency & Phase difference of signals using Lissajous figures

6. Interpret data sheets of discrete components and IC's.
- Write important specifications/ratings of components & ICs and submit it in the form of a report

7. Introduction to EDA Tools: MULTISIM/PSPICE/TINA schematic capture tool, Learning of basic functions of creating a new project, getting and placing parts, connecting placed parts, simulating the schematic, plotting and analyzing the results.
Provide some exercises so that students are familiarized in using EDA tools

8. Assembling and Testing of simple electronic circuits on breadboards; identifying the components and its location on the PCB, soldering of the components, testing the assembled circuit for correct functionality.

9. Familiarization with Computer Hardware & Operating System:

- Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.
- Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps).

Students should record the process of assembling and troubleshooting a computer.

- Install Operating system on the computer. Students should record the entire installation process.

10. Familiarization with Office Tools

- Word Processor: Able to create documents using the word processor tool. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied.
- Spreadsheet: Able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells.
- Presentations: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper-linking, running the slide show, setting the timing for slide show.

11. Familiarization of PA system with different microphones, loud speakers, mixer etc. Represent the same in the form of diagrams, write specifications and submit it in the form of a report.

12. Understand working of various Communication Systems like Television, Satellite Transmitter & Receiver, Radio Receiver, Mobile Phone. Prepare demo boards/charts of various communication systems.

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I B.TECH – I SEMESTER

		L	T	P	C
19A15202	**Applied Physics Lab**	0	0	3	1.5

COURSE OBJECTIVES	
1	To make the students gain practical knowledge to co-relate with the theoretical studies. To develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

COURSE OUTCOMES	
CO1	**Operate** optical instruments like microscope and spectrometer (L2)
CO2	**Estimate** the desired physical parameters by performing the concerned experiments (L2)
CO3	**Plot** the concerned physical parameter to know their related variations (L3)
CO4	**Identify** the role of various physical phenomenon in relation with the experimental concepts (L3)

List of Physics Experiments

1. Determination of thickness of thin object by wedge method
2. Determination of radius of curvature of lens by Newton's rings
3. Determination of wavelengths of various colours of mercury spectrum using diffraction grating in normal incidence method
4. Determination of dispersive power of the prism
5. Determination of dielectric constant and Curie temperature of a ferroelectric material
6. B-H curve
7. Determination of numerical aperture of an optical fiber
8. Laser: Determination of wavelength using diffraction grating
9. Laser: Determination of particle size
10. To determine the resistivity of semiconductor by four probe method
11. Energy gap of a material using p-n junction diode
12. Magnetic field along the axis of a current carrying coil – Stewart-Gee's Method
13. Hall effect : Determination of mobility of charge carriers in semiconductor
14. Measurement of resistance of a semiconductor with varying temperature
15. To determine the self inductance of the coil (L) using Anderson's bridge

Note: Out of twelve experiments, two experiments will be performed using virtual laboratory.
Data Books Required: Nil

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

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I B.TECH – I SEMESTER

		L	T	P	C
19A10506	**Problem Solving & Programming Lab**	0	0	3	1.5

Laboratory Experiments

1. Basic DOS Commands/Unix Commands
2. Familiarize with windows/Linux Environment.
3. Familiarize with development environment of C Language
4. Design a C program which reverses the number
5. Design a C program which finds the second maximum number among the given list of numbers.
6. Construct a program which finds the kth smallest number among the given list of numbers.
7. Design an algorithm and implement using C language the following exchanges

a b c d

6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
7. Implement the C program which computes the sum of the first n terms of the series
   Sum = 1 – 3 + 5 -7 + 9
8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
9. Design an algorithm and implement using a C program which finds the sum of the infinite series
   $1 – x^2/2! + x^4/4! – x^6/6! + ...$
10. Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
12. Develop an algorithm which computes the all the factors between 1 to 100 for a given number and implement it using C.
13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
14. Design a C program which reverses the elements of the array.
15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The starts for each number should be printed horizontally.
16. Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort
    d.. Partitioning sort.
17. Illustrate the use of auto, static, register and external variables.
18. Designalgorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.

20. Design a C program which sorts the strings using array of pointers.

Course outcomes: Student should be able to

1. Construct a Computer given its parts (L6)
2. Select the right control structure for solving the problem (L6)
3. Analyze different sorting algorithms (L4)
4. Design solutions for computational problems (L6)
5. Develop C programs which utilize the memory efficiently using programming constructs like pointers.

References:

1. B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", Tata McGraw-Hill, 2nd edition, 2002.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications

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I B.TECH – I SEMESTER

		L	T	P	C
19A15502	**Communicative English Lab-1**	0	0	3	1.5

Course Objectives

- ➢ students will be exposed to a variety of self instructional, learner friendly modes of language learning
- ➢ students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.
- ➢ students will learn better pronunciation through stress, intonation and rhythm
- ➢ students will be trained to use language effectively to face interviews, group discussions, public speaking
- ➢ students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes

- ➢ CO1: Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- ➢ CO2: Apply communication skills through various language learning activities
- ➢ CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- ➢ CO4: Evaluate and exhibit acceptable etiquette essential in social and professional settings
- ➢ CO5: Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Unit 1

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

Learning Outcomes

At the end of the module, the learners will be able to

- ➢ understand different accents spoken by native speakers of English
- ➢ employ suitable strategies for skimming and scanning on monitor to get the general idea of a text and locate specific information
- ➢ learn different professional registers and specific vocabulary to describe different persons, places and objects

Unit 2

1. JAM
2. Small talks on general topics
3. Debates

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Learning Outcomes

At the end of the module, the learners will be able to

- produce a structured talk extemporarily
- comprehend and produce short talks on general topics
- participate in debates and speak clearly on a specific topic using suitable discourse markers

Unit 3

1. Situational dialogues – Greeting and Introduction
2. Summarizing andNote making
3. Vocabulary Building

Learning Outcomes

At the end of the module, the learners will be able to

- Learn different ways of greeting and introducing oneself/others
- summarize the content with clarity and precision and take notes while listening to a talk/lecture and make use of them to answer questions
- replenish vocabulary with one word substitutes, homonyms, homophones, homographs to reduce errors in speech and writing

Unit4

1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

Learning Outcomes

At the end of the module, the learners will be able to

- Learn different ways of asking information and giving directions
- Able to transfer information effectively
- understand non-verbal features of communication

Unit 5

1. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

Learning Outcomes

At the end of the module, the learners will be able to

- make formal oral presentations using effective strategies
- learn different techniques of précis writing and paraphrasing strategies
- comprehend while reading different texts and edit short texts by correcting common errors

Suggested Software

- Young India Films
- Walden Infotech
- Orell

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.

- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

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I B.TECH – II SEMESTER

		L	T	P	C
19A10402	**Network Theory**	3	0	0	3

UNIT I

Basic Circuit Analysis:

R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Kirchoff's Laws, Loop and Nodal methods of analysis of Networks with dependent and independent voltage and current sources.

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, f-circuit matrix and f-cutset matrix, Tie set and Cutset Matrices for planar networks.

UNIT II

Network reduction techniques: series, parallel, series-parallel, star-to-delta, delta-to-star transformation, source transformation.

Network Theorems: Superposition, Maximum power transfer, Thevenin's, Norton's, Reciprocity, Milliman, Miller and Tellegan's Theorems.

UNIT III

Transient Analysis:

Transient analysis of RC, RL and RLC Circuits, Circuits with switches, step response, 2^{nd} order series and parallel RLC Circuits. Network Analysis using Laplace transform techniques, step, impulse and exponential excitation.

UNIT IV

Single Phase AC Circuits: R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, Series and Parallel resonances.

Coupled Circuits: Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT V

Two Port Networks: Two port network parameters, Z, Y, ABCD, h and g parameters, Relationship between parameter sets, Interconnection of two port networks. Characteristic impedance, Image transfer constant, image and iterative impedance.

Network functions: Driving point and transfer functions – using transformed (S) variables, Poles and Zeros, Foster and Cauer forms of RL/RC/LC circuits.

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I B.TECH – I SEMESTER

		L	T	P	C
19A10403	**Electronic Devices**	2	0	0	2

Unit- I

Review of semiconductor physics:

Energy band in solids (metal, semiconductor and insulators), donors, acceptors, concepts of Carrier Concentration and Fermi level in intrinsic and extrinsic semiconductors, majority carriers (electrons and holes).

Carrier Transport Phenomena: Carrier Drift, Mobility, Resistivity, Hall Effect, Diffusion Process, Einstein Relation, Current Density Equation, Carrier Injection, Generation and Recombination Processes, Continuity Equation.

UNIT II

P-N Junction Diode: Formation of Depletion Layer, Space Charge at a Junction, Derivation of Electrostatic Potential Difference at Thermal Equilibrium, Depletion Width and Depletion and Diffusion Capacitance of an Abrupt Junction, Concept of Linearly Graded Junction, Derivation of Diode Equation and V-I Characteristics, Zener and Avalanche Junction Breakdown Mechanism, Basic construction, working and characteristics of Zener diode, - Problem solving.

UNIT III

Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Emitter Efficiency, Base Transport Factor, Current Gain, Energy Band Diagram of Transistor in Thermal Equilibrium, Quantitative Analysis of Static Characteristics, Base Width Modulation, Regions of operation, Input and Output Characteristics of CB, CE and CC Configurations-Problem solving.

UNIT IV

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 MOSFET (both N channel and P channel), Input and Output Characteristics of CS,CD and CG Configurations, Complimentary MOS (CMOS).

UNIT V

Special Purpose Devices:

Tunnel diode, Varactor diode, UJT, SCR, Diac, Triac, IGBT, LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

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I B.TECH – I SEMESTER

		L	T	P	C
19A53201	**Differential Equations and Vector Calculus**	3	0	-	3

Course Objectives:

1) To enlighten the students in the techniques to solve differential equations.
2) To enable the students to use differential equations in various real world applications ofengineering.

Course Outcomes:

At the end of the course, the student will be able to

- solve the differential equations related to various engineering fields (L6)
- Identify solution methods for partial differential equations that model physical processes (L3)
- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L6)

UNIT 1: Linear differential equations of higher order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator,rules for finding particular integral, method of variation of parameters.

Learning Outcomes:

At the end of this unit, the student will be able to

- identify the essential characteristics of linear differential equations with constant coefficients(L3)
- solve the linear differential equations with constant coefficients by appropriate method (L3)

UNIT 2: Applications of Linear Differential Equations

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients,Applications to L-C-R Circuit problems and Mass spring system.

Learning Outcomes:

At the end of this unit, the student will be able to

- classify and interpret the solutions of linear differential equations (L3)

- formulate and solve the higher order differential equation by analyzing physical situations (L3)

UNIT 3: Partial Differential Equations

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply a range of techniques to find solutions of standard PDEs (L3)
- outline the basic properties of standard PDEs (L2)

UNIT4: Vector differentiation

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient,del applied to vector point functions-Divergence and Curl, vector identities.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply del to Scalar and vector point functions (L3)
- illustrate the physical interpretation of Gradient, Divergence and Curl (L3)

UNIT 5: Vector integration

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Learning Outcomes:

At the end of this unit, the student will be able to

- find the work done in moving a particle along the path over a force field (L4)
- evaluate the rates of fluid flow along and across curves (L4)
- apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (L3)

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Textbooks:

3. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

4. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett,2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B.Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers,2013.
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha ScienceInternational Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
6. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
7. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
8. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
9. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
10. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
11. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
12. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

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I B.TECH – II SEMESTER

		L	T	P	C
19A15303	**Chemistry (Common to EEE, ECE & CSE**	2	1	0	3

COURSE OBJECTIVES	
1	To familiarize engineering chemistry and its applications
2	To train the students on the principles and applications of electrochemistry and polymers
3	To introduce instrumental methods, molecular machines and switches

COURSE OUTCOMES	
CO1	**Apply**Schrodinger wave equation to hydrogen and particle in a box, **illustrate** the molecular orbital energy level diagram of different molecular species, **explain** the band theory of solids for conductors, semiconductors and insulators **discuss** the magnetic behaviour and colour of complexes.
CO2	**apply** Nernst equation for calculating electrode and cell potentials, **differentiate** between pH metry, potentiometric and conductometric titrations, **explain** the theory of construction of battery and fuel cells, **solve** problems based on cell potential
CO3	**explain** the different types of polymers and their applications, **explain** the preparation, properties and applications of Bakelite, Nylon-66, and carbon fibres, **describe** the mechanism of conduction in conducting polymers, **discuss** Buna-S and Buna-N elastomers and their applications
CO4	**explain** the different types of spectral series in electromagnetic spectrum, **understand** the principles of different analytical instruments, **explain** the different applications of analytical instruments
CO5	**explain** the band theory of solids for conductors, semiconductors and insulators, **explain**supramolecular chemistry and self assembly, **demonstrate** the application of Rotaxanes and Catenanes as artificial molecular machines

Unit 1: Structure and Bonding Models:

Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order, crystal field theory – salient features – splitting in octahedral and tetrahedral geometry, magnetic properties and colour, band theory of solids – band diagrams for conductors, semiconductors and insulators, role of doping on band structures.

Unit 2: Electrochemistry and Applications:

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working

and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.
Primary cells – Zinc- MnO_2battery(Laclanche cell), Secondary cells – lead acid and lithium ion batteries- working of the batteries including cell reactions.Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Unit 3: Polymer Chemistry
Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.
Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-6,6, carbon fibres, Elastomers–Buna-S, Buna-N– preparation, properties and applications.
Conducting polymers – polyacetylene, polyaniline, mechanism of conduction and applications.

Unit 4: Instrumental Methods and Applications:
Electromagnetic spectrum. Absorption of radiation: Principle and applications of pH metry, potentiometry, conductometry, UV-Visible**,** IR and Basic concepts of Chromatography techniques and their applications

Unit 5: Advanced Engineering Materials:
(i) Concepts and terms of supra molecular chemistry, complementarity, Basic Lock and Key principle, examples of Supramolecules, Applications of Supra molecules(sensors, catalysts, medical and molecular switches)
ii) Semiconducting and Super Conducting materials-Principles and some examples
iii) Electrical Insulators or Dielectric materials: Definition and classification, Characteristics of electrical insulators and applications of electrical insulating materials
(iv) Nanochemistry: Introduction, classification of nanomaterials properties and applications of Fullerenes, Carbon nano tubes and Graphines nanoparticles.

Text Books:

1. Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, Foruth Edition, New Delhi
2. A Text Book of Enigneering Chemistry, Jain and Jain, Dhanapathi Rai Publications, New Delhi

References:

1.A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi
2. Engineering Chemistry by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH
Pubblications India Pvt Limited.
3. Concepts of Engineering Chemistry- Ashima Srivastavaf and N.N. Janhavi
4. Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu
5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu
6. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

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I B.TECH – II SEMESTER

		L	T	P	C
19A10503	**Data Structures**	2	1	0	3

Course Objectives:

1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithmanalysis
3. To introduce different data structures for solving the problems
4. To demonstrate modeling of the given problem as a graph
5. To elucidate the existing hashing techniques

Unit – 1: Introduction

Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

Learning Outcomes:

Student should be able to

1. Analyze the given algorithm to find the time and space complexities.(L4)
2. Select appropriate sorting algorithm (L4)
3. Designa sorting algorithm (L6)

Unit – 2: Stack, Queue and Linked lists

Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

Learning outcomes:

Student should be able to

1. Evaluate expressions (L5)
2. Develop the applications using stacks and queues (L3)
3. Construct the linked lists for various applications (L6)

Unit – 3 :Trees

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, AVL Trees.

Learning outcomes

1. Explain the concept of a tree (L2)
2. Compare different tree structures (L4)
3. Apply trees for indexing (L3)

Unit – 4 :Graphs and Hashing

The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure

Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

Learning outcomes:
Student should be able to

1. Recognize the importance of Graphs in solving real world problems (L2)
2. Apply various graph traversal methods to applications (L3)
3. Design a minimum cost solution for a problem using spanning trees (L6)
4. Select the appropriate hashing technique for a given application (L5)
5. Design a hashing technique (L6)

Unit – 5: Files and Advanced sorting

File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization.
Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

Learning outcomes:
Student should be able to

1. Organize data in the form of Files (L6)
2. Apply sorting on large amount of data (L3)

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2007.
2. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.

Reference Text Books:

1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016
3. Richard F.Gilberg, Behrouz A.Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.

Course Outcomes:

Students should be able to

1. Select Appropriate Data Structure for solving a real world problem (L4)
2. Select appropriate file organization technique depending on the processing to be done (L4)
3. Construct Indexes for Databases (L6)
4. Analyse the Algorithms (L4)
5. Develop Algorithm for Sorting large files of data (L3)

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I B.TECH – II SEMESTER

		L	T	P	C
19A10303	**Engineering Workshop**	0	0	2	1

C**ourse Objective:**
To familiarize students with wood working, sheet metal operations, fitting and electrical house
Wiring skills

Wood Working:
Familiarity with different types of woods and tools used in wood working and make following
joints

a) Half – Lap joint*
b) Mortise and Tenon joint*
c) Corner Dovetail joint or Bridle joint

Sheet Metal Working:
Familiarity with different types of tools used in sheet metal working, Developments of following
sheet metal job from GI sheets

a) Tapered tray *
b) Conical funnel *
c) Elbow pipe *
d) Brazing

Fitting:
Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit*
b) Dovetail fit *
c) Semi-circular fit
d) Wheel balancing, tubeless tyre puncture and change of two wheelertyre.

Electrical Wiring:
Familiarities with different types of basic electrical circuits and make the following connections

a) Parallel and series*
b) Two way switch*
c) Godown lighting
d) Tube light*
e) Three phase motor
f) Soldering of wires

Note:* Students exercise. Remaining all for demonstration.

Course Outcomes:
After completion of this labthe student will be able to
1. Apply wood working skills in real world applications.
2. Build different parts with metal sheets in real world applications.
3. Apply fitting operations in various applications.
4. Apply different types of basic electric circuit connections.
5. Demonstrate soldering and brazing.
6.Understanding the principle of automobile wheel balancing and alignment.

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I B.TECH – II SEMESTER

		L	T	P	C
19A10304	**Engineering Graphics**	1	0	3	2.5

UNIT-I

Introduction to EngineeringDrawing, Principles of Engineering Graphics and their significance.

Curves used in practice:

Conic sections – Ellipse, Parabola, Hyperbola & Rectangular Hyperbola(general method)

Cycloid, Epicycloid and Hypocycloid – Normal and Tangent

Involutes – Normal and Tangents

UNIT –II

Principles of orthographic projections – First and Third angle projections Projection of points. Projections of lines inclined to one plane and inclined to both planes – True length, true angles of projected lines- Projection of regular planes inclined to one plane and both planes.

UNIT –III

Projection of solids inclined to one plane and inclined to both planes by rotational method – Prism, Cylinder, Pyramid, Cone.

UNIT –IV

Sections of solids: Sections and Sectional views of Regular solids – Prism, Cylinder, Pyramid, Cone – True shapes. Development of Regular solids- Prism, Cylinder, Pyramid, Cone.

UNIT –V

Orthographic projections: Conversion of Pictorial views to orthographic views – Conventions.

Isometric projection: Isometric views of lines, plane figures, simple solids – orthographic views into isometric views.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, K.L. Narayana & P. Kannaih, Scitech Publishers, Chennai.

REFERENCES:

3. Engineering Drawing, Johle, Tata McGraw-Hill Publishers.
4. Engineering Drawing, Shah and Rana,2/e, Pearson Education
5. Engineering Drawing and Graphics, Venugopal/New age Publishers
6. Engineering Graphics, John&john.

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I B.TECH – II SEMESTER

	Title of the Lab	L	T	P	C
19A10404	**Passive Circuits & Electronic Devices Lab**	0	0	2	1

LIST OF EXPERIMENTS

Part A: Experiments using Passive Circuits

- Any 8 of the following experiments are to be conducted in Hardware/Simulation (Multisim/Open source software):

1. Verification of Kirchhoff's Laws
2. Verification of Superposition Theorem
3. Verification of Maximum Power Transfer Theorem
4. Verification of Thevenin's Theorem
5. Verification of Milliman's Theorem
6. Measure and calculate RC/RL time constant for a given RC/RL circuit
7. Measure and analyze (settling time, overshoot, undershoot, etc.) step response of for a given series RLC circuit for following cases:
   (i) $\zeta = 1$ (critically damped system)
   (ii) $\zeta > 1$(over damped system)
   (iii) $\zeta < 1$ (under damped system)
   Choose appropriate values of R, L, and C to obtain each of above cases one at a time.
8. Design a series RLC resonance circuit. Plot frequency response and find resonance frequency, Bandwidth, Q – factor.
9. Design a parallel RLC resonance circuit. Plot frequency response and find resonance frequency, Bandwidth, Q – factor.
10. Measure and calculate h-parameters of two-port network by making use of a transistor.

Part B: List of Experiments

- Any 8 of the following experiments are to be conducted.

1. P-N Junction Diode Characteristics.
2. Zener Diode as voltage regulator.
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. Common Collector input – output characteristics
6. FET Characteristics (CS Configuration)
7. MOSFET Characteristics
8. SCR Characteristics
9. UJT Characteristics

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I B.TECH – II SEMESTER

	Title of the Lab	**L**	**T**	**P**	**C**
19A15304	Chemistry lab	-	-	3	1.5

COURSE OBJECTIVES	
1	Verify the fundamental concepts with experiments

COURSE OUTCOMES	
CO1	**determine** the cell constant and conductance of solutions
CO2	**prepare** advanced polymer materials
CO3	**measure** the strength of an acid present in secondary batteries
CO4	**analyse** the IR and NMR of some organic compounds

LIST OF EXPERIMENTS

1. Conductometrictitration of strong acid vs strong base
2. Conductometrictitration of weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. Estimation of Ferrous Iron by Dichrometry.
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer
8. Verify Lambert-Beer's law
9. Thin layer chromatography
10. Identification of simple organic compounds by IR
11. Separation of Organic mixtures by paper chromatography.
12. Preparation of Nano materials

TEXT BOOKS:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, PearsonEducation.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera

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I B.TECH – II SEMESTER

		L	T	P	C
19A10507	**Data Structures Lab**	0	0	3	1.5

Course Objectives:

1. To introduce to the different data structures
2. To elucidate how the data structure selection influences the algorithm complexity
3. To explain the different operations that can be performed on different data structures
4. To introduce to the different search and sorting algorithms.

Course Outcome:at the end of the course students should be able to

1. Select the data structure appropriate for solving the problem (L5)
2. Implement searching and sorting algorithms (L3)
3. Design new data types (L6)
4. Illustrate the working of stack and queue (L4)
5. Organize the data in the form of files (L6)

Laboratory Experiments

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.

8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, andtraversal.
10. Breadth first search
11. Depth first search
12. Travelling sales person problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using 'Ladies first' principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table data type and support different operations on it.

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II B.TECH – I SEMESTER

		L	T	P	C
19A20604	**Complex Variables and Transforms**	3	0	0	3

Course Objective:

This course aims at providing the student to acquire the knowledge on the calculus of functions ofcomplex variables. The student develops the idea of using continuous/discrete transforms.

Course Outcomes:

After the completion of course, students will be able to

1. understand the analyticity of complex functions and conformal mappings.
2. apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improperintegrals along contours.
3. understand the usage of Laplace Transforms, Fourier Transforms and Z transforms.
4. evaluate the Fourier series expansion of periodic functions.

Unit-I: Laplace Transforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Learning Outcomes:

Studentswill be able to

1. understand the concept of Laplace transforms and find the Laplace transforms of elementaryfunctions.
2. find the Laplace transforms of general functions using its properties.
3. understand Laplace transforms of special functions(Unit step function, Unit Impulse &Periodic).
4. apply Laplace transforms to solve Differential Equations.

Unit-II: Fourier series

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions-typical wave forms - Parseval's formula- Complex form of Fourier series.

Learning Outcomes:

Students will be able to

1. understand finding Fourier series expression of the given function.
2. determine Fourier coefficients (Euler's) and identify existence of fourier series of the givenfunction.
3. expand the given function in Fourier series given in Half range interval.
4. apply Fourier series to establish Identities among Euler coefficients.
5. find Fourier series of wave forms.

Unit-III: Fourier transforms& Z Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem .

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Learning Outcomes:

Students will be able to

1. find Fourier Sine and cosine integrals.
2. understand Fourier transforms.
3. apply properties of Fourier transforms.
4. understand Z transforms.
5. apply properties of Z transforms.
6. apply Z transforms to solve difference equations.

Unit-IV:Complex Variable – Differentiation:

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy- Riemann equations, analytic

functions(exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations(sin z, e^z, cos z, z^2) Mobius transformations (bilinear) and their properties.

Learning Outcomes:

Students will be able to

1. understand functions of Complex variable and its properties.
2. find derivatives of complex functions.
3. understand the analyticity of complex functions .
4. understand the conformal mappings of complex functions.

Unit-V: Complex Variable – Integration:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof);power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi circle with f(z) not having poles on real axis).

Learning Outcomes:

Students will be able to

1. understand the integration of complex functions.
2. apply Cauchy's integral theorem and Cauchy's integral formula.
3. understand singularities of complex functions.
4. evaluate improper integrals of complex functions using Residue theorem.

Text Books:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Advanced Engineering Mathematics, by

Erwin Kreyszig, Wiley IndiaReference Books:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

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II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A24201	**Signals and Systems**	3	0	0	3

Course Objectives:

1. To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domains.
2. To present Fourier tools through the analogy between vectors and signals.
3. To teach concept of sampling and reconstruction of signals.
4. To analyze characteristics of linear systems in time and frequency domains.
5. To understand Laplace and z-transforms as mathematical tool to analyze continuous and discrete-time signals and systems.

Unit I

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error, Fourier series: Trigonometric & Exponential, Properties of Fourier series, concept of discrete spectrum, Illustrative Problems.

Unit II

Continuous Time Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Statement and proof of sampling theorem of low pass signals, Illustrative Problems.

Unit III

Discrete Time Fourier Transform: Definition, Computation and properties of Discrete Time Fourier transform for different types of signals and systems, Illustrative Problems.

Unit IV

Signal Transmission Through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

Unit V

Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the S-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions.

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Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems.

Course Outcomes:

After completion of the course, student will be able to

CO1: Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Also understand the concepts of various transform techniques. (L1)

CO2: Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L2)

CO3: Analyze the frequency spectra of various continuous-time and discrete-time signals using different transform methods. (L3)

CO4: Classify the systems based on their properties and determine the response of them. (L4)

Text Books:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, PHI, 2nd Edition, 2009.
2. Simon Haykin and Van Veen, “Signals & Systems”, Wiley, 2nd Edition, 2005.

References:

1. BP Lathi, “Principles of Linear Systems and Signals”, Oxford University Press, 2nd Edition, 2015.
2. Matthew N.O. Sadiku and Warsame H. Ali, “Signals and Systems A primer with MATLAB”, CRC Press, 2016.
3. Hwei Hsu, “Schaum's Outline of Signals and Systems”, Fourth Edition, TMH, 2019.

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II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A20401	**Electronic Circuits –I**	3	0	0	3

Prerequisites: Semiconductor Devices and their characteristics

Course Objectives:

1. To understand the applications of diodes as rectifiers, clippers, clampers and voltage regulators.
2. To analyze rectifier circuits with and without filters.
3. To design the circuits such as power supplies, voltage regulators.
4. To analyze the various biasing circuits using BJTs & MOSFETs.
5. To understand the operation and analyze the single-stage amplifiers using BJT & MOSFETs at low frequencies.
6. Design of small signal amplifier circuits using MOSFETs and BJTs.

Unit I

Diodes and applications: Introduction, Review of diode characteristics – The ideal diode and its equivalent circuit – Terminal characteristics of junction diode – Modeling the diode forward characteristics – Operation in the reverse break down region – Zener diodes, Rectifier circuits – Half wave rectifier – Full wave Rectifier – Bridge Rectifier, Rectifier with filter – C, L, LC, PI filters, Diodes in digital circuits, Limiting and Clamping Circuits, Problem solving.

Unit II

Bipolar Junction Transistors (BJTs): Review of device structure and physical operation, Current–Voltage Characteristics - Early effect, BJT Circuits at DC, Applying the BJT in Amplifier Design – voltage amplifier – voltage transfer characteristics – small signal voltage gain – Graphical analysis, Biasing in BJT amplifier circuits – fixed bias – emitter bias – self bias – voltage divider bias, biasing using constant current source, Problem solving.

Unit III

Small Signal Analysis of BJTs: Small-Signal Operation and Models – Transconductance – Input resistance at the base – Input resistance at the emitter – voltage gain - Separating the DC Analysis and the Signal Analysis – the hybrid-π model – the T-model – Application of small signal equivalent circuits, Basic BJT Amplifier Configurations - characterizing the amplifiers – Common Emitter (CE) amplifier – CE with emitter resistance – CC amplifier – CB amplifier, Biasing in BJT amplifiers - Discrete-Circuit BJT Amplifiers, Transistor Breakdown and Temperature Effects, Problem solving.

Unit IV

MOS Field Effect Transistors (MOSFETs): Introduction, Review of device structure and physical operation, voltage – current characteristics (n-channel, & p-channel MOSFETs), MOSFET circuits at DC, MOSFETs in amplifier design – voltage amplifier – voltage transfer

characteristics - biasing MOSFET to obtain linear amplification – Graphical analysis,– Small signal operation and models – DC bias point – Biasing MOSFET amplifier circuits – biasing by fixing V_G – biasing through source resistance, biasing through drain to gate resistance – biasing using constant current source, signal current in drain terminal, Problem solving.

Unit V

Small Signal Analysis of MOSFETs: Voltage gain - Separating the DC Analysis and the Signal Analysis – Small Signal Equivalent Models - The Tranconductance g_m - T-equivalent circuit model, Basic amplifier configurations - Characterizing Amplifiers – Common Source amplifier (CS) – CS amplifier with source resistance – Common Gate amplifier – Common Drain amplifier, Frequency response, Body effect – modeling the body effect, Temperature effects, Depletion type MOSFET, Problem solving.

Text Books:

1. Adel S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press International 6th edition, 2013.
2. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.

References:

1. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.
2. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
3. R.L. Boylestead and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

COURSE OUTCOMES:

After the completion of the course students will able to

CO1: Understand the working principle of rectifier circuits, single stage amplifiers (L1)
CO2: Explain the operation of different biasing circuits using MOSFETs and BJTs to stabilize the operating point.(L2)
CO3: Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze low frequency models of BJT and MOSFET. (L3)
CO4: Design circuits for dc power supply with and without filters. Also design biasing circuits using BJTs and MOSFETs. (L4)
CO5: Compare the performance of amplifier circuits involving MOSFETs and BJTs. (L5)

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II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A20402	**Probability Theory and Stochastic Processes**	3	0	0	3

Course Objectives:

1. To gain the knowledge of the basic probability concepts and acquire skills in handling situations involving more than one random variable and functions of random variables.
2. To understand the principles of random signals and random processes.
3. To be acquainted with systems involving random signals.
4. To gain knowledge of standard distributions that can describe real life phenomena.

Unit I

Probability Introduced Through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events, Problem Solving.

Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties, Problem Solving.

Unit II

Operations on Single Random Variable: Introduction, Expectation of a random variable, moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function, transformations of random variable.

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected), Unequal Distribution, Equal Distributions.

Unit III

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

Unit IV

Random Processes-Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence, First-Order

Stationary Processes, Second-Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity. Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

Random Processes-Spectral Characteristics: The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

Unit V

Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties.

Noise Definitions: White Noise, colored noise and their statistical characteristics, Ideal low pass filtered white noise, RC filtered white noise.

Course Outcomes:

After completion of the course, student will be able to

CO1: Understanding the concepts of Probability, Random Variables, Random Processes and their characteristics learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L1)

CO2: Formulate and solve the engineering problems involving random variables and random processes. (L2)

CO3: Analyze various probability density functions of random variables. (L3)

CO4: Derive the response of linear system for Gaussian noise and random signals as inputs. (L3)

TEXT BOOKS:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th Edition, 2002.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", PHI, 4th Edition, 2002.

REFERENCES:

1. Simon Haykin, "Communication Systems", Wiley, 3rd Edition, 2010.
2. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing," Pearson Education, 3rd Edition, 2002.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis," Oxford, 3rd Edition, 1999.

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II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A24204	**Digital Electronics and Logic Design**	3	0	0	3

Course Objectives:

1. To teach significance of number systems, conversions, binary codes and functionality of logic gates.
2. To discuss different simplification methods for minimizing Boolean functions.
3. To impart knowledge on operation, characteristics and various configurations of TTL and CMOS logic families.
4. To outline procedures for the analysis and design of combinational and sequential logic circuits.
5. To introduce programmable logic devices.

Unit I

Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess -3 codes, Gray code.
Binary codes Classification, Error detection and correction – Parity generators and checkers – Fixed point and floating-point arithmetic.

Boolean Algebra& Logic Gates: Boolean operations, Boolean functions, Algebraic manipulations, Min-terms and Maxterms, Sum-of-products and Product-of-sum representations, Two-input logic gates, NAND /NOR implementations.

Unit II

Minimization of Boolean Functions: Karnaughmap, Don't-care conditions, Prime implicants, Minimization of functions using Quine-McClusky method.
Combinational Circuits: Introduction, Analysis of combinational circuits, Design Procedure–Adders, Subtractors, Comparators, Code Converters, Encoders, Decoders, Multiplexers, Demultiplexers

Unit III

Sequential Circuits: Introduction, Latches –RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flip flops, Edge-triggered flip-flops, Flip-flop conversions.

Registers and Counters: Registers, shift registers, Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.

Unit IV

Sequential Machines

Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N – Counters, Finite state machine-capabilities and limitations, Mealy and Moore models

Programmable Logic Devices (PLDs): Basic concepts, Programmable Array Logic (PAL) and Programmable Logic Array (PLA), Design of combinational circuits using PLDs.

Unit V

Digital Logic Families: Unipolar and Bipolar Logic Families, Transistor-Transistor Logic (TTL): Operation of TTL, Current sink logic, TTL with active pull up, TTL with open collector output, Shockley TTL, TTL characteristics, I^2L, ECL logic Families.

CMOS: CMOS Inverter, CMOS characteristics, CMOS configurations - Wired Logic, Open drain outputs, Interfacing: TTL to CMOS and CMOS to TTL, Tristate Logic, Characteristics of Digital ICs: Speed, power dissipation, figure of merit, fan-out, Current and voltage parameters, Noise immunity, operating temperature range, power supply requirements.

COURSE OUTCOMES:

After completion of the course, student will be able to

CO1: Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits. (L1)

CO2: Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Also describe the various performance metrics for logic families. (L2)

CO3: Design combinational and sequential logic circuits. (L4)

CO4: Compare different types of programmable logic devices and logic families. (L5)

TEXTBOOKS:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design", Pearson Education, 4th Edition 2013.
2. Z. Kohavi and N. K. Jha, “Switching and Finite Automata Theory”, Third Edition, Tata McGraw Hill, 2010.
3. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education (India Private Limited), 4th edition, 2012.

REFERENCES:

1. Wakerly J.F., “Digital Design: Principles and Practices”, Pearson India, 4th Edition 2008.
2. Charles H Roth (Jr), Larry L. Kinney, “Fundamentals of Logic Design”, Cengage Learning India Edition, 5th Edition, 2010.
3. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.

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II B.TECH – I SEMESTER

		L	T	P	C
19A22401	**Electrical Technology**	3	0	0	3

Course Objectives: Student can be able to know

1	The constructional features of DC machines, different types of DC machines and their characteristic.
2	The constructional details of single phase transformer and their performance characteristics by conducting suitable tests.
3	The analysis of three phase balanced and unbalanced circuits, Three phase induction motors and their characteristics.
4	The constructional feature and operation of synchronous machines.

UNIT- I DC GENERATORS

D.C. Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of
E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators- Applications

Learning Outcomes:

- To know about principle of operation of a DC machine working as a generator
- To distinguish between self and separately excited generators and classification
- To know how emf is developed
- To distinguish between critical field resistance and critical speed
- To know about various characteristics of different types of generators

UNIT – II D.C. MOTORS

D.C Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses
– Calculation of Efficiency - Swinburne's Test.

Learning Outcomes:

- To know about principle of operation of DC machine working as a motor
- To know about torque developed

- To know about how to control speed of DC shunt motor
- To know about necessity of starter
- To know about various load characteristics of various types of DC motors

UNIT-III SINGLE PHASE TRANSFORMERS & THREE PHASE A.C. CIRCUITS

Introduction - Single Phase Transformers- Constructional Details- Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency- Regulation-OC and SC Tests - Predetermination of Efficiency and Regulation. Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems.

Learning Outcomes:

- To understand the principle of operation of 1-ϕ transformer
- To understand computation and predetermination of regulation of a 1-ϕ transformer
- To know about basics of three phase circuits
- To distinguish between phase voltages, currents, line values and phase values
- To distinguish between balanced and unbalanced three phase circuits and power measurement

UNIT-IV 3-PHASE INDUCTION MOTORS

Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation- Torque Slip Characteristics – Losses and efficiency.

Learning Outcomes:

- To know about principle of operation of three phase induction motor
- To distinguish between squirrel cage and slip ring induction motors
- To know about various losses and computation of efficiency of induction motor
- To know about the torque developed by the induction motor
- To understand various characteristics of induction motor

UNIT – V SYNCHRONOUS MACHINES

Principle and Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

Learning Outcomes:

- To know about principle of working of alternator
- To distinguish between salient pole and cylindrical rotor machines
- To know about emf equation
- To know about predetermination of regulation of alternator by synchronous impedance method
- To know about principle of operation of synchronous motor

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TEXT BOOKS:

1. Electric Machines by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition.2005
2. Basic Electrical Engineering by T.K.Nagsarkar and M.S. Sukhija Oxford University Press, 3rd Edition, 2017.

REFERENCE BOOKS:

1. Fundamentals of Electric Machines by B. R. Gupta, Vandana Singhal, 3rd Edition, New age International Publishers, 2005.
2. Electromachanics – III by S. Kamakashiah, overseas publishers Pvt. Ltd.
3. Principles of Electrical Engineering by V.K. Mehta and Rohit Mehta, S.Chand Publications, 2005.

Course Outcomes:

After completing the course, the student should be able to do the following:

CO1	Able to calculate the e.m.f. generated on DC Generator also able to control speed of different DC motors.
CO2	Able to conduct open circuit and short circuit tests on single phase transformer for knowing their characteristics.
CO3	Able to analyse three phase circuits, three induction motor operating principle and know their torque slip characteristics.
CO4	Able to have knowledge on synchronous machine with which he/she can able to apply the above conceptual things to real-world problems and applications.

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II B.TECH – I SEMESTER

		L	T	P	C
19A20901	**Universal Human Values**	2	0	0	2

Course Objectives:

- Exposure to the value of life, society and harmony
- Leading towards holistic perspective based on self-exploration about themselves (human being), family, and society and nature/existence.
- Bringing transition from the present state to Universal Human Order
- Instill commitment and courage to act.
- Know about appropriate technologies and management patterns

Course Outcomes:

CO1: Analyze the terms like Natural Acceptance, Happiness and Prosperity
CO2: Understand awareness of oneself, and one's surroundings (family, society nature)
CO3: Apply what they have learnt to their own self in different day-to-day settings in real life
CO4: Relate human values with human relationship and human society.
CO5: Justify the need for universal human values and harmonious existence
CO6: Develop as socially and ecologically responsible engineers

UNIT – I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Universal Human Values-I – Self-Exploration- content and process; 'Natural Acceptance' and Experiential Validation – self-exploration - Continuous Happiness and Prosperity - Human Aspirations - current scenario - Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT – II: Understanding Harmony among Human Beings & Self Harmony!

Human being as a co-existence of the sentient 'I' and the material' Body' - the needs - happiness and physical facility -the Body as an instrument of 'I' - the characteristics and activity of 'I' and harmony in 'I' - the harmony of I with the Body

UNIT – III:Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Values in human relationship; meaning of Justice; Trust and Respect; Difference between intention and competence; the other salient values in relationship - the harmony in the society: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals – Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT – IV: **Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

The harmony in the Nature - Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature - Understanding Existence as Co-existence of

mutually interacting units in all- pervasive space - Holistic perception of harmony at all levels of existence.

UNIT – V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Humanistic Education - Competence in professional ethics: professional competence - people friendly and eco-friendly production systems - appropriate technologies and management patterns for above production systems. Individuals as socially and ecologically responsible engineers, technologists and managers.

Textbooks:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999
2. HumanValues, A.N.Tripathi, NewAgeIntl.Publishers, NewDelhi,2004.
3. The Story of Stuff (Book).
4. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj - PanditSunderlal 9. Rediscovering India - byDharampal
5. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
6. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English)

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II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A20403	**Electronic Circuits - I Lab**	0	0	3	1.5

COURSE OBJECTIVES:

1. To verify the theoretical concepts practically from all the experiments.
2. To analyze the characteristics of diodes, BJT, MOSFET.
3. To provide a practical exposure for design& analysis of electronic circuits for generation and amplification input signal.
4. To learn the frequency response and finding gain, input & output impedance of single stage amplifiers.
5. To model the electronic circuits using tools such as PSPICE/Multisim.

LIST OF EXPERIMENTS:

Note: Conduct all the experiments in the laboratory.

1. Design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally.
2. Analyze various clipping and clamping circuits using PN junction diode
3. Design a Zener diode-based ***voltage regulator*** against variations of supply and load. Verify the same experimentally.
4. Design and analysis of voltage- divider bias/self bias circuit using BJT and conduct the experiment to verify theoretical and practical results.
5. Design and analysis of self bias circuit using MOSFET. Verify the same experimentally.
6. Design and implement experimentally suitable circuit for switch using CMOSFET//BJT.
7. Design common source amplifier using MOSFET for the given specifications. Conduct the experiment and verify the same.
8. Design and simulate common gate amplifier using MOSFET (Depletion mode) either in PSPICE or Multisim environment, and study the Gain and Bandwidth of amplifier.
9. Design common drain amplifier using MOSFET (Enhance mode) for the given specifications and calculate the bandwidth of amplifier from its frequency response.
10. Design common emitter amplifier for the given specifications. Conduct the experiment and verify the same.
11. Design and simulate common base amplifier either in PSPICE or Multisim environment, and study the Gain and bandwidth of amplifier.
12. Design common collector amplifier for the given specifications and calculate the bandwidth of amplifier from its frequency response.

Tools / Equipment Required: Software Tool kit Multisim/ Pspice or Equivalent,
DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices

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COURSE OUTCOMES:

CO1: Understand the basic characteristics and applications of basic electronic devices, frequency response of various amplifiers. (L1)

CO3: Analyze all the amplifier circuits and verify the results with theoretical ones.

CO4: Design MOSFET based amplifier circuits/BJT based amplifiers for the given specifications. Also simulate all circuits in PSPICE /Multisim. (L4).

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II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A20404	**Simulation Lab**	0	0	2	1

Course Objectives:

1. To provide practical exposure with generation and simulation of basic signals using standardized tools.
2. To teach analysing signals and sequences using Fourier, Laplace and Z-transforms.
3. To enable to write programs for signal processing applications.

List of Experiments:

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.
4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences.
6. Write a program to find autocorrelation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write a program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).
12. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.
13. To plot pole-zero diagram in S-plane/Z-plane of given signal/sequence and verify its stability.

Note:

- All the experiments are to be simulated using MATLAB or equivalent software.

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Course Outcomes:

CO1: Understand the basic concepts of programming in MATLAB and explain use of built-in functions to perform assigned task. (L1)
CO2: Generate signals and sequences, input signals to the systems to perform various operations (L2)
CO3: Analyze signals using Fourier, Laplace and Z-transforms. (L3)
CO4: Compute Fourier transform of a given signal and plot its magnitude and phase spectrum. (L3)
CO5: Verify Sampling theorem, Determine Convolution and Correlation between signals and sequences. (L5)

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II B.TECH – I SEMESTER

		L	T	P	C
19A22402	**Electrical Technology Lab**	0	0	2	1

Course Objectives: To make the student learn about:

1	Experimental verification of theorems and Experimental verification of Resonance phenomenon.
2	Drawing current locus diagrams and Practical determination of two port network parameters.
3	The DC motors, DC Generators and know various characteristics, performance analysis of DC machines and speed control techniques of DC machines.
4	Various test conditions of single phase transformers.

Course Outcomes:

After completing the course, the student should be able to do the following:

CO1	Apply suitable theorems for circuit analysis and verify the results theoretically.
CO2	Experimental determination of two port network parameters, verify with theoretical , and knowing the performance of RLC circuits with help of locus diagrams.
CO3	Learn about DC motors, DC Generators and know various characteristics, performance analysis of DC machines and speed control techniques of DC machines.
CO4	Various test conditions of single phase transformers.

From the following list experiments minimum five experiments from Part-A and minimum three experiments from Part-B are required to be conducted:

PART-A

1. Verification of KVL and KCL.
2. Two Port Network Parameters – Z-Y Parameters.
3. Two Port Network Parameters – ABCD and H-Parameters.
4. Verification of Superposition and Reciprocity Theorems.
5. Verification of Maximum Power Transfer Theorem.
6. Verification of Thevenin's and Norton's Theorem.

PART-B

1. Magnetization Characteristics of D.C.Shunt Generator. Determination of Critical Field Resistance.
2. Swinburne's Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
3. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
4. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at Given Power Factors and Determination of Equivalent Circuit).

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II B.TECH – I SEMESTER

		L	T	P	C
19A28801	**Biology for Engineers**	3	0	0	0

Course Objectives: To provide basic understanding about life and life Process. Animal an plant systems. To understand what bimolecules, are, their structures are functions. Application of certain bimolecules in Industry.

- Brief introduction about human physiology and bioengineering.
- To understand hereditary units,i.e. DNA (genes) and RNA and their synthesis in living organism.
- How biology Principles can be applied in our daily life using different technologies.
- Brief introduction to the production of transgenic microbes, Plants and animals.

UnitI: Introduction to Basic Biology

Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes.Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Briefintroductiontofivekingdomsofclassification.

UnitOutcomes:

After completingthisunit,thestudentwillbeableto

- Summarize the basis of life.(L1)
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes).(L2)
- Understand how organisms are classified.(L3)

UnitII:IntroductiontoBiomolecules

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA)and theirtypes.Enzymes,EnzymeapplicationinIndustry.Largescaleproductionofenzymesb yFermentation.

UnitOutcomes:

After completingthisunit,thestudentwillbeableto

- Understandwhatarebiomolecules?theirroleinlivingcells,theirstructure,functio nandhowtheyareproduced.(L1)
- Interprettherelationshipbetweenthestructureandfunctionofnucleicacids.(L2)
- Summarizetheapplicationsofenzymesinindustry.(L3)
- Understandwhatisfermentationanditsapplicationsoffermentationinindustry.(L4)

UnitIII:HumanPhysiology

Nutrition:Nutrientsorfoodsubstances.Digestivesystem,Respiratorysystem,(aerobican danaerobicRespiration).Respiratoryorgans,respiratorycycle.Excretorysystem.

UnitOutcomes:

Aftercompletingthisunit,thestudentwillbeableto

- Understandwhatnutrientsare(L1)
- Understandthemechanismandprocessofimportanthumanfunctions(L2&L3)

UnitIV:IntroductiontoMolecularBiologyandrecombinantDNATechnology

ProkaryoticgeneandEukaryoticgenestructure.DNAreplication,TranscriptionandTran slation.rDNAtechnology. Introductiontogenecloning.

UnitOutcomes:

After completingthisunit,thestudentwillbeableto

- Understandandexplainaboutgenestructureandreplicationinprokaryotes andEukaryotes
- Howgeneticmaterial isreplicatedandalsounderstandshowRNAandproteinsaresynthesized.(L2)
- UnderstandaboutrecombinantDNAtechnologyanditsapplicationindifferentfie lds.(L3)
- Explainwhatiscloning.(L4)

UnitV:ApplicationofBiology

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins,Vaccines andantibodies. Basics of biosensors, biochips, Biofuels, andBioEngineering. BasicsofProductionofTransgenicplants andanimals.

UnitOutcomes:

Aftercompletingthisunit,thestudentwillbeabletoUnderstand.

- Howbiologyisappliedforproductionofusefulproductsformankind.(L1)
- Whatarebiosensors,biochipsetc.(L2)
- Understandtransgenicplantsandanimalsandtheirproduction(L3)

CourseOutcomes:

After studyingthecourse,thestudentwillbeableto:

- Explainaboutcellsandtheir structureandfunction. DifferenttypesofcellsandbasicsforclassificationoflivingOrganisms.
- Explainaboutbiomolecules, theirstructureandfunctionandtheirroleinthelivingorganisms.Howbiom oleculesareusefulinIndustry.
- Brieflyabouthumanphysiology.
- Explainaboutgeneticmaterial,DNA,genesandRNAhowtheyreplicate, passandpreservevitalinformationinlivingOrganisms.
- Know aboutapplicationofbiologicalPrinciplesindifferenttechnologiesforthepro

ductionofmedicinesandPharmaceuticalmoleculesthroughtransgenicmicr obes,plantsandanimals.

Textbooks:

1. P.K.Gupta,CellandMolecularBiology,5th Edition,RastogiPublications-
2. U.Satyanarayana.Biotechnology,Books&AlliedLtd2017

ReferenceBooks:

1. N.A.Campbell,J.B.Reece,L.Urry,M.L.CainandS.A.Wasserman,"Biology:A GlobalApproach", PearsonEducationLtd,2018.
2. TJohnson,BiologyforEngineers,CRCpress,2011
3. J.M.WalkerandE.B.Gingold,MolecularBiologyandBiotechnology2nd ed..Pa nimaPublications.PP434.
4. DavidHames,InstantNotesinBiochemistry–2016
5. PhilTunner,A.Mctennan,A.Bates&M.White,InstantNotes– MolecularBiology –-2014

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II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20405	**Electromagnetic Waves and Transmission Lines**	3	0	0	3

Course Objectives:

1. To introduce fundamentals of static and time varying electromagnetic fields.
2. To teach problem solving in Electromagnetic fields using vector calculus.
3. To demonstrate wave concept with the help of Maxwell's equations.
4. To introduce concepts of polarization and fundamental theory of electromagnetic waves in transmission lines and their practical applications.
5. To analyze reflection and refraction of electromagnetic waves propagated in normal and oblique incidences.

Unit I

Vector Analysis: Coordinate systems and transformation-Cartesian, Cylindrical and Spherical coordinates

Vector Calculus: Differential length area and volume, line surface and volume integrals, del operator, gradient, divergent and curl operations.

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, DivergenceTheorem, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

Unit II

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic dipole, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's equations for time varying fields, Maxwell's Equations in Different Final Forms and Word Statements, Illustrative Problems

Unit III

Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

Unit IV

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal

Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

Unit V

Transmission Lines: Introduction, Transmission line parameters, Transmission line equivalent circuit, Transmission line equations and their solutions in their phasor form, input impedance, standing wave ratio, Transmission of finite length- half wave, quarter wave transmission line, Smith chart, graphical analysis of transmission lines using Smith chart, stub matching- single and double stub matching, Illustrative Problems.

COURSE OUTCOMES:

After completion of the course, student will be able to

CO1: Explain basic laws of electromagnetic fields and know the wave concept. (L2)
CO2: Solve problems related to electromagnetic fields. (L3)
CO3: Analyze electric and magnetic fields at the interface of different media. (L3)
CO4: Derive Maxwell's equations for static and time varying fields. (L3)
CO5: Analogy between electric and magnetic fields. (L5)
C06: Describes the transmission lines with equivalent circuit and explain their characteristic with various lengths. (L2)

TEXT BOOKS:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th ed., 2006.

REFERENCES:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000.
2. John D. Krauss, "Electromagnetics", McGraw- Hill publication, 4th Edition,1999.
3. Electromagnetics, Schaum's outline series, 2nd Edition, Tata McGraw-Hill publications, 2006.

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II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20406	**Electronic Circuits –II**	3	0	0	3

Course Objectives:

1. To design and analyze multi-stage amplifiers using BJT & MOSFET at high frequencies.
2. To explain effect of negative feedback on amplifier characteristics.
3. To teach basic principles for analysing RC & LC oscillator circuits.
4. To introduce different types of large signal amplifiers and tuned amplifiers.

Unit I

Differential and Multistage Amplifiers:

The MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, Other Nonideal Characteristics of the Differential Amplifier, The Differential Amplifier with Active Load, Multistage Amplifiers – RC coupled amplifier – Darlington pair – Cascode amplifier, Problem solving.

Unit II

Frequency Response:

Introduction, Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS and CE Amplifiers, Useful Tools for the Analysis of the High-Frequency Response of Amplifiers, A Closer Look at the High-Frequency Response of the CS and CE Amplifiers, High-Frequency Response of the CG and Cascode Amplifiers, High-Frequency Response of the Source and Emitter Followers, High-Frequency Response of Differential Amplifiers, Other Wideband Amplifier Configurations, Multistage Amplifier Examples, Problem solving.

Unit III

Feedback Amplifiers:

Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Transconductance Amplifier, The Feedback Transresistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series), Summary of the Feedback Analysis Method, Determining the Loop Gain, Problem solving.

Unit IV

Power Amplifiers:

Introduction, Classification of Output Stages, Class A Output Stage, Class B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, IC Power Amplifiers, MOS Power Transistors, Problem solving.

Unit V

Tuned Amplifiers and Oscillators:

Basic principle, Inductor losses, use of transformers, Amplifiers with multiple tuned circuits, Synchronous tuning, Stagger tuning.
Basic Principles of sinusoidal oscillators, Op Amp–RC oscillator circuits, LC and crystal oscillators.

COURSE OUTCOMES:

CO1: Understand the working principle of Feedback amplifiers, power amplifiers and tuned amplifiers. (L1)
CO2: Apply appropriate feedback topology to employ with each of the four amplifier types: voltage, current, transconductance, and transresistance amplifiers. (L2)

CO3: Analyze feedback amplifiers, power amplifiers, and tuned amplifier. Evaluate efficiency of large signal (power) amplifiers and voltage regulators (L3)

CO4: Design feedback amplifiers, oscillators, power amplifiers and tuned amplifiers for given specifications. (L4)

Text Books:

1. Adel S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press International 6th edition, 2013.
2. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.

References:

1. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.
2. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
3. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

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II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20407	**Analog Communications**	3	0	0	3

Course Objectives

1. To introduce various modulation and demodulation techniques of analog communication system.
2. To analyze different parameters of analog communication techniques.
3. Know Noise Figure in AM & FM receiver systems.
4. Understand Function of various stages of AM, FM transmitters and Know Characteristics of AM &FM receivers.
5. Understand the concepts of information theory.

Unit – I

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation: Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Frequency division multiplexing (FDM), Illustrative Problems.

Unit – II

Angle Modulation & Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation- Frequency Modulation & Phase modulation : Bandwidth of angle modulated waves, Narrow band frequency modulation (NBFM) and Wide band FM (WBFM), Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves-Indirect method, Direct generation; Demodulation of FM, Band pass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM Capture Effect, Illustrative Problems.

Unit – III

Noise in Communication Systems: Thermal noise, Time domain representation of narrowband noise, filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

Unit – IV

Radio Receivers: Working principle of Super heterodyne AM and FM Receivers along with suitable block diagrams, Sensitivity, Selectivity and fidelity.

Analog Pulse Modulation Schemes: Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

Unit – V

Information Theory: Introduction, Information and Entropy, and its properties, source coding Theorem, Data Compaction – Prefix coding, Huffman coding, Discrete Memory less channels, Mutual Information, and its properties, Channel capacity, Channel coding Theorem, Application to binary symmetric channels, differential entropy and mutual information, Information capacity theorem, implication of information capacity theorem, Rate Distortion, Illustrative problems.

TEXT BOOKS:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," Oxford Univ. press, 3rd Edition, 2006.
2. Simon Haykin, "Communication Systems," by John Wiley & Sons,3rd Edition, 2010.
3. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.

REFERENCES:

1. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010.
2. Herbert Taub&Donald L Schilling, "Principles of Communication Systems", Tata McGraw- Hill, 3rd Edition, 2009.
3. R.E. Ziemer& W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", Jaico Publishing House, 5thedition, 2001.
4. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH,2004.

Course Outcomes

After completion of the course, student will be able to

CO1: Understand the concepts of various Amplitude, Angle and Pulse Modulation schemes. Understand the concepts of information theory with random processes. (L1)
CO2: Apply the concepts to solve problems in analog and pulse modulation schemes. (L2)
CO3: Analysis of analog communication system in the presence of noise. (L3)
CO4: Compare and contrast design issues, advantages, disadvantages and limitations of various modulation schemes in analog communication systems. (L4)
CO5: Solve basic communication problems & calculate information rate and channel capacity of a discrete communication channel. (L5)

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II B.Tech – II SEM

		L	T	P	C
19A20209	**Control Systems**	3	0	0	3

Course Objectives:

To make the students learn about:

1	Merits and demerits of open loop and closed loop systems; the effect of feedback
2	The use of block diagram algebra and Mason's gain formula to find the overall transfer function
3	Transient and steady state response, time domain specifications and the concept of Root loci
4	Frequency domain specifications, Bode diagrams and Nyquist plots
5	State space modelling of Control system

Course Outcomes:

After completing the course, the student should be able to:

CO1	Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis
CO2	Apply the concepts of Block diagram reduction, Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of these techniques.
CO3	Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.
CO4	Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.

UNIT – I CONTROL SYSTEMS CONCEPTS

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, Synchros.

Learning Outcomes: At the end of the unit, the student will be able to

- Write the differential equations for mechanical and electrical systems
- Obtain the transfer function from block diagrams, servo motors and signal flow graphs

UNIT-II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, P, PI, PID Controllers.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze the time domain specifications
- Calculate the steady state errors
- Understand about Proportional, Integral and Derivative controllers along with combinations

UNIT – III STABILITY ANALYSIS IN TIME DOMAIN

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze the concept of stability in time domain
- Apply the concept of Routh's stability and Root locus in time domain

UNIT – IV FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis. Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

Learning Outcomes: At the end of the unit, the student will be able to

- Evaluate the frequency domain specifications from Bode, Polar and Nyquist plots
- Design Compensators for various systems
- Deducing transfer functions from Bode Plots
- Understand difference between Phase and Gain margins

UNIT – V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of state space, controllability and observability
- Obtain the transfer function from sate space and vice versa
- Understand the state transition method of solving time invariant state equations

TEXT BOOKS:

1. "Modern Control Engineering" by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. "Control Systems Engineering" by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

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REFERENCE BOOKS:

1. "Control Systems Principles & Design" by M.Gopal, 4th Edition, Mc Graw Hill Education, 2012.
2. "Automatic Control Systems" by B. C. Kuo and FaridGolnaraghi, John wiley and sons, 8th edition, 2003.
3. "Feedback and Control Systems", Joseph J Distefano III, Allen R Stubberud& Ivan J Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. "Control System Design" by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. "Feedback Control of Dynamic Systems" by Gene F. Franklin, J.D. Powell and Abbas Emami-Naeini, 6th Edition, Pearson, 2010. \
6. NPTEL Lectures on Control Systems by Prof.C.S.Shankar Ram, IIT Madras.

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II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A25501	**Fundamentals of Python Programming** Common to EEE and ECE	2	0	0	2

Course Objectives:
- To teach the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To train in the development of solutions using modular concepts
- To introduce the programming constructs of python

Course Outcomes: After completion of the course a successful student is able to
- List the basic constructs of Python
- Design programs for data structure list and manipulating strings
- Apply object orientation concepts, use data structure dictionaries
- Organize data in the form of files

Unit – I
Introduction: What is a program, Running python, Arithmetic operators, Value and Types. Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.
Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Learning Outcomes: Student should be able to

- List the basic constructs of Python (L1)
- Solve the problems by applying modularity principle (L3)

Unit – II
Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.
Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types,

Learning Outcomes: Student should be able to
- Apply the conditional execution of the program (L3)
- Apply the principle of recursion to solve the problems (L3)

Unit - III
Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

Learning Outcomes: Student should be able to

- Design programs for manipulating strings (L6)

Unit – IV

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Learning Outcomes: Student should be able to

- Apply object orientation concepts (L3)
- Use data structure lists and tuples (L3)

Unit – V

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus planning.

Learning Outcomes: Student should be able to

- Organize data in the form of files (L6)
- Plan programs using object orientation approach (L6)

Text books:

- Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

Reference Books:

- Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
- Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
- R. NageswaraRao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

Course Outcomes: Student should be able to

- Explain the features of Python language (L2)
- Select appropriate data structure for solving a problem (L4)
- Design object oriented programs for solving real-world problems (L6)

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II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20408	**Computer Architecture and Organization**	3	0	0	3

Course Objectives:

1. To discuss organization and design of a digital computer.
2. To explain how to use RTL to represent memory and Arithmetic/ Logic/ Shift operations.
3. To introduce computer languages, machine, symbolic and assembly levels.
4. To present organization of central processing unit and concepts of micro-programmed control.
5. To explain how input-output devices communicate with the other components and methods of data transfer.
6. To teach different types of addressing modes and memory organization.

Unit I

Data Representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Other Binary Codes

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit

Unit II

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design and Accumulator Logic.

Programming the Basic Computer: Machine Language, Assembly Language, the Assembler, Program Loops, programming arithmetic and logic operations

Unit III

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

Unit IV

Micro-programmed Control: Control Memory, Address Sequencing, Micro-program example, Design of Control Unit.

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations.

UNIT V

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

TEXT BOOKS:

1. M. Morris Mano, Computer System Architecture, Pearson Education, Third edition, 2017.

REFERENCES:

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, Computer Organization, McGraw Hill, 5th Edition
2. John D. Carpinelli, Computer Systems Organization and Architecture, Pearson Education, 2018, Fifteenth reprint
3. William Stallings, "Computer Organization and Architecture: Designing for Performance", Eighth Edition, Pearson

Course Outcomes:

CO1: Conceptualize basics of organizational and architectural issues of a digital computer (L4)
CO2: Emphasize representation of data types, numbers employed in arithmetic operations and binary coding of symbols used in data processing (L5)
CO3: Develop low-level programs to perform different basic instructions (L5)
CO4: Evaluate various modes of data transfer between CPU and I/O devices (L5)
CO5: Analyze various issues related to memory hierarchy (L3)
CO6: Design basic computer system using the major components (L4)

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II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20409	Electronic Circuits– II Lab	0	0	3	1.5

Course Objectives:

1. To learn the frequency response and finding gain, input &output impedance of multistage amplifiers.
2. To design negative feedback amplifier circuits and verify the effect of negative feedback on amplifier parameters.
3. To understand the application of positive feedback circuits& generation of signals.
4. To understand the concept of design and analysis of power amplifiers and tuned amplifiers.

LIST OF EXPERIMENTS:

Note: (a) Make use of MOSFETs and BJTs in conducting experiments which are given below. (b) At least four experiments shall be conducted using PSPICE/Multisim from the following list.

1. Design a differential amplifier and find (i) CMRR, (ii) input resistance, (iii) output resistances experimentally.
2. Design a two stage RC coupled amplifier for the given specifications. Determine Gain and Bandwidth from its frequency response curve.
3. Design Darlington amplifier. Determine Gain and Bandwidth from its frequency response curve.
4. Design CE – CB Cascode amplifier. Determine Gain and Bandwidth from its frequency response curve.
5. Design a voltage series feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a voltage series feedback amplifier.
6. Design a current shunt feedback for the given specifications. Determine the effect of feedback on the frequency response of a current shunt feedback amplifier.
7. Design and simulate RC Phase shift oscillator and Wien bridge oscillator for the given specification. Determine the frequency of oscillation.
8. Design either Hartley or Colpitts oscillator for the given specifications. Determine the frequency of oscillation.
9. Design a class A power amplifier and find its conversion efficiency.
10. Design a class B push-pull amplifier and find out the efficiency.
11. Design single tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.
12. Design a double tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.

Course Out Comes:

After completion of the course, student will be able to

CO2: Analyze negative feedback amplifier circuits, oscillators, Power amplifiers, Tuned amplifiers. (L3)

CO3: Determine the efficiencies of power amplifiers (L2)
CO4: Design RC and LC oscillators using transistors. (L4)
CO3: Simulate all the circuits and compare the performance. (

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II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20410	**Analog Communications Lab**	0	0	3	1.5

Course Objectives

- To familiarize the students with basic analog communication systems. Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course.
- Understand all types of analog modulation / demodulation principles.
- Substantiate pulse modulation techniques.
- To design and implement different modulation and demodulation techniques.
- To write and execute programs in MATLAB to implement various modulation techniques.

LIST OF EXPERIMENTS

Conduct any twelve Experiments to be conducted

1. (a) Develop an Amplitude modulation circuit to get modulated signal for various modulation indices. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
   (b) Design a suitable demodulated circuit to recover original information signal.
2. Generate a DSB - SC signal using suitable circuit diagram. Extract information bearing signal from DSB-SC signal. Calculate the power of the DSB-SC signal.
3. (a) Develop a Frequency modulation circuit to get modulated signal for various modulation depths. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
   (b) Design a suitable demodulated circuit to recover original information signal.
4. (a)Design a Mixer circuit to verify the principle of operation of Mixer experimentally.
   (b)Design a Pre-emphasis & de-emphasis circuit and verify its importance experimentally and plot necessary graph.
5. Construct Pulse Amplitude Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
6. Construct Pulse Width Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
7. Construct Pulse Position modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
8. Radio receiver measurements – Sensitivity Selectivity and Fidelity.

Conduct the following experiments using MATLAB software

9. Simulate AM and FM signals and find power spectrum of each signal. Plot the graphs.
10. Simulate PAM and PWM signals and find power spectrum of each signal. Plot the graphs.

11. Generate a complex Gaussian noise (with zero mean unit variance). And pass through an LTI system. Find the power spectrum density of the noise signal available at the output of LTI system.
12. Make use of AM signal from experiment no. 9 add Gaussian noise (with zero mean and unity variance) to the signal. Extract the information bearing signal using suitable system.
13. Simulate Huffman coding.

EQUIPMENT & SOFTWARE REQUIRED:

SOFTWARE:

1. Computer Systems with latest specifications
2. Connected in LAN (Optional)
3. Operating system (Windows XP)
4. Simulations software (MATLAB)

EQUIPMENT:

1. Regulated Power Supply (0-30) V
2. CROs (0-20)MHz
3. Function Generators (0-3) MHz
4. RF Signal Generators (0-1000) MHz
5. Multimeters
6. Required Electronic components (active and passive) for the design of experiments from 1 -7
7. Radio Receiver Demo kits or Trainers.
8. RF power meter frequency range 0 – 1000MHz
9. Spectrum Analyzer

Course Outcomes:

After the completion of the course students able to:

CO1: Understand different analog modulation techniques &Radio receiver characteristics. (L1)

CO2: Analyze different analog modulation techniques. (L3)

CO3: Design and implement different modulation and demodulation techniques. (L4)

CO4: Observe the performance of system by plotting graphs & Measure radio receiver characteristics. (L2)

CO5: Simulate all digital modulation and demodulation techniques. (L5)

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II B.TECH – II SEMESTER

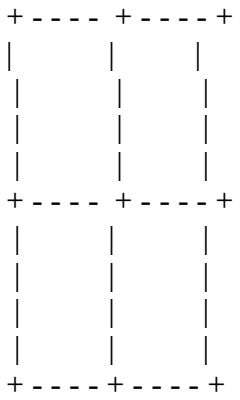
Course Code		L	T	P	C
19A25503	**Fundamentals of Python Programming Lab**	0	0	2	1

Course Objectives:

1. To train solving computational problems
2. To elucidate solving mathematical problems using Python programming language
3. To illustrate the features of Python language

Laboratory Experiments

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a Scientific Calculator
2. Write a function that draws a grid like the following:



3. Write a function that draws a Pyramid with # symbols

```
        #
      # # #
    # # # # #
  # # # # # # #
        .
        .
        .
```

Up to 15 hashes at the bottom

4. The letters of the alphabet can be constructed from a moderate number of basic elemlents, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.

5. The time module provides a function, also named time that returns the current Greenwich Mean Time in "the epoch", which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January 1970.

```
>>> import time
>>>time.time()
1437746094.5735958
```

Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.

6. Given $n+r+1 <= 2^r$ .n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.

7. Write a program that evaluates Ackermann function

8. The mathematician SrinivasaRamanujan found an infinite series that can be used to generate a numerical approximation of $1/\pi$:

9. Write a function called estimate_pi that uses this formula to compute and return an estimate of π.

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

It should use a while loop to compute terms of the summation until the last term is smaller than 1e-15 (which is Python notation for 10^{-15}). You can check the result by comparing it to math.pi.

10. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.

11. Given a text of characters. Write a program which counts number of vowels, consonants and special characters.

12. Given a word which is a string of characters. Given an integer say 'n'. Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.

13. Write program which performs the following operations on list's. Don't use built-in functions

    a) Updating elements of a list
    b) Concatenation of list's
    c) Check for member in the list
    d) Insert into the list
    e) Sum the elements of the list
    f) Push and pop element of list

g) Sorting of list
h) Finding biggest and smallest elements in the list
i) Finding common elements in the list

14. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
15. Write a program that takes a string and prints the letters in decreasing order of frequency.
16. Write a program that reads a word list from a file (see Section 9.1) and prints all the sets of words that are anagrams.
    Here is an example of what the output might look like:
    ['deltas', 'desalt', 'lasted', 'salted', 'slated', 'staled']
    ['retainers', 'ternaries'] ['generating', 'greatening']
    ['resmelts', 'smelters', 'termless']
17. Consider all the files on your PC. Write a program which checks for duplicate files in
    your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
18. Write a program illustrating the object oriented features supported by Python.
19. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
20. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)

Course outcomes: Student should be able to

1. Design solutions to mathematical problems (L6)
2. Organize the data for solving the problem (L6)
3. Develop Python programs for numerical and text based problems (L3)
4. Select appropriate programming construct for solving the problem (L5)
5. Illustrate object oriented concepts (L3)

Reference Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python 3”, 3rd edition, Available at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. Paul Barry, “Head First Python a Brain Friendly Guide” 2nd Edition, O’Reilly, 2016
3. DainelY.Chen “Pandas for Everyone Python Data Analysis” Pearson Education, 2019

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II B.TECH – II SEMESTER

		L	T	P	C
19A10804	**Environmental Science**	3	0	0	3

OBJECTIVE: To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

UNIT – I:

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II:

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III:

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution

e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV:

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V:

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health –

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

TEXT BOOKS :

(1) Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
(2) Environmental Studies by Palani Swamy – Pearson education
(3) Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

REFERENCES :

(1) Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications.
(2) Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
(3) Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.
(4) Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
(5) A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Pubilishing House

(6) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

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III B.Tech I Sem	**L**	**T**	**P**	**C**
	2	**0**	**0**	**2**

19A50401 **INTEGRATED CIRCUITS AND APPLICATIONS**

Course Objectives:

- To introduce basic building blocks of Op-Amps & specialized ICs.
- To explain DC and AC performance characteristics of Op-Amps.
- To impart knowledge on linear and non-linear applications of Op-Amps.
- To describe operation & characteristics of data converters.
- To design various circuits using Op-Amps and 555 timer.
- To familiarise specialised ICs such as VCO, PLL, voltage regulators.

UNIT- I

Operational Amplifier: Introduction, Block diagram, Characteristics and Equivalent circuits of an ideal op-amp, Various types of Operational Amplifiers and their applications, Inverting and non-inverting amplifier configurations. The Practical op-amp: Introduction, Input offset voltage, Offset current, Thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and Gain – bandwidth product.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different Offsets present in Op amp & nullification circuits.
- Examine performance of Op-Amp in open loop and closed configurations.
- Analyse emitter-coupled differential amplifier.
- Compare ideal and practical Op-Amps.

UNIT- II

Applications of Operational Amplifier: Amplifiers: Adder, Integrator, Differentiator, Difference amplifier and Instrumentation amplifier, Converters: Current to voltage and voltage to current converters, Active Filters: First order filters, second order active finite and infinite gain low pass, high pass, band pass and band reject filters, Sine Wave Oscillators: RC phase shift oscillator, Wien bridge oscillator.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe operation of Op-Amp based Linear application circuits, converters, amplifiers and non-linear circuits.
- Examine different types of oscillators & active filters with detailed mathematical analysis and illustrations.
- Design circuits such as amplifiers, comparator, differentiators and integrators using operational amplifiers for various applications, Design active filters and oscillators using Op amp for given specifications.

UNIT- III

Non-Linear Applications of Operational Amplifier: Comparators: Inverting comparator, non-inverting comparator, Schmitt Trigger.

Waveform Generators: Square wave and triangular wave generator with duty cycle modulation, Half and full wave precision rectifiers, log and antilog amplifiers, voltage to frequency converter, frequency to voltage converter.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe operation of Op-Amp based comparators, converters, detectors, rectifiers, sample & hold circuits and waveform generators.
- Analyse Op-Amp based Comparators, converters, detectors, rectifiers, sample & hold circuits and waveform generators.
- Design Wave form generators, voltage to frequency converters & frequency to voltage converters for given specification.

UNIT- IV

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC. Dual Slope ADC, DAC and ADC Specifications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain operation principles of different A/D & D/A converters.
- Compare different types of A/D & D/A converter circuits.
- Inspect ADC & DAC specifications to select the right converter for an application.

UNIT -V

Special Purpose Integrated Circuits: Functional block diagram, working, design and applications of Timer 555 (Monostable&Astable), Functional block diagram, working and applications of VCO 566, PLL 565, voltage regulators.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe internal circuit operation of 555 timer, IC voltage regulators
- Describe functionality of special purpose ICs such as VCO, PLL.
- Design multi-vibrator circuits using timer.

Course Outcomes:

- Understand DC and AC characteristics of operational amplifiers & Op amp parameters and functionality of specialized ICs such as 555 TIMER, VCO, PLL & Voltage regulators.
- Make use of Op-Amps and specialized ICs to design circuits for various applications.
- Analyze Op-Amp based Comparators, Waveform generators, Active filters, Converters.
- Design of Op amp based Comparators, Waveform Generators, Active filters, Converters, design various multi-vibrator circuits using IC 555 timer
- Compare different types of A/D and D/A Converter circuits.

Textbooks:

1. Ramakanth A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, 4thEdition, Pearson, 2017.

2. D. Roy Choudhury,"Linear Integrated Circuits", 2nd Edition, New Age International (p) Ltd., 2003.

Reference Books:

1. Sergio Franco, "Design with Operational Amplifiers &Analog Integrated Circuits", 3rd edition, McGraw Hill, 1988.
2. Jacob Millman, Christos C. Halkias, "Integrated Electronics - Analog and Digital circuits system", Tata McGraw Hill, 2003.
3. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", 5th edition Wiley International, 2009.

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B.Tech – III-I Sem

L	T	P	C
3	0	0	3

19A50402 **ANTENNAS AND WAVE PROPAGATION**

Course Objectives:

- To introduce radiation mechanisms and basic characteristics of antennas.
- To derive mathematical expressions and their application for complete design of antennas.
- To demonstrate various modes of EM wave propagation.
- To explain measurement of antenna parameters
- To introduce design concepts of various types of antennas including micro strip antenna.

UNIT- I

Antenna Characteristics: Radiation mechanism and current distribution, radiation pattern, directivity, gain, Input impedance, polarization, bandwidth, HPBW. Reciprocity, equivalence of radiation and receive patterns, equivalence of impedances, effective aperture, vector effective length, antenna temperature, Friis transmission formula, problem solving.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand radiation mechanism and basic antenna characteristics.
- Compute radiation intensity, gain and directivity of antennas.

UNIT- II

Wire and Antenna Arrays: Wire and antenna arrays: Radiation resistance and directivity and other characteristics of short dipole, monopole, half-wave dipole, small loop antenna.
Linear array and pattern multiplication, two-element array, uniform array, binomial array, broadside and end-fire arrays.
Rhombic antennas, Yagi-Uda array, Turnstile Antenna, Helical antenna - axial and normal modes, log-periodic Array, spiral antenna.

Learning Outcomes:

At the end of this unit, the student will be able to

- Derive expressions for radiation resistance, directivity of wire antennas.
- Obtain radiation pattern of various array antennas using pattern multiplication.
- Compare radiation pattern and other antenna parameters of broadside and endfire array antennas.
- To know the design aspects of antenna arrays.

UNIT- III

Aperture Antennas and Lens Antennas: Aperture Antennas and Lens Antennas: Slot antenna, pyramidal and conical horn antennas, reflector Antenna: flat plate, corner and parabolic reflectors - common curved reflector shapes, Feed mechanisms.
Lens Antennas - Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

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Learning Outcomes:
At the end of this unit, the student will be able to

- Understand basic principles of aperture and lens antennas.
- Design aperture and lens antennas.

UNIT- IV

Micro-Strip Antennas And Antenna Measurements: Micro-strip Antennas and Antenna Measurements: Basic characteristics, feeding methods, methods of analysis - Design of Rectangular and Circular Patch Antennas, Introduction to Smart Antennas - Concept of adaptive beam forming, Measurement of Antenna Parameters, basic setup, radiation pattern measurement, gain, directivity.

Learning Outcomes:
At the end of this unit, the student will be able to

- Describe feeding methods for micro-strip antennas.
- Apply the concepts to measure antenna parameters.
- Design rectangular and circular patch antennas for given specifications.

UNIT- V

Wave Propagation - I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Quantitative Treatment) - Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections, Space Wave Propagation - Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super retraction, M- Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.

Wave Propagation - II: Sky Wave Propagation - Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and skip Distance, Multi-hop Propagation, illustrative problems.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand effects of earth's magnetic field on wave propagation
- Apply the concepts to solve problems related to wave propagation
- Analyze tropospheric propagation and derive the expression for received field strength
- Identify layers in ionosphere and their ionization densities

Course Outcomes:

- Understand various antenna parameters, principle of operation of various antennas viz. wired, aperture, micro strip antennas.
- Discuss various EM wave propagation methods in ionosphere and troposphere
- Analyze mathematical aspects of wave propagation, Derive expressions related to radiation mechanisms for antennas

- Design various antennas namely array, micro strip, horn, lens and aperture antennas, etc., for a given application.
- Compare performance of various antennas.

Textbooks:

1. John D. Kraus, Ronald J. Marhefka, Ahmad S. Khan, "Antennas and Wave Propagation", 4thEdition, TMH, 2010.
2. Jordan, E.C. and Balmain. K. G., "Electromagnetic Waves and Radiating Systems", Prentice Hall Publications.

Reference Books:

1. Constantine A. Balanis, "Antenna Theory-Analysis and Design", Wiley Publication, 2016.
2. K.D. Prasad, "Antenna & Wave Propagation", Satya Prakash Publications, 2009.
3. Matthew N.O.Sadiku, "Principle of Electromagnetics", 4th edition, Oxford (International), 2012.

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B.Tech – III-I Sem

L	T	P	C
3	0	0	3

19A50403 **DIGITAL COMMUNICATIONS**

Course Objectives:

- To understand the key modules of digital communication systems with emphasis on digital modulation techniques.
- To get introduced to the concept and basics of information theory and the basics of source and channel coding/decoding.
- To prepare mathematical background for communication signal analysis.
- To study signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.

UNIT- I

Source Coding Systems: Introduction, sampling process, quantization, quantization noise, conditions for optimality of quantizer, encoding, Pulse-Code Modulation (PCM), Line codes, Differential encoding, Regeneration, Decoding & Filtering, Noise considerations in PCM systems, Time-Division Multiplexing (TDM), Synchronization, Delta modulation (DM)-Granular noise Slope over distortion, Differential PCM (DPCM), Processing gain, Adaptive DPCM (ADPCM), Comparison of the above systems, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand source coding techniques & pulse modulation techniques.
- Describe and determine the performance of line codes.
- Analyze different pulse modulation techniques &Distortions.
- Compare the performance different pulse modulation Schemes.

UNIT- II

Baseband Pulse Transmission: Introduction, Matched filter, Properties of Matched filter, Matched filter for rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, ideal Nyquist channel, raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signalling schemes, Partial response signalling, Baseband M-ary PAM transmission, Eye diagrams, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the performance of baseband pulse transmission system.
- Describe the generation & detection of pass band modulated signals.
- Analyze probability of error for various pass band data transmission schemes.
- Compare the power bandwidth required for various pass band data transmission scheme.

UNIT- III

Signal Space Analysis: Introduction, Geometric representation of signals, Gram-Schmidt orthogonalization procedure, Response of bank of correlators to noisy input, Coherent detection of signals in noise - maximum likelihood decoder, Probability of error, Correlation receiver, detection of signals with unknown phase, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of signal space analysis.
- Examine the characteristics of maximum likelihood decoder.
- Analyze correlation receiver.

UNIT- IV

Passband Data Transmission: INTRODUCTION, Passband transmission model, Coherent modulation schemes- Generation and detection of binary phase shift keying (BPSK), Quadrature shift keying (QPSK), and Binary Frequency shift keying (BFSK). Analysis of probability of error for BPSK, QPSK, BFSK, Power spectra of above mentioned modulated signals. M-ary PSK, M-ary quadrature amplitude modulation (M-ary QAM), Non-coherent orthogonal modulation schemes - Generation and detection of non-coherent BFSK, DPSK - analysis of probability of error and Comparison of power bandwidth requirements for all the above schemes, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyse the different digital modulation techniques, generation and detection, power spectra and their probability of error performance.
- Compare the power bandwidth, bit error probability for various modulation schemes.

UNIT- V

Channel Coding: Discrete memory less channels, Linear Block Codes-Repetition codes, Syndrome decoding, minimum distance considerations, Cyclic codes- generator polynomial, parity check polynomial, encoder for cyclic code, calculation of syndrome, Convolutional Codes – generator polynomials, state diagrams, Viterbi algorithm, Illustrative problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand various error control encoding and decoding techniques.
- Apply information theory and linear algebra in source coding and channel coding.
- Analyse the performance of error control codes.

Course Outcomes:

- Understand the elements of digital communication system, baseband pulse transmission, pass band digital modulation, geometric representation of signals, basics of information theory and error correcting codes.

- Apply the knowledge of signals and system & statistical theory to evaluate the performance of digital communication systems.
- Analyze the different coding, modulation techniques, Probability of error performance of digital system.
- Compare the performance of different modulation schemes& error correcting codes.

Textbooks:

1. Simon Haykin, "Communication Systems", Wiley India Edition, 4th Edition, 2011.
2. B.P. Lathi, &Zhi Ding, "Modern Digital &Analog Communication Systems", 4th edition, Oxford University Press, International 2010.

Reference Books:

1. Sam Shanmugam, "Digital and Analog Communication Systems", 3rd Edition, John Wiley, 2005.
2. Bruce Carlson, and Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", 5th Edition, McGraw-Hill International Edition, 2010.
3. Bernard Sklar, "Digital Communications", 2nd edition, Prentice-Hall PTR, 2001.
4. Herbert Taub and Donald L Schilling, "Principles of Communication Systems", 3rdEdition, Tata McGraw-Hill, 2009.

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B.TECH III–I SEM

		L	T	P	C
19A55501	**English Language Skills**	3	0	0	3

Course Description:
English Language Skills aims to enable the engineering students to meet the demands of the modern job market through thorough training in LSRW skills, presentation skills, interview skills, academic writing etc. Students of our region have knowledge of their respective subjects, but the surveys make it clear that they are lagging behind in expressing themselves effectively in a professional setting. So this course will enable them to hone these skills and excel in their respective fields.

Course Objectives:
- To develop awareness in students of the relevance and importance of technical communication and presentation skills.
- To prepare the students for placements
- To sensitize the students to the appropriate use of non-verbal communication
- To train students to use language appropriately for presentations and interviews
- To enhance the documentation skills of the students with emphasis on formal and informal writing

Course Outcomes:
CO1: To recall and memorize the basic concepts of effective communication
CO2: To understand the various components of effective communication.
CO3: To apply writing skills in order to meet the demands of work place environment.
CO4: To analyze verbal and non-verbal interpretations in multicultural context.
CO5: To evaluate different aspects of verbal and linguistic competence to become effective presenters.
CO6: To design and develop an effective written document in technical domain.

UNIT 1: LSRW SKILLS
Introduction to LSRW Skills – Definition – Importance of LSRW Skills - Advantages and Disadvantages of Oral and Written Skills – Advantages and disadvantages of Written & Speaking skills - Barriers to effective communication
Learning Outcomes:
- To recall and memorize the basic concepts of LSRW skills
- To understand the various components of oral and written skills
- To apply English language skills to avoid barriers to effective communication

UNIT II: VERBAL & NON-VERBAL SKILLS
Informal and Formal Conversation - Non-verbal Skills–Kinesics, Proxemics, Chronemics, Haptics, Oculesics , Paralinguistic features – Body language for interviews
Learning Outcomes:
- To understand the basic components of non-verbal communication.
- To apply the knowledge of the difference between informal and formal conversation in order to meet the demands of work place environment.
- To analyze non-verbal interpretations in multicultural context.

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UNIT III: ACADEMIC WRITING SKILLS

Writing Skills–Art of condensation- summarizing and paraphrasing - Abstract Writing, Synopsis Writing – Formal Letter Writing - Report Writing

Learning Outcomes:

- To understand the basic components of written communication.
- To apply knowledge of different formats of written communication needed in work place environment.
- To analyze the structure of letters, reports etc.

UNIT IV: CREATIVE WRITING SKILLS

Film Review Writing – Creative Writing- Short Story Writing – Speeches for academic settings – Writing Skits – Script for Short Films/Web Series

Learning Outcomes:

- To apply writing skills in creative writing to meet the demands of documentation in professional life
- To analyze different figures of speech in creative writing
- To evaluate different aspects creative and academic writing to become effective at written communication

UNIT V: PROFESSIONAL SPEAKING SKILLS

Job Interviews –Types of Job Interviews – Characteristics of a job interview - Interview Preparation Techniques –How to overcome Stage fright

Group Discussions(GD): Importance of Group Discussion- Characteristics of a GD - GD as a tool for selection – GD Strategies – Do's & Don't of GD - GD Vs Debates

Learning Outcomes:

- To analyze the different aspects of interviews and group discussions
- To evaluate the group dynamics to excel in group discussions
- To design and develop strategies to answer effectively in interviews

Text Books:

1. Effective Technical Communication, Ashrif Rizvi, TataMcGrahill, 2011
2. Technical Communication by Meenakshi Raman & Sangeeta Sharma,3rd Edition, O U Press 2015

References:

1. Communication Skills by Pushpalatha& Sanjay Kumar, Oxford Univsesity Press
2. Books on TOEFL/GRE/GMAT/CAT/IELTS by Barron's/DELTA/Cambridge University Press.2012.
3. Soft Skills for Everyone, Butterfield Jeff, Cengage Publications, 2011.
4. Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
5. Successful Presentations by John Hughes & Andrew Mallett, Oxford.
6. Winning at Interviews by Edgar Thorpe and Showick Thorpe, Pearson

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B.Tech – III-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A50404 ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Professional Elective-I

Course Objectives:

1 To provide an understanding of various measuring systems functioning and metrics for performance analysis.
2 Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3 Provides understanding of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:

CO-1 Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
CO-2 Measure various physical parameters by appropriately Measuring equipments.
CO-3 Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
CO-4 Able to design various bridge models different classes of transducers.

UNIT I

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters –multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand various Performance characteristics of Instruments.
- Apply information in understanding Errors in Measurement, and their statistical analysis.
- Analyse the performance of various parameters of AC & DC Ammeters and Voltmenters.

UNIT II

Oscilloscopes: Standard specifications of CRO,CRT features, derivation of deflection sensitivity, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method).Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concept of different types of Oscilloscopes.

- Apply information in understanding Measurement of amplitude, frequency and phase (Lissajous method).
- Analyse the performance of Principles of sampling, Digital frequency counters, time & Period measurements

UNIT III

Signal generators-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concept of Signal generators-fixed and variable Oscillators.
- Understand concept of various Signals standards, specifications and principles of working
- Analyse the performance of Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers

UNIT IV

Review of DC Bridges: Wheatstone bridge, Wein Bridge, errors and precautions in using bridges, AC bridges: Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance- Schearing Bridge.Kelvin Bridge, Q-meter, EMI and EMC, Interference and noise reduction techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concept of DC Bridges.
- Understand concept of AC Bridges
- Analyse the performance of Measurement of capacitance for various bridge models

UNIT V

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the concept of Sensors and Transducers.
- Understand concept of Active and passive transducers
- Analyse the performance of Measurement of displacement

Textbooks:

1. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 5th Edition, 2002.
2. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill, 2004.

Reference Books:

1. Ernest O Doebelin and Dhanesh N Manik, "Measurement Systems Application and Design", TMH, 5th Edition, 2009.
2. Oliver and Cage, "Electronic Measurement and Instrumentation", TMH.
3. Robert A.Witte, "Electronic Test Instruments, Analog and Digital Measurements", Pearson Education, 2nd Ed., 2004.

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B.Tech – III-I Sem

L	T	P	C
3	0	0	3

19A50405 **MACHINE LEARNING**
Professional Elective-I

Course Objectives:

1 To provide an understanding of various Statistics and Statistical Hypothesis Testing methods
2 Provides understanding of principle supervised and Unsupervised Learning methods from Machine Learning basics.
3. Provides understanding of various machine learning algorithms and python libraries.
4. Able to unserstand concept of Neural networks and activation function.

COURSE OUTCOMES

CO-1 Identify the various statistical learning and statistical hypothesis testing methods.
CO-2 Understand concept of machine learning basics for supervised and unsupervised learning.
CO-3 Analyze various types of Machine learning algorithms and python libraries.
CO-4 Understand basics of Neural networks and activation functions.

Unit -I

Statistics

What is Statistics?, Statistics vs Machine Learning, Statistical Learning, Examples of Statistics in Machine Learning: overview,Gaussian distribution, Sample vs Population, Test Dataset, Central Tendencies, Variance, Describing a Gaussian, Simple Data Visualization.

Statistical Hypothesis Testing: Statistical Test Interpretation, Errors in Statistical Tests, Degrees of Freedom in Statistics, Statistical Distributions: Distributions, Gaussian distribution, Student's t-Distribution, Chi-Squared Distribution,Critical Values, Covariance and Correlation, Significance Tests.

Learning Outcomes:

- Discuss basics of statistics vs Machine learning.
- Explain different types of example in machine learning for data visualization
- Analyze different Statistical Test and Statistical Distribution methods

Unit -II

Machine Learning Basics

Supervised Learning,Classification and Regression, Generalization, Over fitting, and Under fitting, Supervised Machine Learning Algorithms, Some Sample Datasets,k-Nearest Neighbors,Linear Models, Naive Bayes,Classifiers,Decision Trees,Ensembles of Decision Trees, Kernelized Support Vector Machines,Neural Networks (Deep Learning),Uncertainty Estimates from Classifiers, The Decision Function, Predicting Probabilities, Uncertainty in Multiclass Classification.

Unsupervised Learning and Preprocessing.

Types of Unsupervised Learning,Challenges in Unsupervised Learning, Preprocessing and Scaling, Different Kinds of Preprocessing, Applying Data Transformations, Scaling Training and Test Data the Same Way,The Effect of Preprocessing on Supervised Learning, Dimensionality Reduction, Feature Extraction, and Manifold Learning, Principal Component

Analysis (PCA),Non-Negative Matrix Factorization (NMF),Manifold Learning with t-SNE,Clustering,k-Means Clustering, Agglomerative Clustering ,DBSCAN.

Learning Outcomes:

- Discuss basics of Machine learning basics for supervised and unsupervised processing.
- learn different types of linear models and preprocessing methods
- Analyze classifiers and data transformations

Unit – III

Machine Learning Algorithm Performance Metrics

Algorithm Evaluation Metrics, Classification Metrics, Regression Metrics, Spot-Check Classification Algorithms, Algorithm Spot-Checking, Linear Machine Learning Algorithms, Nonlinear Machine Learning Algorithms, Spot-Check Regression Algorithms.

Learning Outcomes:

- Discuss basics of Machine learning basics algorithm metrics
- learn different types of classification metrics and algorithms

Unit –IV

Python Libraries: Matplotlib, Numpy, pandas, requests, Scikit-learn, NuPIC, Ramp, Pipenv, TensorFlow, Bob, PyTorch, Pybrain, MILK, Keras, Dash, SQLAlchemy, BeautifulSoup, Pyglet, SciPy,Scrapy, PyGame, Python Twisted, Pillow, pywin32, wxPython, iPython, Nose, Flask, SymPy, Fabric, PyGTK, Theano, Sympy, Caffe2, Seaborn, Hebel, chainer, openCVPython, NLTK, SQLAlchemy, Bakeh.

Estimation with Cross-Validation: k-Fold Cross-Validation, Configuration of k, Cross-Validation in Python, Variations on Cross-Validation.

Learning Outcomes:

- learning basics python libraries
- Understand cross validation using python

Unit -V

Neural Networks Introduction

History of Neural Networks, Structure and functions of biological and artificial neuron, Neural network architectures, learning methods, evaluation of neural networks, Regularization, Normalization, Activation Function, loss functions, Gradient descent algorithm optimization.

Learning Outcomes:

- Discuss basics of Neural Networks functions and architecture
- Learn different learning methods and activation functions

Textbooks:

1. Jason brownlee “Statistical methods for machine learning – Discover how to transform data into knowledge with python”, Machine learning mastery, 2018.
2. José Unpingco, “Python for Probability, Statistics, and Machine Learning”, Springer, 2nd Edition.

Reference Books:

1. Andreas C. Müller and Sarah Guido, "Introduction to Machine Learning with Python A Guide for Data Scientists", O'Reilly, 1st Edition, 2016.
2. J.M. Zurada, "Introduction to Artificial Neural Systems" - Jaico Publishing House, 2001.

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B.Tech – III-I Sem

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3	0	0	3

19A50406 **SENSORS AND ACTUATORS**
Professional Elective-I

Course Objectives:

- To provide basic knowledge about sensors used in Process industry, manufacturing industry and Automated plants.
- To provide basic knowledge about various Actuation and Mechanical Actuation Systems, manufacturing industry and Automated plants

Course Outcomes:

- Students able to understand the various sensors and Actuators used in process Industry
- Knowledge about different types of mechanical and electromechanical sensor
- Analyze various designs of Thermal sensors – types, sensitivity and specifications
- Design the various types of Radiation sensors design and Electical Actuation Systems

UNIT-I

Definition, principle of sensing &transduction, classification, parameters-Characterstics: static and Dynamic, Characterization, performance characterstics of Instrumentation system.

Mechanical and Electromechanical sensor: Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. Inductive sensor: common types- Reluctance change type, Mutual inductance change type, transformer action type, Magnetostrictive type, brief discussion with respect to material, construction and input output variable, Ferromagnetic plunger type, short analysis. LVDT: Construction, material, output input relationship, I/O curve, discussion. Proximity sensor.

Learning Outcomes:

- Learn fundamentals of principle of sensing & transduction and Characterization
- Explain , Discuss different types of mechanical and electromechanical sensor
- Analyze construction , performance of sensitivity

UNIT-II

Capacitive sensors: variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity. Stretched diaphragm type: microphone, response characteristics.

Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.

Learning Outcomes:

- Discuss design of Capacitive sensors – types, caluculations and its Characterization
- Explain , Discuss Piezoelectric element and ultrasonic sensors

UNIT-III

Thermal sensors: Material expansion type: solid, liquid, gas & vapor, Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermister material, shape, ranges and accuracy specification. Thermoemf sensor: types, thermoelectric power, general

consideration, Junction semiconductor type IC and PTAT type. **Radiation sensors:** types, characteristics and comparison. Pyroelectric type.

Learning Outcomes: :

- Discuss design of Thermal sensors – types, sensitivity and specifications
- Explain Thermoemf sensor, Radiation sensors, –types, Pyroelectric type, characteristics and comparison

UNIT-IV

Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive celltypes, materials, construction, response. Geiger counters, Scintillation detectors.

Learning Outcomes:

- Discuss effects of vilalri and wiedemann - for yoke coil magnetic sensors.
- Explain different types of Radiation sensors design

UNIT - V:

Actuators Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems - Directional Control valves – Presure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators. Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection. Electrical Actuation Systems-Electrical systems -Mechanical switches – Solid-state switches Solenoids – D.C. Motors – A.C. motors – Stepper motors.

Learning Outcomes:

- Discuss various types of actuation systems and measurement of control values.
- Explain different types of Electical Actuation Systems

Textbooks:

1. D. Patranabis – “Sensors and Transducers” –PHI Learning Private Limited.
2. Andrzeji M.Pawlak, “Sensors and Actuators design and applications”, T&F group.

Reference Books:

1. Ramon Pallas- Areny, “Sensors and Signal Conditioning”, John G.Webster, 2nd Edition.
2. Jon Wilson, “Sensor Technology Hand Book”, Newnes, 2004.
3. Herman K.P.Neubrat, “Instrument Transducers – An Introduction to their Performance and design”, Oxford University Press.
4. H.S.Kalsi, “Electronic Instrumentation”, McGraw Hill Education, 3rd Edition, 2017.

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B.Tech – III-I Sem

L	T	P	C
3	0	0	3

19A50407 **ANALOG ELECTRONICS**
Open Elective-I

Course Objectives:

- To understand the characteristics of various types of electronic devices and circuits .
- To apply various principles of electronic devices and circuits to solve complex Engineering problems .
- To analyze the functions of various types of electronic devices and circuits .
- To evaluate the functions of various types of electronic devices and circuits in real time applications .
- To design various types of electronic circuits for use in real time applications .

UNIT-I
Diodes and Applications
Characteristics of PN junction diode and Zener diode. Applications of PNdiode as a switch, rectifier and Zener diode as voltage regulator. Special purpose diodes: photodiode and LED.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the characteristics of various types of diodes .
- Apply the principles of diodes to solve complex Engineering problems .
- Analyze the functions of diodes in forward and reverse bias conditions .
- Evaluate the functions of diodes in real time applications .
- Design rectifiers and switches using diodes .

UNIT-II
BJT and its Applications
Construction, Operation, and Characteristics in CE, CB and CC configurations. Fixed-Bias and Voltage Divider-Bias. Applications as switch and amplifier.
Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the characteristics and biasing of BJT .
- Apply the principles of BJT to solve complex Engineering problems .
- Analyse the functions of BJT in various configurations .
- Evaluate the functions of BJT in real time applications .
- Design amplifiers and switches using BJT .

UNIT-III
FETs and Applications
JFETs: Construction, Operation, and Characteristics in CS configurations. Fixed-Bias and Voltage Divider -Bias. Applications as switch and amplifier.

MOSFETs: Construction, Operation, and Characteristics of Enhancement and Depletion modes in CS configurations. Biasing in Enhancement and Depletion modes. Applications as switch.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the characteristics and biasing of FETs .
- Apply the principles of FETsto solve complex Engineering problems .
- Analyze the functions of FETs in CS configuration .
- Evaluate the functions of FETs in real time applications .
- Design amplifiers and switches using FETs .

UNIT-IV
Feedback Amplifiers and Oscillators
Feedback Amplifiers: Concept of feedback, General characteristics of negative feedback amplifiers, Voltage-series, Current-series, Voltage-shunt, and Current-shunt feedback amplifiers.
Oscillators: Conditions for oscillations, Hartley and Colpitts oscillators, RC phase-shift and Wien-bridge oscillators.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the concept of negative & positive feedback and characteristics feedback amplifiers .
- Apply the principles of feedback amplifiers and oscillators to solve complex Engineering problems .
- Analyze the functions of feedback amplifiers and oscillators .
- Evaluate the functions of feedback amplifiers and oscillators in real time applications .
- Design feedback amplifiers and oscillators for specific applications .

UNIT-V
Wave Shaping and Linear Integrated Circuits
Wave Shaping: Introduction, Waveform Shaping Circuits –RC and RL Circuits. Clippers, Comparator and Clampers.
Linear Integrated Circuits: Operational Amplifier: Characteristics, Block diagram, Applications – Inverting, Non-inverting, Summing amplifier, Subtractor, Voltage Follower.
Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the operation of Wave-Shaping and Linear Integrated Circuits .
- Apply the principles of Wave-Shaping and Linear Integrated Circuits to complex Engineering solve problems .
- Analyse the functions of Wave-Shaping and Linear Integrated Circuits .
- Evaluate the functions of Wave-Shaping and Linear Integrated Circuits in real time applications .
- Design Wave-Shaping and Linear Integrated Circuits for specific applications .

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Note: In all the units, only qualitative treatment is required.

Course Outcomes:
At the end of the course, the student should be able to

- Understand the characteristics of various types of electronic devices and circuits
- Apply various principles of electronic devices and circuits to solve complex
- Engineering problems
- Analyse the functions of various types of electronic devices and circuits, Evaluate the functions of various types of electronic devices and circuits in real time applications
- Design various types of electronic circuits for use in real time applications.

Textbooks:

1. S. Salivahanan and N. Suresh Kumar, "Electronic Devices and Circuits", 4th Edition, McGraw Hill Education (India) Pvt Ltd., 2017.
2. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", 4thEdition, Pearson, 2017

Reference Books:

1. J. Milliman, Christos C Halkias, and Satyabrata Jit, "Electronics Devices and Circuits", 4th Edition, McGraw Hill Education (India) Pvt Ltd., 2015.
2. David A. Bell, "Electronics Devices and Circuits", 5th Edition, Oxford University Press, 2008.

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B.Tech – III-I Sem		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
19A50408	**DIGITAL ELECTRONICS**				
	Open Elective-I				

Course Objectives:

- To introduce different methods for simplifying Boolean expressions
- To analyze logic processes and implement logical operations using combinational logic circuits
- To understand characteristics of memory and their classification.
- To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines
- To understand concept of Programmable Devices

UNIT- I

Minimization Techniques: Boolean Laws**,** De-Morgan's Theorems- Boolean expressions - Minimization– Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions.
Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND– NOR implementations.
Learning Outcomes:

At the end of the unit, the student should be able to:

- Learn Boolean algebra and logical operations in Boolean algebra.
- Apply different logic gates to functions and simplify them.
- Analyze the redundant terms and minimize the expression using Kmaps

UNIT- II

Combinational Circuits: Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor- BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder – encoder.
Learning Outcomes:

At the end of the unit, the student should be able to:

- Apply the logic gates and design of combinational circuits
- Design of different combinational logic circuits

UNIT -III
Sequential Circuits:
Latches, Flip-flops - SR, JK, D, T, and Master-Slave –Truth table – Edge triggering – Level Triggering – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters

Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

Learning Outcomes:

At the end of the unit, the student should be able to:

- Understand the clock dependent circuits
- Identify the differences between clocked and clock less circuits, apply clock dependent circuits
- Design clock dependent circuits

UNIT -IV

Memory Devices Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization, Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

Learning Outcomes:

At the end of the unit, the student should be able to:

- Understand the principle of operation of basic memory devices, and programmable logic devices.
- Implement combinational logic circuits using memory and programmable logic devices

UNIT -V

CMOS LOGIC: : Introduction to logic families, CMOS logic, CMOS logic families; BIPOLAR LOGIC AND INTERFACING: Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families, Familiarity with standard 74-series and CMOS 40- series-ICs – Specifications

Learning Outcomes:

At the end of the unit, the student should be able to:

- Understand Various CMOS Logic familes
- Understand the concept of Bipolar Logic Interfacing.
- Analyze the procedure to perform logic operation to various CMOS logic operations
- Illustrate the various TTL familes , ECL familes and various standard series-ICs specifications.

Course Outcomes:

- Explain switching algebra theorems and apply them for logic functions, discuss about digital logic gates and their properties, Identify the importance of SOP and POS canonical forms in the minimization of digital circuits.
- Evaluate functions using various types of minimizing algorithms like Boolean algebra, Karnaugh map or tabulation method.
- Analyze the design procedures of Combinational & sequential logic circuits.

- Design of different combinational logic circuits, and compare different semiconductor memories.

Textbooks:

1. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. ZviKohavi, "Switching and Finite Automata Theory", 3rd Edition, South Asian Edition, 2010,

Reference Books:

1. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.
5. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
6. Donald D.Givone, "Digital Principles and Design", TMH, 2003.

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(Open Elective - 1)

Subject Code	Title of the Subject	L	T	P	C
19A50513T	**Introduction to Java Programming**	2	1	0	3

COURSE OBJECTIVES	
1	Study the computer basics , software engineering and network basics , HTML
2	Learn Java features to create applications & perform event handling .
3	Learn the Database and interconnection with java.

COURSE OUTCOMES	
1	Ability to know basics of computer and software engineering
2	Ability to write Efficient programs of HTML
3	Create Tables with the databases and retrieving by using queries.
4	Able to design java application and dynamic behavior of classes.
5	Developapplications using different types ofinheritance, polymorphism,overloading And overriding Database and interconnection with java

UNIT-1

Introduction to Computer Basics: Computer, Hardware, CPU, Monitor, Keyboard/mouse, Memory, -RAM, Storage, Software, OS,Application, Saving a file, Files and Folders.

Basics of Network: Home and Office Networks, Networking Types and Structures, Wired vs Wireless Networks,Networking Topologies, Networking Topology- Physical vs Logical, Peer to Peer, Client Server,Network Size.

Networking Levels and Layers and Protocols: Network Addressing, Classes of IPv4, Public and PrivateIP Addresses, What is a Protocol? What is a Protocol Suite?

Protocol Stacks, Networking and Internet Service: IP protocol, DHCP (Dynamic Host configurationProtocol), DNS (domain Name Service), General Networking Physical Component.

Software Engineering Fundamentals : Software Requirement, Problem Recognition, Evaluation and Synthesis, Modeling, Specification, Review, Objectives of Software Design, Software Design Concepts, Different levels of Software Design, Software Design Process, Architectural Design, Structured Programming, Functional Programming, Programming style, Software Documentation, Software Implementation Challenges , Software Validation, Software Verification, Manual Vs Automated Testing,

Testing Approaches, Testing Levels, Testing Documentation, Testing vs. Quality Control, QualityAssurance and Audit

Software Engineering Fundamentals & OOP: Overview of Software Maintenance Need forMaintenance, Categories of Software Maintenance.

Overview of Configuration management and version control : What is Software Configuration Management?, Why do we need Configuration management?, Tasks in SCM process, Configuration Identification, Baseline, Change Control, Configuration Status Accounting, Configuration Audits and Reviews, Participant of SCM process, Software Configuration Management Plan, Software ConfigurationManagement Tools.

Agile Basics:

What is Agile?, What are Agile Methodologies?, What is the Agile Manifesto?, What is Agile projectmanagement?, Agile Scrum methodology.

OOP :

Object Oriented Concepts Problems in Functional Programming, What Is ObjectOriented Programming? ,Objects and Classes Declaration of Class, Declaring Objects, State of an Object, Behaviour of an Object Principles in ObjectOriented technology Abstraction, Encapsulation

OOP & HTML, CSS and JavaScript:

Principles in Object-Oriented technology, Inheritance, PolymorphismHTML,
CSS and JavaScript

Introduction to Web Technology

World Wide Web, IoT, Web Programming, Web Framework, HTML, CSS and JavaScript Introduction to HTML5: HTML5 Elements, Semantic Elements HTML Overview, HTML Versions,
Semantic Web, Semantic Elements in HTML5, <header>, <nav>, <section>, <article>, <aside>, <footer>

Table, List, Working with Links, Image Handling

Define an HTML Table, <table>, <tr>, <td>, <th>, <caption>, Unordered List, Ordered List, DescriptionList, <ul>, <ol>, <li>, <dl>, <dt>, <dd>, Hyperlinks, The target Attribute, Absolute URLs vs. Relative URLs, Use an Image as a Link, Link to an Email Address, <a>, href Attribute, <img>, The src Attribute,The alt Attribute, Image Size - Width and Height, Image as a Link

Form-Input Elements, HTML5 Form elements

The <form> Element, The <input> Element, Text Fields, The <label> Element, Radio Buttons,Checkboxes,
The Submit Button

UNIT-II

HTML, CSS and JavaScript:

HTML5 Attributes, Video & Audio, iframes

Standard Attributes, align, background, bgcolor, class, height, hidden, id, style, tabindex, valign, width,Embedding Video, Embedding Audio, Handling Media Events, HTML <iframe> Tag

Introduction to CSS3, CSS Syntax, CSS Styling

What is CSS, Why use CSS, Inline Style, CSS Style Tags, Linking to CSS, Style Override Precedence

Text and Fonts properties, CSS Selectors, Different color schemes

Text Color and Background Color, CSS Text Alignment, Text Direction, Vertical Alignment, Generic FontFamilies, The CSS font-family Property, Font Style, Font Size

CSS Borders, CSS Margins, CSS Backgrounds

CSS Border Style, The border-style property, Border Width, Border Color, Border Sides, CSS RoundedBorders, margin-top, margin-right, margin-bottom, margin-left, CSS background-color, Opacity / Transparency, CSS background-image, CSS background-repeat

JavaScript basics

Introduction to Javascript, Execution of Javascript, Scripts in head and body of HTML, Internal andExternal Javascript, Javascript Variables, Comments

Functions in Javascript

JavaScript Function Syntax, Built in methods in Javascript, Function Invocation, Function Return, WhyFunctions?,

The () Operator Invokes the Function, Functions Used as Variable Values, Local Variables

Javascript validation

Client-side form validation, Different types of client-side validation, Using built-in form validation,Validating forms using JavaScript, Validating forms without a built-in API

Events, Javascript event handling

Introduction to JavaScript events, Event flow, Event bubbling, Event capturing, Event object, addEventListener(), preventDefault(), stopPropagation()

JavaScript Strings

String Methods and Properties, String Length, Extracting String Parts, The substring() Method, ReplacingString Content, Converting Upper and Lower Case, The concat() Method

JavaScript Dates

JavaScript Date Output, Creating Date Objects, new Date(),new Date(year, month, ...), new Date(dateString), Date Methods, Displaying Dates

Array in Javascript

What is an Array, Creating an Array, Accessing Array Elements, Array Properties and Methods, LoopingArray Elements

Document Object Model (Window, Frame, Navigator Objects)

What is Document Object Model (DOM), Node Types, The nodeName and nodeValue properties, Nodeand Element, Node Relationships
Working with Document Object (Its Properties and methods, Cookie handling)Selecting Elements, Traversing Elements, Manipulating Elements

RDBMS Concepts and SQL Using Oracle:

Introduction to RDBMS Concepts
What is a Relational Database, The relational model, Benefits of relational database management system, ACID properties and RDBMS ,Introduction to SQL History of SQL, SQL Standards, How SQL Works Creating and Managing Tables , Guidelines for Managing Tables, Creating Tables, Altering Tables,Dropping Tables, Data Manipulation: INSERT, UPDATE, DELETE

UNIT-III

RDBMS Concepts and SQL Using Oracle:

Basic SQL SELECT Statements
SELECT, FROM Clause, Comparison Operators, WHERE Clause, ORDER BY, AND, OR, DISTINCT,IN, IS NULL, IS NOT NULL, LIKE, REGEXP_LIKE, NOT, ALIASES

Scalar & Aggregate Functions

String Functions, Numeric Functions, Date Functions, Conversion Functions, NULL-related Functions,AVG, COUNT, MAX, MIN, LISTAGG, SUM
Joins & Subqueries
Oracle INNER JOIN, Oracle LEFT JOIN, Oracle RIGHT JOIN,
Introduction to the Oracle Subquery: Advantages of Oracle Subqueries, Oracle Subquery in the SELECT clause, Oracle Subquery in the FROM clause, Oracle Subquery with comparison operators, Oracle Subquery with IN and NOT IN operators, Oracle correlated Subquery, Oracle correlated Subquery in the WHERE clause, Oracle correlated Subquery in the SELECT clause,
Oracle correlated Subquery with the EXISTS operator

Views & Index

What is a VIEW in Oracle, Create VIEW, Update VIEW, DROP VIEW, What is an Index in Oracle,Create an Index, Create a Function-Based Index, Rename an Index, Drop an Index

RDBMS Concepts and SQL & Introduction to Java:

Sequence, Synonym

About Sequences, Creating Sequences, Altering Sequences, Using Sequences, Dropping Sequences About Synonyms, Creating Synonyms, Using Synonyms in DML Statements, Dropping SynonymsData Control Language Statements , GRANT, REVOKE

Introduction to Java

Features of Java, Java Runtime Environment, Developing software in Java

UNIT-IV

Introduction to Java ProgrammingLanguage Fundamentals: Keywords, Primitive Data Types, Operators and Assignments, Flow Control:Java's Control Statements.

Classes and Objects: Access Specifiers, Constructors - Default and Parameterized, Method & ConstructorOverloading, this reference, using static keyword, Wrapper Classes, Using Scanner Class

Strings, String Handling functions. Array: One dimensional array, Array of Objects, Using varargs, UsingArrays class.

UNIT-VCollections: Collection basics, Set, HashSet, Map, HashMap, List, Array List.

JDBC: JDBC Basics, JDBC architecture, JDBC Drivers. Process SQL with JDBC, JDBC IntroductionJDBC Driver, Create Connection, Query, Update.

Text books:

1. https://www.geeksforgeeks.org
2. https://www.w3schools.com
3. https://www.oracletutorial.com
4. https://www.tutorialspoint.com
5. https://www.javatpoint.com

References:https://www.pcmag.com/encyclopedia

1. https://www.computerhope.com
2. https://courses.lumenlearning.com

https://docs.microsoft.com/en-us/windows-server/networking/technologies

ubject Code	Title of the Subject	L	T	P	C

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

19A50513L	**Java Programming Lab**		-	-	-

COURSE OBJECTIVES	
1	Study the computer basics , software engineering and network basics , HTML
2	Learn Java features to create applications & perform event handling .
3	Learn the Database and interconnection with java.

COURSE OUTCOMES	
1	Ability to know basics of computer and software engineering
2	Ability to write Efficient programs of HTML
3	Create Tables with the databases and retrieving by using queries.
4	Able to design java application and dynamic behavior of classes.
5	Develop applications using different types of inheritance,polymorphism,overloading and overriding and Database and interconnection with java

Week-1:

1. Problem Title: BankAccount Class:
   - Create a Java class called BankAccount which represents a bank account, having as attributes: accountNumber (numeric type), name (name of the account owner as string type), balance.
   - Create a constructor with parameters: accountNumber, name, balance.
   - Create a deposit() method which manages the deposit actions.
   - Create a withdrawal() method which manages withdrawals actions.
   - Create a bankFees() method to apply the bank fees with a percentage of 5% of the balance account.
   - Create a display() method to display account details.
   - Give the complete code for the BankAccount class.

Week-2:

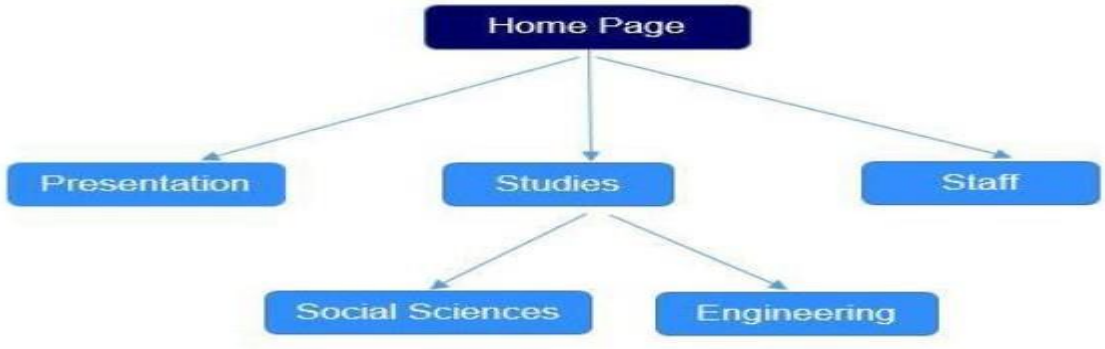
2. Problem Title: Person Class

- Create a Java class Person with attributes: name and age of type string.
- Create a display() method that displays the name and age of an object created via the Person class.
- Create a child class Student which inherits from the Person class and which also has a sectionattribute.
- Create a method displayStudent() that displays the name, age and section of an object created viathe Student class.

- Create a student object via an instantiation on the Student class and then test the displayStudentmethod.

Week-3:

3. Create a website with the following information and structure using HTML5:



The contents of the home page should be:

- Logo and title of the website
- Navigation bar: links to presentation, studies and staff
- News (aside/article/section)
- Announcements (aside/article/section)
- Footer: contact information and copyright
- Use these tags: <header>, <nav>, <aside>, <article>, <section>, <time>, <footer>.
- Here logo image, news, announcements used can be any suitable dataDesign

below form using HTML5:

Vistor Entry Form

Name	Enter your name
Gender	○ Male ○ Female
Mobile Number	Enter your mobile number
Address	Enter your address
City	Mumbai
How you come to know about us	☐ Tv news ☐ Internet
	Reset Submit

Note:

-City is drop down list with multiple city names

-Name, mobile number, address are mandatory fields. If any of these field is empty, after clickingsubmit button, it should show like this.

Week-4:

4. Problem Description:

1. To Create this a HTML Application create a folder called TestCSS.
2. create a file called TableWithCSS.html
3. In the body tag, create a table with header, table rows and table data.
4. Use Internal CSS and provide styles as in sample output
5. Use any png image as background to table header with border radius of 6px.Refer to output forcolor, height, width and font-size.
6. For the table, provide collapse to border-collapse attribute
7. For table data provide border of 1 px dotted and padding of 15px, width 100px, refer to otherproperties and background color as in output
8. Run the Application in Live Server as http://127.0.0.1:5500/TableWithCSS.htmlOr open the Application in browser

Week-5:

5. Problem Description:

1. To Create this HTML Application, create a folder called Telephone.
2. create a file called TelephoneComplaint.html
3. In the body tag create a form and table as shown in sample output with the labels and input typesas shown.
4. Include the following options under Nature Of Complaint
5. 1.Disconnection Problem 2.Phone Dead 3.Other
6. Create a TelephoneComplaint.css file and define the CSS properties here as per sample outputLink CSS file to HTML file.

Sample output:

Week-6:

6. Problem Description:

1. To Create this HTML Application, create a folder called pyramid.
2. Create a file called pyramid.html
3. Use internal JS and define a function called buildPyramid with the number of rows as parameter
4. Write the logic to construct a pyramid in the function.
5. Invoke the function with any value as row argument.

Open the application in browser or run in Live Server with URL as http://127.0.0.1:5500/pyramid.html

Sample output:

Week-7:

7. Problem Description:

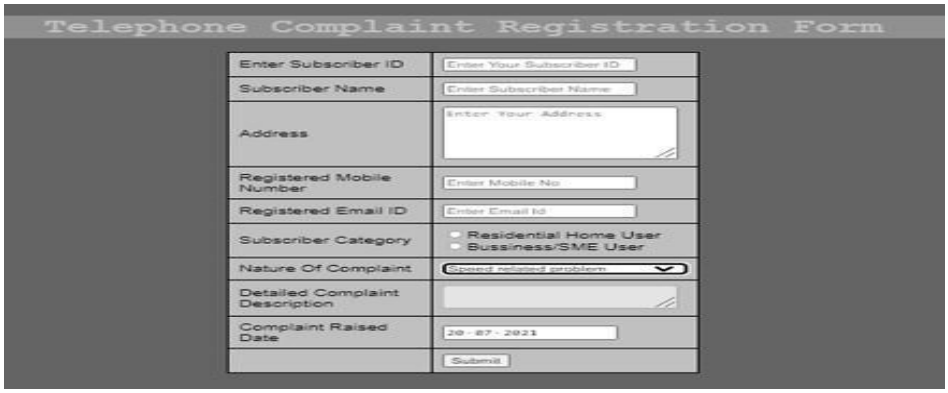
For this Application, use the existing application TelephoneComplaint.html created in folder Telephoneunder section 4.3

Modify the HTML page to include the below validations in JavaScript

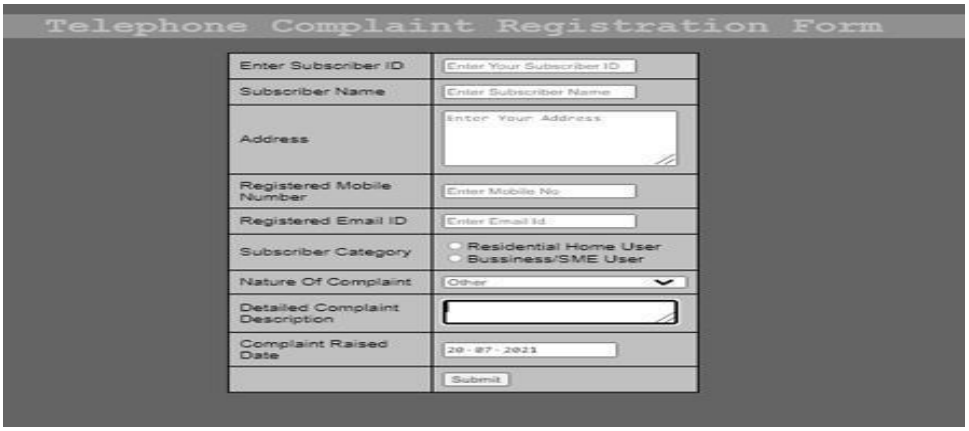
1. Subscriber Name is required and should have max length of 10.
2. validate Email to have @ and. symbol.
3. Registered Mobile number should be 10 digits

Detailed Complaint Description box should be disabled initially, and when user chooses Other option in Nature of Complaint, Description box should get enabled and get disabl ed when a subscriber changes the Nature Of Complaint to something else. (Disconnection Problem/Phone Dead).
Hint: Use onchange event and write JS Code in function enableDisableTextBox(this) to enable/disable description box. This refers to the option currently selected
Complaint raised date should be current date and shouldn't be changed, it should be readyonly and the date should be populated as soon as the form loads in browser.
Hint: write code in JS function getDate() to load current date. Invoke this function using window.onload.Open the application in browser or in LiveServer with URL as http://127.0.0.1:5500/TelephoneComplaint.html

Sample Output when form loads on browser (Assume sysdate/currentDate is 20-07-2021)



Sample Output when NatureOf Complaint is chosen as Other



8. Problem Description:

Zip codes consist of 5 consecutive digits. Given a string, write a JavaScript function isValid(zipCode) todetermine whether the input is a valid zip code.
A valid zip code is as follows:

- Must only contain numbers (no non-digits allowed).
- Must not contain any spaces. Must not be greater than 5 digits in length

Examples:

isValid("59001") ➞ true isValid("853a7") ➞ false isValid("732 32") ➞ false isValid("393939") ➞ false

A group of friends have decided to create a secret code which will be used to login their application. Thiscode will be the first letter of their names, sorted in alphabetical order and count of group members.

Create a function that takes in an array of names and returns the secret code.

Examples:
findCode(["Adam", "Sarah", "Malcolm"]) ➞ "AMS3"
findCode(["Harry", "Newt", "Luna", "Cho"]) ➞ "CHLN4"
findCode(["Phoebe", "Chandler", "Rachel", "Ross", "Monica", "Joey"]) ➞ "CJMPRR6"

Note

The secret code name should entirely uppercased

Week-8:

9. Problem Description:

1. To Create this application, create a folder called DomManipulation.
2. Create a HTML file called dom.html with hyperlink for the paragraph text
3. -[On mouse hover here bold words of the following paragraph will be highlighted]||
4. Include 2 events onMouseOver and onMouseOut for the above hyperlink. ForonMouseOver definea function highlight() and for onMouseOut define a function return_normal.
5. Include the other paragraph having bold(strong) and non bold text as in output.
6. Create an external JS called dom.js and link to html file.

7. Define following functions in dom.js such that when window loads, it invokes functiongetBold_items(). getBold_items() gets all the bold tags with tagname strong and stores it.
9. highlight() iterates all stored bold tags and changes color to red.
10. return_normal() makes all highlighted words dark once the mouse is moved out from hyperlink
11. Open the html application in browser or run in LiveServer with URL http://127.0.0.1:5500/dom.html

Sample Output:

On loading the page in browser

Sample output-1 when mouse is moved over hyperlink

Sample Output-2 when mouse is moved away from hyperlink

10. Problem Description:

Given a list of items

```
<ul id="menu">
<li>Homepage</li>
<li>Services</li>
<li>About</li>
<li>Contact</li>
</ul>
```

Manipulate DOM using JS such that the DOM is changed to

Problem Description:

- Home
- Services
- About

Using DOM Manipulation create a dynamic shopping List as below

My shopping list

Enter a new item: Add item

As items are entered, it gets added as below with the option to delete

My shopping list

Enter a new item: Add item

- Milk Delete
- Veggies Delete
- Chocolates Delete

When Chocolates is deleted, the List should be

My shopping list

Enter a new item: Add item

- Milk Delete
- Veggies Delete

week-9:

11. Problem Title: Insert Records – Tickets

nsert the below records into tickets table.

Ticket_id	Schedule_id	User_id	No_seats
T1	S5	1	2
T2	S2	5	1

12. Problem Title: Department name based on block number

Write a query to display the names of the departments in block number 3 in ascending order.

13. Problem Title: Students Name based on Start and Ending Character

Write a query to display the names of the students that start with letter 'A' and end with the letter 'a',ordered in ascending order.

14. Problem Title: Number of departments

Write a query to display the block number and number of departments in each block and give an alias asNO_OF_DEPT. Sort the result based on NO_OF_DEPT in descending.

15. Problem Title: Subject with Staff Details

Write a query to display the subjectname, code and staff name who handles that subject, ordered by code in ascending order.

16. Problem Title: Maximum mark in Subject with Staff name

Write a query to display list of staff name, subject name handled and maximum mark scored in that subject. Give an alias to the maximum mark as max_mark. Sort the result based on maximum mark in descending

17. Problem Title: Salesmen from New York

Write a query to create a view for those salesmen belongs to the city New York. Refer the following schema

Salesman_id	name	city	commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5007	Paul Adam	Rome	0.13
5003	Lauson Hen	San Jose	0.12

Problem Title: Create Index on Customer table

Create an index named customer_name for the cust_name column of the customer table Refer the following schema

Week-10:

18. Problem Title: Create Sequence

Write a PL/SQL query to create an ascending sequence called id_seq, starting from 10, incrementing by10, minimum value 10, maximum value 100.

19. Problem Title: Use Sequence in a Table Column

Create a new table called tasks with the below DDL query CREATE TABLE tasks(id NUMBER
PRIMARY KEY,

title VARCHAR2(255) NOT NULL
);
Create a sequence called task_id_seq for the id column of the tasks table and use it while insertingrecords to the tasks table:

20. Problem Title: Print Name

Write a Java program to print 'Hello' on screen and then print your name on a separate line.Sample Output 1:
Hello Alex.

21. Problem Title: Divide Numbers

Write a Java program to divide two numbers and print on the screen.

Sample Input 1:
50/3
Sample Output 1:
16

22. Write a Java program to Print "Hello World" 5 times using for loop.

Sample Output 1:
Hello World Hello World Hello World Hello World Hello World

23. Problem Title: Swap Numbers Write a Java program to swap two numbers.Sample Input 1:
Input the First Number: 5 Input the Second Number: 6Sample Output 1:
After Swapping: First Number : 6 Second Number : 5

24. Problem Title: Fibonacci Sequence

Construct Fibonacci sequence controlled by a do-while loopSample Output 1:
0,1,1,2,3,5,8,13,21,34

25. Problem Title: Area of Circle

Write a Java program to print the area of a circle. Radius = 7.5Sample

Output 1:
Area is = 176.71458676442586

26. Problem Title: Temperature convertor

Write a Java program to convert temperature from Fahrenheit (ex 212) to Celsius degree

Sample Input 1:

Given temperature in Fahrenheit: 212
Sample Output 1:
212.0 degree Fahrenheit is equal to 100.0 in Celsius

Week-11:

Problem Title: Product class

27. Create class ProductTwoNum with two integer values and computes their product by calling the instance method int computeProd(int num1, int num2).

Sample Input 1
Num1 : 20
Num2 : 3
Sample Output 1
The product of 20 and 3 is 60.
Problem Title: Area calculation and print details

28. Write a program to print the area of two rectangles having sides (4,5) and (5,8) respectively by creating a class named ‗Rectangle' with a method named ‗rectangleArea' which returns the area and length and breadth passed as parameters to its constructor.

Sample Output 1
Print the area of the Rectangle

Problem Description:

29. Smith has library of magazines. He wants to maintain information of magazines.Write a java program for this. Create a class Magazine with the following attributes:

id, title, author, price Methods:

Sample Input 1

If below sample values are set for magazine object

Id	Title	Author	Price
23	Journey of Life	Michael Jo	600

Enter discount percentage: 5
Sample Output 1 Magazine Details: Id: 23

Title: Journey of Life Author: Michael Jo Price: 570

30. Problem Description:

Alina has to keep track of customers data who are buying products from her shop. For this create aclass Customer with the following attributes:

customerId, customerName, contactNo, paymentDone

- Parameterized constructor

- displaydetails() to display the details of the magazines
- discountedPrice() : pass the discount percent, calculate the discount on price and return theamount to be paid after discount

Input 1

If below sample values are set for customer object

customerId	customerName	contactNo	paymentDone
56	Anjali	9123456789	700
89	Sujoy	8123456790	360
22	Manju	7654389129	1200

Sample Output 1

Total payment done is 2260 Rs.
Highest payment done customer details: Customer Id: 22
Customer Name: Manju Contact number: 7654389129
Payment done: 1200

Week – 12:

31. Problem Title: Palindrome check

Write a program to Identify string given by user is palindrome or not.

Sample Input 1
Enter String: Malayalam
Sample Output 1
Given String is palindrome
Sample Input 2 Enter String: Test Sample Output 2Given
String is not palindrome

Problem Description:

32. Write a java program with method checkEnding() that takes two strings and returns trueif the first string ends with the second string, otherwise return false.

Sample Input 1
checkEnding(-abc||,||bc||);
Sample Output 1
true
Sample Input 2 checkEnding(–samurai||,||pi||); Sample Output 2 False

33. Problem Description:

Write a Java program to calculate the average value of array elements.

Sample Output 1
Average value of the array elements is: 7.0
Problem Description:
Write a Java program to find the maximum and minimum value of an array.Sample

Output 1Original Array: [25, 14, 56, 15, 36, 56, 77, 18, 29, 49]

Maximum value for the above array = 77 Minimum value for the above array = 14

Problem Description:

34. **Write a Java program to create a new array list, add some elements (string) and print outthe collection.**

Sample Output 1:
[Red, Green, Orange, White, Black]
Problem Description:

35. **Problem Description:**

Write a Java program to iterate through all elements in a hash Map.

Sample Output 1:
Red White Pink Yellow Black Green

36. **Problem Description:**

Declare an ArrayList called numList to hold values of Integer type. Write code such that the duplicatevalues are removed.

Sample Input 1
[1,2,3,2,1,4,5,6,6,7,8,8]

Sample Output 1
[1,2,3,4,5,6,7,8]

37. **Problem Description:**

Write a program to store only unique elements of Employee type in the collection, the uniqueness of employee must be identified by the employeeId, the employee must have other properties like name, salary & designation. Print all the employees stored in the collection.
Hint: Use Set<Employee> set = new HashSet<Employee>(); to store the employee object

Sample Output 1

Employee Id = 100, Name = Alex, Salary = 25000, Designation = Manager Employee Id = 101, Name = Bruce, Salary = 15000, Designation = Tester

38. **Problem Description:**

Use the comparator and sort the employee‘s id in ascending and descending order and print the employees in both ascending & descending order

39. **Problem Description:**

Create a menu that will display 4 options

a. Store
b. Display by id
c. Delete by id
d. Exit

The menu should repeat until you enter exit, however the other options must perform operations like storing in the collection, displaying the item based on the id, deleting the item based on id. The item hasto be an Employee with properties like id, name, salary and designation. Employee properties must be initialized dynamically

Define a Java Class Main and in main method write code to load driver and establish connection with database.

Sample Output:

student Id	studentName	Branch	Percentage
100	Ann	Electronics	70.5
101	Ben	Computers	71.3
102	Ken	Mech	60
103	Ram	Computers	90
104	Bhim	Mech	72
105	Shyam	Computers	86

studentId	studentName	Branch	Percentage
103	Ram	Computers	90
105	Shyam	Computers	86

Week-13:

40. Problem Description:

Create a menu that will display 4 options

a. Store
b. Display by id
c. Delete by id
d. Exit

The menu should repeat until you enter exit, however the other options must perform operations likestoring in the collection, displaying the item based on the id, deleting the item based on id. The item has to be an Employee with properties like id, name, salary and designation. Employee properties must be initialized dynamically.

41. Write the menu driven program using JDBC which will have following options

a. Store
b. Display by id
c. Delete by id
d. Update salary by id
e. Exit

The menu should repeat until you enter exit, however the other options must perform operation like storing in the database, displaying the item based on the id, deleting the item based on id, updating the salary of the item based on id. The item has to be an Employee with properties like id, name, salary and designation. Employee properties must be initialized dynamically and also program must ask the id dynamically to perform display and delete and for update id and salary must be dynamic.

Text books:

6. https://www.geeksforgeeks.org
7. https://www.w3schools.com
8. https://www.oracletutorial.com
9. https://www.tutorialspoint.com
10. https://www.javatpoint.com

References:

5. https://www.pcmag.com/encyclopedia
6. https://www.computerhope.com
7. https://courses.lumenlearning.com

https://docs.microsoft.com/en-us/windows-server/networking/technologies

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem

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19A50409 **INTEGRATED CIRCUITS AND APPLICATIONS LAB**

LIST OF EXPERIMENTS

Course Objectives:

- To familiarize different Analog ICs.
- To implement linear and nonlinear application circuits by Op amp.
- To realize active filters using Op amp.
- To design of various multi-vibrator circuits using 555 timer application
- To design and Understand the working of mixed signal circuits like Analog to Digital Convertors, Digital to analog Convertors and Phase Locked Loop.
- To understand the working of a few application specific analog ICs and to design circuits based on these ICs.

Conduct any 8 experiments from the following list.

Note: All the Hardware experiments may be performed using ICs 741, TL082, 555,565

Interpretation of data sheets (741/TL082, 555, 565)

1. Applications of Op-amp
   Design and test the performance of the following circuits using Op-amp IC741/TL082
   a. Inverting amplifier
   b. Non-inverting amplifier
   c. Voltage follower
   d. Summer
2. Design and test the performance of practical differentiator and integrator circuits for various time constants. Plot the graphs.
3. Comparator circuits
   To study Schmitt trigger using Op-Amp.
4. Active filters using Op-amp
   Design and test the performance of any order Butterworth LPF, HPF.
5. Construct and verify the performance of
   a. Logarithmic and antilog amplifiers b. Instrumentation amplifier
6. Precision rectifiers
   Conduct experiments on half wave and full wave precision rectifiers and draw the output waveforms.
7. Design the mono stable multivibrator circuit and verify their performance practically using IC 555.
8. Design the astable multivibrator circuit and verify their performance practically using IC 555.
9. Data converters
   Construct and study performance of
   a. DAC circuits – R-2R and ladder type.

b. Successive approximation type ADC.

10. To study performance of PLL IC565
11. Design a DC power supply using 78XX/79XX and LM723, verify the same practically.

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes

Course Outcomes:

- Understand the working of Op amp ICs & Application specific analog ICs.
- Analyze operational amplifier based circuits for linear and non-linear applications.
- Design Operational amplifiers for linear and nonlinear application, Multivibrator circuits using 555 & application specific ICs.
- Simulate all linear and nonlinear application based Op amp Circuits and circuits based on application specific ICs.
- Compare theoretical, practical & simulated results in integrated circuits.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

III B.TECH–I SEM

		L	T	P	C
19A55502	**English Language Skills Lab**	0	0	3	1.5

Course Description:

English Language Skills Lab aims to enable the engineering students to meet the demands of the modern job market through group activities, individual presentations, mock interviews and group discussions. Students of our region have knowledge of their respective subjects, but the surveys make it clear that they are lagging behind in expressing themselves effectively in a professional setting. So, this course will enable them to hone these skills and excel in their respective fields.

Course Objectives:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.
- To initiate them into greater use of the computer in resume preparation, report writing, format making etc.
- To train them to use language effectively to face interviews, group discussions, public speaking.

Course Outcomes:

CO1: To recall and memorize tips to communicate effectively
CO2: To understand various listening components that includes listening comprehension of gist and detailed information.
CO3: To apply extensive and intensive reading methods for specific reading and voracious reading of vast material.
CO4: To analyze different descriptive and technical writing material.
CO5: To evaluate and develop, academic research paper with appropriate citations, quotations, and references when needed.
CO6: To develop communicative competency and make the students job ready

UNIT-I: COMMUNICATIVE COMPETENCY

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary for competitive purpose

Learning Outcomes:

1. To recall and memorize the basic concepts of reading and listening skills
2. To understand the various components to build up vocabulary

3. To apply English language skills to avoid barriers to effective reading and listening

UNIT-II: TECHNICAL WRITING

1. Email Writing
2. CV/Resume Writing
3. Mini Project Writing

Learning Outcomes:

1. To understand the basic components of writing Emails
2. To apply the knowledge of writing eye catching resumes
3. To analyze different ways of writing a mini project

UNIT-III: ORAL PRESENTATION SKILLS

1. Self-Introduction – Introducing Others – Welcome Speech – Vote of Thanks
2. Oral Presentation-Individual/Impromptu Speeches/ JAM
3. Stage Dynamics– Barriers to Effective Presentation

Learning Outcomes:

1. To understand the basic components of speeches
2. To apply knowledge of different forms of presentation.
3. To analyze stage dynamics for effective presentation

UNIT-IV: TECHNICALPRESENTATION SKILLS

1. Information Transfer
2. PPT Presentation
3. Poster Presentation

Learning Outcomes:

1. To apply knowledge of different types of pictograms to transfer the information
2. To analyze the techniques of preparing PPTs
3. To evaluate different skills in poster presentation

UNIT-V: PROFESSIONAL SKILLS

1. Group discussions-II
2. Interview skills
3. Answering Strategies

Learning Outcomes:

1. To analyze the different aspects of interviews and group discussions
2. To evaluate the group dynamics to excel in group discussions
3. To design and develop strategies to answer effectively in interviews

MINIMUM REQUIREMENT FOR ELCS LAB:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids

- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

SUGGESTED SOFTWARE:

1. Orell: Language Lab Software
2. Clarity Pronunciation Power – Part I (Sky Pronunciation)
3. Clarity Pronunciation Power – part II
4. LES(Learn English Select) by British council
5. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
6. English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
7. Cambridge Advanced Learners' English Dictionary with CD.

The software consisting of the prescribed topics elaborated above should be procured and used.

Reference Books:

1. DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
2. TOEFL &GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
3. Train2success.com

1. Objective English for Competitive Exams, Hari Mohana Prasad, 4th edition, Tata Mc Graw Hill.
2. Technical Communication by Meenakshi Raman & Sangeeta Sharma, O U Press 2009.
3. Books on TOEFL/GRE/GMAT/CAT/IELTS by Barron's/DELTA/Cambridge University Press.2012.
4. Handbook for Technical Writing by David A McMurrey& Joanne Buckely CENGAGE Learning 2008.
5. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.
6. Word Power Made Handy, Shalini Verma, S Chand Publications, 2011.
7. Effective Technical Communication, Ashrif Rizvi, TataMcGrahill, 2011.

WEB LINKS

1.https://www.slideshare.net/ruschellecossid/reading-comprehension-56872438
2.https://www.slideshare.net/FiveEEE/listening-comprehension-40031081
3.https://www.slideshare.net/shrutisalunkhe2/english-for-competitive-exams
4.https://www.slideshare.net/nidhipandey16/email-writing-52942112
5.https://www.slideshare.net/aamirmuhammadaamir77/resume-writing-ppt
6.https://www.powershow.com/view/1d8cf2-OWFhN/Mini_Project_Report_Writing_Workshop_powerpoint_ppt_presentation
7.https://www.slideshare.net/8788902/oral-presentations-28994496
8.https://www.slideshare.net/nandapalit/presentation-skills-33500438
9.https://www.slideshare.net/ritikadhameja/group-discussion-46255658
10.https://www.slideshare.net/vikkerkar/interview-skills-presentation

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B.Tech (R19 Regulation)

B.Tech – III-I Sem **L T P C**
0 0 3 1.5

19A50410 **DIGITAL COMMUNICATIONS LAB**

Course Objectives

- To Develops skills for performance analysis of practical digital communication systems.
- To understand the fundamental concepts on TDM, Pulse modulations& digital modulation techniques.
- To evaluate the performance of PCM, DPCM and DM in a digital communication system.
- To learns how to use MATLAB software and hardware effectively and creatively to synthesis digital communication systems.

LIST OF EXPERIMENTS
Minimum of Twelve experiments to be conducted (any six from Part-A)

HARDWARE EXPERIMENTS (PART – A)

1. Generation of random data using linear feedback shift registers at a given data rate. Plot the random data.
2. Construct Time division multiplexing circuit to multiplex three users' data.
3. Verify the functionality of each block in Pulse code modulation system practically.
4. Find the processing gain in a Differential pulse code modulation circuit experimentally.
5. Verify the operation of Delta modulation and demodulation.
6. Design and verify modulated and demodulated circuit for Frequency shift keying.
7. Construct a modulated and demodulated circuit for Differential phase shift keying.
8. Design and verify working principle of QPSK modulation and demodulation with suitable setup.

SOFTWARE EXPERIMENTS (PART-B)
Modeling of Digital Communications using MATLAB

1. Study Sampling Theorem and verify the effect of under sampling and oversampling while retrieving the original signal.
2. Understand functioning of each block in Pulse code modulation circuit and verify through simulation.
3. Write a program on Differential pulse code modulation and demodulation.
4. Write a program on Frequency shift keying modulation schemes for given two carrier frequencies, determine the bit error probability.
5. Write a program and verify QPSK modulation and demodulation, determine the bit error probability.
6. Write a program and verify Differential phase shift keying modulation scheme is a non-coherent modulation scheme, determine the bit error probability is inferior to that of QPSK.

EQUIPMENT REQUIRED FOR LABORATORIES:

1. RPS - 0 – 30V
2. CROs - 0 – 20 MHz.
3. Function Generators - 0 – 1 MHz

4. RF Generators - 0 – 1000 MHz.
5. Multimeters
6. Required Electronic Components (Active and Passive) which include ICs as well.
7. Arbitrary Wave form generators/ PNS generators – 2 Nos. (To generate digital data at required data rates)
8. Licensed MATLAB software with required toolboxes.

Course Outcomes

- Understand real time behavior of different digital modulation schemes and technically visualize spectra of different digital modulation schemes.
- Design and implement different modulation and demodulation techniques.
- Analyze digital modulation & demodulation techniques.
- Simulate all digital modulation and demodulation techniques in MATLAB.

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B.Tech – III-I Sem

		L	T	P	C
19A55404	**CONSTITUTION OF INDIA (Mandatory course for Semester III/IV)**	3	0	0	0

COURSE OBJECTIVES : The objective of this course is	
1	To Enable the student to understand the importance of constitution
2	To understand the structure of executive, legislature and judiciary
3	To understand philosophy of fundamental rights and duties
4	To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
5	To understand the central-state relation in financial and administrative control

Syllabus

UNIT-I Introduction to Indian Constitution – Constitution -Meaning of the term - Indian Constitution- Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History and features of Indian constitution
- Learn about Preamble, Fundamental Rights and Duties

UNIT-II Union Government and its Administration Structure of the Indian Union - Federalism - Centre-State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III State Government and its Administration - Governor - Role and Position -CM and Council of ministers - State Secretariat-Organization Structure and Functions

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LEARNING OUTCOMES:-After completion of this unit student will

- Understand the structure of state government
- Analyze the role of Governor and Chief Minister
- Explain the role of State Secretariat
- Differentiate between structure and functions of state secretariat

UNIT-IV Local Administration - District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Pachayati Raj - Functions– PRI –Zilla Parishath - Elected officials and their roles – CEO,ZillaParishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration's role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Learn about the role ofZillaParishath block level organization

UNIT-V Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

LEARNING OUTCOMES:-After completion of this unit student will

- Know the role of Election Commission
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze the role of state election commission
- Evaluate various commissions viz SC/ST/OBC and women

TEXT BOOKS

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust

REFERENCES:

1. J.A. Siwach, Dynamics of Indian Government & Politics,
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. .J.C. Johari, Indian Government andPolitics, Hans India
4. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

E-RESOURCES: 1.nptel.ac.in/courses/109104074/8 2.nptel.ac.in/courses/109104045/ 3.nptel.ac.in/courses/101104065/

4.www.hss.iitb.ac.in/en/lecture-details
5.www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Understand historical background of the constitution making and its importance for building a democratic India.
CO2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
CO3	Understand the value of the fundamental rights and duties for becoming good citizen of India.
CO4	Analyze the decentralization of power between central, state and local self-government
CO5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

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B.Tech – III-II Sem

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3	0	0	3

19A60401 **MICROPROCESSORS AND MICROCONTROLLERS**

Course Objectives:

- To introduce fundamental architectural concepts of microprocessors and microcontrollers.
- To impart knowledge on addressing modes and instruction set of 8086 and 8051.
- To introduce assembly language programming concepts.
- To explain memory and I/O interfacing with 8086 and 8051.
- To introduce16 bit and 32 bit microcontrollers.

Course Outcomes:

- Understand instruction set of 8086 microprocessor and ARM architecture.
- Explain addressing modes of 8086, develop assembly language programs for various problems, describe interfacing of 8086 with peripheral devices, architecture and addressing modes of ARM Cortex M0+, assembly instruction set of ARM Cortex M0+.
- Distinguish between microprocessor and microcontroller, 8085& 8086 microprocessors, design applications using microcontrollers.

UNIT- I

Introduction to 8085 and 8086 Microprocessors: 8085 Microprocessor Architecture, Pin Diagram, Flag Register, Interrupts of 8085. Register Organisation of 8086, Architecture, Pin Diagram, Flag Register, Physical Memory concept, Memory addressing in 8086, Stack organization of 8086, Addressing Modes in 8086, Interrupt structure of 8086.

Learning Outcomes:-

After completion of this unit student will

- Summarize features of a microprocessor
- Explain about ISR and interrupt structure of 8086
- Distinguish between Intel 8085& 8086 microprocessors

UNIT- II

8086 Microprocessor Instruction Set and Addressing Modes, Instruction Set of 8086, Assembly Language Programming, Simple programs, Assembler Directives, Procedures and Macros, String Instructions.

Learning Outcomes:-

After completion of this unit student will

- Understand instruction set of 8086 microprocessor
- Explain addressing modes of 8086
- Develop assembly language programs for various problems

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UNIT- III

Memory interacting with 8086 and Peripheral Devices, Interfacing SRAMs, DRAMs and EPROMs to 8086, Programmable Peripheral Interface 8255, Programmable Interval Timer 8253, Programmable Interrupt Controller 8259, Programmable Communication Interface 8251 USART, DMA Controller 8257.

Learning Outcomes:-

After completion of this unit student will

- Demonstrate memory &I/O interfacing with 8086
- Describe interfacing of 8086 with peripheral devices

UNIT- IV

Intel 8051 Microcontroller, Microprocessor vs Microcontroller, 8051 Microcontroller Architecture, Microcontroller 8051 pin diagram, 8051 Ports, Internal and External Memory, Counters and Timers, Serial Communication in 8051, Interrupts in 8051, Addressing Modes, Data Transfer Instructions, Data and Bit-Manipulation Instructions, Arithmetic Instructions, simple programs.

Learning Outcomes:-

After completion of this unit student will

- Describe architecture and features of Intel 8051 microcontroller
- Develop assembly language programs to perform various operations using 8051
- Distinguish between microprocessor and a microcontroller

UNIT- V

ARM Architectures and Processors: What is ARM Architecture, ARM Processor Families, ARM Cortex-M Series, Cortex-M0+ Processor Overview, Cortex-M0+ Block Diagram, Registers, Memory Map, Bit-band Operations, Endianness, ARM Cortex-M0+ Processor Instruction Set – ARM and Thumb Instruction Set.

Learning Outcomes:-

After completion of this unit student will

- Explain architecture and addressing modes of ARM Cortex M0+.
- Explain the Assembly instruction set of ARM Cortex M0+.

Textbooks:

1. K M Bhurchandi, A K Ray, “Advanced Microprocessors and Peripherals”, 3rd edition, McGraw Hill Education, 2017.
2. Alexander G. Dean “Embedded Systems Fundamentals on Arm Cortex-M based Microcontrollers”: A Practical Approach, ARM Education Media.

Reference Books:

1. Raj Kamal, "Microcontrollers: Architecture, Programming, Interfacing and System Design", 2nd edition, Pearson, 2012.
2. Ramesh S Gaonkar, "Microprocessor Architecture Programming and Applications with the 8085", 6th edition, Penram International Publishing, 2013.
3. Kenneth J. Ayala, " the 8051 Microcontroller", 3rd edition, Cengage Learning, 2004.
   Andrew N. Sloss, Dominic Symes, Chris Wright, ARM System Developer's Guide: "Designing and Optimizing System Software", Elsevier, 2004.
4. John H. Davies, Newness, "MSP 430 Microcontroller Basics", Elsevier Publications, 2008.

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B.Tech – III-II Sem

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19A60402 **DIGITAL SIGNAL PROCESSING**

Course Objectives:

- To provide background and fundamental material for the analysis and processing of digital signals.
- To familiarize the relationships between continuous-time and discrete time signals and systems.
- To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
- To introduce a few real-world signal processing applications.
- To acquaint with DSP processor.

Course Outcomes

- Understand the basic concepts of IIR and FIR filters, DSP building blocks to achieve high speed in DSP processor, DSP TMS320C54XX architecture and instructions.
- Compute the fast Fourier transforms and find the relationship with other transforms. Realization of digital filter structures.
- Design of FIR and IIR digital filters.
- Compare FIR and IIR filters.

UNIT- I

Discrete Fourier Transform: Discrete Fourier series, Properties of Discrete Fourier series, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT.

Fast Fourier Transforms: Efficient computation of DFT algorithms - Radix 2-Decimation-in-Time & Decimation-in-Frequency algorithms, Inverse FFT, Illustrative problems.

Learning Outcomes:-

After completion of this unit student will

- Understand the concept of DFT and its properties.
- Find N-Point DFT/FFT for a given signal/sequence.

UNIT- II

IIR Digital Filters: Review of analog filter design, Frequency transformation in the analog and digital domains,Design of IIR filters from Analog filters – Approximation of derivatives, Impulse invariance, Bilinear transformation,Design of Butterworth, Chebyshev filters, Illustrative problems.

Realization of IIR Systems: Structures for IIR systems–Direct form I& Direct form II, Transposed, Cascade form, Parallel form and Lattice structures, Signal flow graphs.

Learning Outcomes:-

After completion of this unit student will

- Understands signal flow graph and block diagram representations of difference equations that realize digital filters
- Realization of different structures for IIR filters
- Design of IIR filters using different techniques.

UNIT- III

FIR Digital Filters: Linear phase FIR filter, characteristic response, location of zeros, Design ofFIR filter using Windowing Techniques - Rectangular, Hanning, Hamming, Kaiser, Bartlett, Blackman, Design ofFIR filter by Frequency sampling technique, Illustrative problems.
Realization of FIR Systems: Structures for FIR systems - Direct form, Cascade form and Lattice structures. Comparison of FIR and IIR filters.

Learning Outcomes:-
After completion of this unit student will

- Understand the concept of FIR filter
- Realization of different structures for FIR filters
- FIR filter design based on windowing methods.
- Compare FIR and IIR filters

UNIT -IV

Architectures for Programmable DSP Devices: Basic Architectural features, DSPComputational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues.

Learning Outcomes:-
After completion of this unit student will

- Recognize the fundamentals of fixed and floating point architectures of various DSPs.
- Learn the architecture details and instruction sets of fixed and floating point DSPs.
- Illustrate the control instructions, interrupts, and pipeline operations.

UNIT- V
Programmable Digital Signal Processors: Introduction, Commercial Digital signal-processingDevices, Architecture of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Learning Outcomes:-
After completion of this unit student will

- Illustrate the features of on-chip peripheral devices and its interfacing along with its programming details.
- Analyze and implement the signal processing algorithms in DSPs.

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Textbooks:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications", Pearson Education/PHI, 4th ed., 2007.
2. Avtar Singh and S. Srinivasan, "Digital Signal Processing", Thomson Publications, 2004.

Reference Books:

1. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3rd edition, 2009.
2. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing", 2nd, Pearson Education, 2012.
3. B. P. Lathi, "Principles of Signal Processing and Linear Systems", Oxford Univ. Press, 2011.
4. B.VenkataRamani and M.Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", TMH, 2004.

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B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60403 **DIGITAL SYSTEM DESIGN THROUGH VHDL**

Course Objectives:

- Learn and understand the architectures of Field-programmable Gate Arrays.
- Translate a software application into hardware logic for FPGA architectures.
- Design synthesizable systems based on industry-standard coding methods.
- Build testbenches and create data models to verify bit-true accurate designs.
- Acquire the knowledge about Design and modelling of Parwan CPU, vending machine, washing machine, etc.

UNIT-I

Introduction and Field-Programmable Gate Arrays: Hardware Description Languages, FPGA Boards and Software Tools, Transistor as a Switch, Logic Gates from Switches, FPGA Building Blocks, Layout of the Xilinx Artix-7 XC7A35T FPGA, Resources of FPGA, Clock Management, The XADC Block, High-Speed Serial I/O Transceivers, Peripheral Component Interconnect Express Interface, FPGA-Based Digital System Design Philosophy, Advantages and Disadvantages of FPGAs, Usage Areas of FPGAs, Introduction to VHDL, VHDL Fundamentals, Entity and Architecture Representations, Dataflow Modeling, Behavioral Modeling, Timing and Delays in Modeling, Hierarchical Structural Representation, Testbench Formation in VHDL, Structure of a VHDL Testbench File, Displaying Test Results.

Learning Outcomes:-

After completion of this unit student will

- Understand the architecture of FPGA devices
- Know the software tools used in digital design
- Understand the VHDL design styles to design digital systems

UNIT-II

VHDL Data Types and Operators: Data Types in VHDL, Signal and Variable Data Types, Data Values, Naming a Signal or Variable, Defining Constants, Defining Arrays, Operators in VHDL, Application on Data Types and Operators, FPGA Building Blocks Used in Data Types and Operators, Implementation Details of Vector and Arithmetic Operations.

Learning Outcomes:-

After completion of this unit student will

- Know various data types used in VHDL language
- Understand the VHDL operators and apply them in digital design
- Implement various arithmetic and logical operations in digital design

UNIT-III

Combinational Circuits: Logic Gates, Combinational Circuit Analysis, Logic Function Formation between Input and Output, Boolean Algebra, Gate-Level Minimization,Combinational Circuit Implementation, Truth Table-Based Implementation, Implementing Combinational Circuits, Combinational Circuit Design,

Combinational Circuit Blocks: Adders in VHDL, Comparators in VHDL, Decoders in VHDL, Encoders in VHDL, Multiplexers in VHDL, Parity Generators and Checkers in VHDL, Applications on Combinational Circuit Blocks, Sample Designs, Home Alarm System, Digital Safe System, Car Park Occupied Slot Counting System, Applications on Combinational Circuits, Implementing the Home Alarm System, Implementing the Digital Safe System, Implementing the Car Park Occupied Slot Counting System, FPGA Building Blocks Used in Combinational Circuits,
Data Storage Elements: Latches in VHDL, Flip-Flops in VHDL, Register, Memory, Read-Only Memory, ROM in VHDL, ROM Formation Using IP Blocks, Random Access Memory, Application on Data Storage Elements, FPGA Building Blocks Used in Data Storage Elements.

Learning Outcomes:-
After completion of this unit student will
- Design and analyze various combinational logic circuits
- Use VHDL in design of combinational logic circuits to analyze the behaviour
- Implement various memory and data storage elements using VHDL

UNIT-IV
Sequential Circuits: Sequential Circuit Analysis, State Table, State Diagram, State Representation in VHDL, Timing in Sequential Circuits, Synchronous Operation, Asynchronous Operation, Shift Register as a Sequential Circuit, Shift Registers in VHDL, Multiplication and Division Using Shift Registers, Counter as a Sequential Circuit, Synchronous Counter, Asynchronous Counter, Counters in VHDL, Frequency Division Using Counters, Sequential Circuit Design, Applications on Sequential Circuits

Learning Outcomes:-
After completion of this unit student will
- Design sequential logic circuits
- Use VHDL in design of sequential logic circuits to analyze the behavior
- Create VHDL structural models to design sequential logic circuits

UNIT-V
CPU Modeling and Design: Defining a Comprehensive Example,ParwanCPU Memory Organization of Parwan, Instruction Set, Instruction Format, Programming in Parwan Assembly, Behavioral Description of Parwan, Timing and Clocking, Packages, Interface Description of Parwan,Parwan Behavioral Architecture, Parwan Bussing Structure, Interconnection of Components, Global View of Parwan Components, Instruction Execution
Advanced Applications: Vending Machine, Digital Clock, Moving Wave via LEDs, Translator, Air Freshener Dispenser, Obstacle-Avoiding Tank, Intelligent Washing Machine, Non-Touch Paper Towel Dispenser, Car Parking Sensor System, Digital Table Tennis Game

Learning Outcomes:-
After completion of this unit student will
- Understand the design of Parwan CPU
- Develop VHDL models for various advanced digital applications

- Use VHDL in design of digital design systems like washing machines, car parking systems

Course Outcomes:

- Understand the architecture of FPGAs, tools used in modelling of digital design and modelling styles in VHDL.
- Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
- Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.
- Model complex digital systems at several levels of abstractions, behavioural, structural.
- Design complex digital CPU, vending machine and washing machines etc and analyze the case studies.

Textbooks:

1. CemUnsalan, Bora Tar "Digital System Design with FPGA Implementation Using Verilog and VHDL" McGraw-Hill Education, 2017
2. ZainalabedinNavabi "VHDL: Analysis and Modeling of Digital Systems", Z. Navabi, McGraw Hill International Ed. 1998.

Reference Books:

1. J. Bhaskar "A VHDL Primer", Pearson Education India, 3rd edition, 2015
2. Stephen Brown and ZvonkoVranesic "Fundamentals of digital logic design with VHDL"Tata McGraw Hill, 2nd edition, 2009.

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B.Tech – III-II Sem		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
19A60404	**SPEECH PROCESSING**				
	Professional Elective - II				

Course Objectives:

- To understand how speech signals are processed for Analysis and Synthesis. Also tounderstand speech processing in the context of its creation (anatomy, classification of sounds, etc.) as well as in its perception (psychology & neuroscience).
- To analyze tools that are needed for analysis and synthesis, in the areas of digital signal processing for time-frequency analysis.

Course Outcomes:

- After completing the course, the student will be familiar with the principles and the techniques used in speech processing.
- Understand speech synthesis, speech coding and speech recognition.
- Analyze models for speech processing and LPC
- Learn about the recognition approaches, Parametric representation of speech and recognition.

UNIT-I

FUNDAMENTALS OF DIGITAL SPEECH PROCESSING: Anatomy & Physiology of Speech organs, the process of speech production, the acoustic theory of speech production, Digital models for speech signals.

TIME DOMAIN MODELS FOR SPEECH PROCESSING: IntroductionWindow considerations, Short time energy and average magnitude Short time average zero crossing rate ,Speech vs silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

Learning Outcomes:

- Knowledge about digital speech processing and domain models.
- Understand the autocorrelation functions

UNIT-II

LINEAR PREDICTIVE CODING (LPC) ANALYSIS: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition, Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Learning Outcomes:

- Knowledge about Linear Predictive Analysis and Autocorrelation Method
- Understand the Comparison between the Methods of Solution of the LPC Analysis Equations

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UNIT-III

HOMOMORPHIC SPEECH PROCESSING: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, the Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder.

SPEECH ENHANCEMENT: Nature of interfering sounds, Speech enhancement techniques, Spectral subtraction, Enhancement by re-synthesis.

Learning Outcomes:

- Knowledge about Homomorphic Systems for Convolution
- Understand the Complex Cepstrum of Speech
- Understand the Speech enhancement techniques, Spectral subtraction

UNIT-IV

AUTOMATIC SPEECH RECOGNITION: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System. Continuous digit Recognition System SPEAKER RECOGNITION: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

Learning Outcomes:

- Knowledge about Parametric representation of speech
- Understand the Recognition techniques, Speaker Recognition Systems

UNIT-V

HIDDEN MARKOV MODEL (HMM) FOR SPEECH: Hidden markov model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS, Adapting to variability in speech, Language models.

Learning Outcomes:

- Knowledge about Hidden markov model (HMM) for speech recognition
- Understand the Viterbi algorithm, Training and testing using HMM.

Textbooks:

1. L.R Rabiner and S.W.Schafer, “Digital processing of speech signals”, Pearson, 2007.
2. Douglas O Shaughnessy, “Speech communication”, Second Edition Oxford University press, 2000.

Reference Books:

1.Thomas F. Quateri, “Discrete Time Speech Signal Processing”, 1/e, Pearson, 2006.
2. Ben Gold & Nelson Morgan, “Speech & Audio Signal Processing”, 1/e, Wiley, 2006.
3. L.R Rabinar and B.H.Juang, “Fundamentals of Speech Recognition”, Pearson, 1993.

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B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60405 **ADVANCED MACHINE LEARNING**
Professional Elective - II

Course Objectives:

- To understand basics of Linear algebra and importance of special kinds of matrices.
- Learn basics of Deep Learning and convolution algorithms
- Understand the concept of Docker containers and AWS
- Learn about Tensor flow and its limitations.

Course Outcomes:

- After completing the course, the student will be familiar with the principles and the techniques used in linear algebra.
- Understand concept of Deep learining and various efficient convolution algorithm
- Analyze the importance of Docker containers and installing docker.
- Knowledge about AWG sage maker and training models

Unit –I

Linear Algebra:

Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices, Linear Dependence and Span, Norms, Special Kinds of Matrices and Vectors, Eigendecomposition, Singular Value Decomposition, The Moore-Penrose Pseudoinverse, The Trace Operator, The Determinant, Example: Principal Components Analysis.

Learning Outcomes:

- Understand the importance of Linear algebra
- Know about the scalars, vectors and tensors and special kinds of matrices.

UNIT -II

Deep Learning

Convolution network, pooling, structured output, data types, efficient convolution algorithm, randomized and unsupervised features, Recurrent and recursive networks- unfold computation graphs, recurrent neural networks, encoder-decoder, deep recurrent network, recursive neural network, echo state network, optimization, and challenges,Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.

Learning Outcomes:

- Understand the concept of Deep learning basics
- Know about the Convolution network, pooling, structured output, data types and convolution algorithms
- Knowledge about Reccurrent and recursive networks.

UNIT -III

Docker Container

Getting started with Docker, Installing docker – Mac OS X, Windows, Ubuntu, Google Cloud, Building Images, parameters, Examples Building an image from a Dockerfile, A simple Dockerfile, Difference between ENTRYPOINT and CMD, Exposing a Port in the Dockerfile, Pushing and Pulling an Image to Docker Hub or another Registry, Building using a proxy, Connecting Containers – parameters, Docker network, Docker compose, container linking.

Learning Outcomes:

- Understand the concept of Docker containers and installing docker.
- Know about the docker file between entrypoint and CMD

UNIT -IV

Machine Learning with Amazon Web Services

What Is Cloud Computing?, Cloud Service Models, Cloud Deployment Models, The AWS Ecosystem, Machine Learning Application Services, Machine Learning Platform Services, Support Services, AWS Global Infrastructure, Regions and Availability Zones Edge Locations, Accessing AWS.

AWS Sage maker: Creating an Amazon SageMaker Notebook Instance, Preparing Test and Training Data, Training a Scikit-Learn Model on an Amazon SageMaker Notebook Instance, Training a Scikit-Learn Model on a Dedicated Training Instance, Training a Model Using a Built-in Algorithm on a Dedicated Training Instance.

Learning Outcomes:

- Understand the concept of Cloud Computing and AWS services
- Know about the machine learning services for AWS
- Knowledge about AWG sage maker and training models used for built in algorithms

UNIT -V

Introduction to TensorFlow:

What Is Machine Learning?, Limitations of Traditional Programming, From Programming to Learning, What Is TensorFlow?, Using TensorFlow- Installing TensorFlow in Python, Using TensorFlow in PyCharm, Using TensorFlow in Google Colab, Getting Started with Machine Learning Seeing What the Network Learned.

Learning Outcomes:

- Understand the concept of Tensor flow and its limitations
- Know about usage of tensorflow in pycharm , goolge colab and in python

Textbooks:

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville, “Deep learning”, MIT press, Cambridge, Massachusetts, London, 2016.
2. Laurence Moroney, “AI and Machine Learning for Coders”, Printed in the United States of America, y O’Reilly Media.

Reference Books:

1. Farhan Hasin Chowdhury-The Docker Handbook – 2021 Edition.
2. François Chollet,“Deep Learning with Python”, Second Edition,Manning Publications, 2017.
3. Abhishek Mishra, “Machine Learning in the AWS Cloud Add Intelligence to Applications with Amazon SageMaker and Amazon Rekognition”, John Wiley & Sons, Incorporated (2019).

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B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60406 **DATA COMMUNICATIONS AND NETWORKINGS**
Professional Elective-II

Course Objectives:

- To explain the basic concept of computer communication networks
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce IP addressing, UDP and TCP Models.
- To have the concept of different routing techniques for data communications.

Course Outcomes:

- Understand the requirement of theoretical & practical aspects of computer networks, functions of various layers involved in data communications, building the skills of sub netting and routing mechanisms.
- Explain the role of protocols in networking.
- Analyze the services and features of the various layers in the protocol stack.

UNIT- I

Introduction to Computer Networks: Uses of computer Network, Network Software-design Issues for layers, Service primitives and relationship of services to Protocols, Reference models- OSI & TCP/IP, network architectures introduction, Example of Networks-X.25, Frame Relay & ATM, Protocols and Standards.

Learning Outcomes:

At the end of this unit, the student will be able to

- Enumerate the layers of the OSI model and TCP/IP.
- Explain the function(s) of each layer.

UNIT- II

Physical Layer: Physical layer- Data rate limits, Transmission media-guided and Unguided, Switching systems, Circuit switching, Datagram switching & Virtual circuit switching, Structure of circuit and packet switch, cable modem and DSL technologies, SONET basics, selection of IEEE std 802.11, a, b, c, g.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand principles of data communication using transmission (guided and wireless) media.
- Know to the concepts of various switching techniques.
- Explain the basics of DSL, SONET, and IEEE standards.

UNIT- III

Data link layer: Framing, Flow & Error control Protocols, HDLC, PPP, Multiple access techniques, random access, controlled access & Channelization, Ethernet types-bridged, Switched, Full duplex, Fast & gigabit Ethernet, Introduction to Data link layer in 802.11 LAN, connecting devices like passive hubs, repeaters, Active hubs, Bridges, Two-layer

Switches, Routers, three layer switches, Gateway etc., Backbone networks, Virtual LANs, Simple Router architecture, Sliding window protocol.

Learning Outcomes:
At the end of this unit, the student will be able to

- List the different connecting devices for networking.
- Understand the principles of error control protocols, multiple access protocols, routers and switches in data link layer.
- Solve the error control and multiple access based problems.

UNIT- IV
Network Layer: IPv4 address, IPv6 address, Address mapping-ARP, RARP & DHCP, IPv4 datagram detail format, IPv6 datagram detail format, ICMP, IGMP, Network layer issues like Delivery, forwarding, intra-domain and Inter-domain routing, Routing algorithms like Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Path vector routing etc., Addressing types-Physical, Logical & port address.
Transport Layer: Transport layer-Process to process delivery, Connection oriented & Connectionless Transport, UDP, TCP, congestion control and Quality of Service.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the concepts of IPvx and different protocols.
- Apply the knowledge on different routing algorithms and measure their performance metrics.
- Distinguish between the connection oriented and connection less transport protocols.

UNIT- V
Application Layer: Application layer protocols and applications like Ping, FTP, telnet, HTTP, SMTP, SNMP, TFTP, BOOTP, DNS, NFS, RPC, X-server, E-mail, Introduction to streaming Audio/Video,P2P file sharing, Introduction to socket programming.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the importance of application layer and the terminology like FTP, HTTP, SMTP, SNMP,TFTP etc.,
- Know about the P2P file sharing and socket programming.

Textbooks:

1. Behrouz A. Forouzan, “Data Communications and Networking”, 4th Edition, Tata McGraw Hill, 2007.
2. Andrew Tenenbaum, “Computer Networks”, 4th Edition, Pearson Education.

Reference Books:

1. William Stallings, “Computer Networks and Cryptography”, 3rd Edition, Pearson Education.
2. Stevens, “TCP/IP illustrated Volume - I & II”, Pearson education.
3. Feibel Werner, “Encyclopedia of networking”, Pearson education.
4. Kurose & Ross, “Computer Networking- A top down approach featuring the Internet”, 3rd Edition, Pearson Education

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B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60407 **PRINCIPLES OF COMMUNICATIONS**
Open Elective-II

Course Objectives:

- To understand the concept of various modulation schemes and multiplexing.
- To apply the concept of various modulation schemes to solve engineering problems.
- To analyse various modulation schemes.
- To evaluate various modulation scheme in real time applications.

Note: ***The main emphasis is on qualitative treatment. Complex mathematical treatment may be avoided.***

UNIT-I
Amplitude Modulation
Introduction to Noise and Fourier Transform. An overview of Electronic Communication Systems. Need for Frequency Translation, Amplitude Modulation: DSB-FC, DSB-SC, SSB-SC and VSB. Frequency Division Multiplexing. Radio Transmitter and Receiver.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the concept of noise, Fourier transform, career modulation and frequency division multiplexing.
- Apply the concept of amplitude modulationto solve engineering problems.
- Analyse various amplitude modulation schemes.
- Evaluate various amplitude modulation schemes in real time applications.

UNIT-II
Angle Modulation
Angle Modulation, Tone modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulation and Demodulation. Stereophonic FM Broadcasting.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the concept of angle modulation and its components .
- Apply the concept of frequency modulation to solve engineering problems .
- Analyse angle modulation schemes.
- Evaluate frequency modulation scheme in real time applications.

UNIT-III
Pulse Modulation
Sampling Theorem: Low pass and Band pass Signals. Pulse Amplitude Modulation and Concept of Time Division Multiplexing. Pulse Width Modulation. Digital Representation of Analog Signals.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the concept of various pulse modulation schemes and time division multiplexing.
- Analyse various pulse modulation schemes.

UNIT-IV
Digital Modulation
Binary Amplitude Shift Keying, Binary Phase Shift Keying and QuadraturePhase Shift Keying, Binary Frequency Shift Keying. Regenerative Repeater.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the concept of various digital modulation schemes.
- Analyze various digital modulation schemes.

UNIT-V
Communication Systems
Satellite, RADAR, Optical, Mobile and Computer Communication (Block diagram approach only).

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the concept of various communication systems.
- Analyze various Radar Communication Systems

Course Outcomes:

- Understand the concept of various modulation schemes and multiplexing.
- Apply the concept of various modulation schemes to solve engineering problems.
- Analyse various modulation schemes, and evaluate various modulation scheme in real time applications.

Textbooks:
1. B. P. Lathi, Zhi Ding and Hari M. Gupta, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2017.
2. George Kennedy and Bernard Davis - Electronic Communication Systems – Tata McGraw Hill Education Pvt Ltd, 2019.

Reference Books:
1. Herbert Taub, Donald L Schilling and GoutamSaha, "Principles of Communication Systems", 3rdEdition, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. K. Sam Shanmugam "Digital and Analog Communication Systems", Wiley India Edition, 2008.

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B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60408 PRINCIPLES OF DIGITAL SIGNAL PROCESSING
Open Elective-II

Course Objectives:

- To explain about signals and perform various operations on it.
- To understand discrete time signals and systems.
- To solve Laplace transforms and z-transforms for various signals.
- To find Discrete Fourier Transform of a sequence by using Fast Fourier Transform.
- To design and realize IIR and FIR filters.

Course outcomes:

- Define basic signals and its operations, Classify discrete time signals and systems.
- Solve Laplace Transform and z-Transform for various signals, Calculate DFT of a given sequence by using Fast Fourier Transform.
- Analyze the continuous and discrete signals and systems
- Design and realize IIR and FIR filters from the given specifications.

UNIT- I

Introduction to Signals & Systems

Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals.

Basic operations on signals: Time shifting, Time scaling, Time reversal, Amplitude scaling and Signal addition.

Elementary Signals: Unit step, Unit ramp, Impulse, Sinusoidal function, Exponential function, Gate function,

Classification of Systems: Linear / Non-linear, Time invarient / Time variant, stable/Unstable, Static/Dynamic, causal/non causal,

Learning Outcomes:

At the end of this student, the student will be able to

- Define basic signals and its operations, Classify discrete time signals and systems.
- Understand various basic operations on signals

UNIT – II

Discrete Time Signals and Systems

Discrete Time Signals: Elementary discrete time signals, Classification of discrete time signals: power and energy signals, even and odd signals. Simple manipulations of discrete time signals: Shifting and scaling of discrete-time signals.

Discrete Time Systems: Input-Output description of systems, Block diagram representation of discrete time systems, Linear Constant Coefficient Difference Equations, Classification of discrete time systems: linear and nonlinear, time-invariant and variant systems, causal and non causal, stable and unstable systems.

Learning Outcomes:

At the end of this student, the student will be able to

- Define basic signals and its operations, Classify discrete time signals and systems.

- Understand various basic operations on signals

UNIT- III
LAPLACE TRANSFORMS AND Z- TRANSFORMS
Laplace Transforms: Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of Region of Convergence (ROC), Constraints on ROC for various classes of signals, Properties of Laplace transforms.
Z-Transforms: Concept of Z-transform of a discrete sequence, Region of convergence in Z-Transform, constraints on ROC for various classes of signals, inverse Z-transform, properties of Z-Transforms.
Learning Outcomes:

At the end of this student, the student will be able to
- Understand the basic concepts of Laplace and Z transforms
- Apply the transform techniques to solve the problems

UNIT – IV
FAST FOURIER TRANSFORMS
Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms: radix-2 DIT-FFT, DIF-FFT, and Inverse FFT: IDFT-FFT.
Learning Outcomes:

At the end of this student, the student will be able to
- Understand the importance of DTFT, DFT, FFT and their inverse transforms with respect to signals and systems
- Analyze the Decimation in time and frequency algorithms

UNIT – V
IIR AND FIR DIGITAL FILTERS
IIR DIGITAL FILTERS: Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters. Realization of IIR filters: Direct form-I, Direct form-II, cascade form and parallel form.
FIR DIGITAL FILTERS: Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques: Rectangular window, Triangular or Bartlett window, Hamming window, Hanning window, Blackman window. Realization of FIR filters

Learning Outcomes:
At the end of this student, the student will be able to
- Understand the importance of IIR and FIR digital Filters
- Realize IIR filters and analyze various windowing techniques in FIR filters
- Design IIR and FIR filters

Textbooks:
1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications", 4th edition, Pearson Education/PHI, 2007.
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", 2nd edition, PHI.

Reference Books:

1. A.V. Oppenheim, A.S. Will sky and S.H. Nawab, "Signals and Systems", PHI, 2nd Edition, 2013.
2. Andreas Antoniou, "Digital signal processing", Tata McGraw Hill, 2006.
3. R S Kaler, M Kulkarni,, Umesh Gupta, "A Text book on Digital Signal processing", I K International Publishing House Pvt. Ltd.
4. M H Hayes, Schaum'sOutlines, "Digital Signal Processing", Tata Mc-Graw Hill, 2007.
5. B. P. Lathi, "Signals, Systems and Communications", BS Publications, 2008.

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B.Tech III–II SEM

		L	T	P	C
19A65401	**Managerial Economics and Financial Analysis (Humanities Elective – I)**	3	0	0	3

Course Objectives:

• To inculcate the basic knowledge of micro economics and financial accounting
• To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
• To know the various types of Market Structures & pricing methods and its strategies
• To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
Course Outcomes:
CO1: Define the concepts related to Managerial Economics, financial accounting and management.
CO2: Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
CO3: Apply the concepts of production, cost and revenues for effective business decisions
CO4: Analyze how to invest their capital and maximize returns
CO5: Evaluate the capital budgeting techniques

UNIT-I:Managerial Economics

Introduction – Nature, meaning, significance, functions and advantages. Demand-Concept, Function, Law of Demand – DemandElasticity- Types – Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

Learning Outcomes:

At the end of the Unit, the learners will be able to
1. State the Nature of Managerial Economics and its importance
2. Understand the concept of demand andits determinants
3. Analyze the Elasticity and degree of elasticity
4. Evaluate demand forecasting methods
5. Design the process of demand estimation for different types of demand

UNIT-II: Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Shortrun and longrun Production Function- Isoquants andIsocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale.Cost&Break-Even Analysis - Cost concepts and Cost behavior-

Break-Even Analysis (BEA) -Determination of Break-Even Point (Simple Problems)- Managerial significance and limitations of Break-Even Analysis.

Learning Outcomes:

At the end of the Unit, the learners will be able to
1. Define the production function, Input-Output relationship and different cost concepts
2. Apply the least-cost combination of inputs
3. Analyze the behavior of various cost concepts
4. Evaluate BEA for real time business decisions
5. Develop profit appropriation for different levels of business activity

UNIT-III: Business Organizations and Markets

Introduction – Nature, meaning, significance, functions and advantages.Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises.Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition – Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

Learning Outcomes:

At the end of the Unit, the learners will be able to
1. Explain the structure of markets, features of different markets and forms of business organizations
2. Apply the price output relationship in different markets
3. Analyze the optimum output levels to maximize profit in different markets
4. Evaluate price-output relationship to optimize cost,revenue and profit

UNIT- IV:Capital Budgeting

Introduction – Nature, meaning, significance, functions and advantages. Typesof Working Capital,Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals,Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

Learning Outcomes:

At the end of the Unit, the learners will be able to
1. Explain the concept of capital budgeting and its importance in business
2. Contrast and compare different investment appraisal methods
3. Analyze the process of selection of investment alternatives using different appraisal methods
4. Evaluate methods of capital budgeting for investment decision making and for maximizing returns
5. Design different investment appraisals and make wise investments

UNIT-V: Financial Accounting and Analysis

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts

(Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).***Financial Analysis*** **-** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Learning Outcomes:

At the end of the Unit, the learners will be able to

1. Discuss the concept,convention and significance of accounting
2. Apply the fundamental knowledge of accounting while posting the journal entries
3. Analyze the process and preparation of final accounts and financial ratios
4. Evaluate the financial performance of an enterprise by using financial statements

Text Books:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

References:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage,201

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B.Tech III–II SEM

		L	T	P	C
19A65402	**Business Ethics and Corporate Governance (Humanities Elective – I)**	3	0	0	3

Course Objective:

- To make the student understand the principles of business ethics
- To enable them in knowing the ethics in management
- To facilitate the student's role in corporate culture
- To impart knowledge about the fair-trade practices

UNIT-I: ETHICS

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior - Value systems - Business Ethics,Types, Characteristics, Factors, Contradictions and Ethical Practices inManagement- Corporate Social Responsibility – Issues of Management – Crisis Management.

Learning Outcomes:

After completion of this unit student will
1. Understand the meaning of loyalty and ethical Behavior
2. Explain various types of Ethics
3. Analyze the corporate social responsibility of management

UNIT-II: ETHICS IN MANAGEMENT

Introduction Ethics in production, finance, ,Human Resource Managementand,Marketing,Management - Technology Ethics and Professional ethics - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

Learning Outcomes:

After completion of this unit student will
1. Understand the meaning of Marketing Ethics
2. Compare and contrast technical ethics and professional ethics
3. Develop ethical values

UNIT-III: CORPORATE CULTURE

Introduction, Meaning, definition, Nature, Scope, Functions and significance– Cross cultural issues in Ethics - - Emotional Honesty – Virtue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind. The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

Learning Outcomes:

After completion of this unit student will
1. Define UniversalismUtilitarianism, Distributive

2. Understand the corporate culture in business
3. Analyze Ethical Value System Ethical Values in different Cultures

UNIT- IV: LEGAL FRAME WORK

Law and Ethics, Agencies enforcing Ethical Business Behavior, Legal Impact– Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers.

Learning Outcomes:

After completion of this unit student will
1. Understand Law and Ethics
2. Analyze Different fair-trade practices
3. Make use of Environmental Protection andFair-Trade Practices

UNIT -V: CORPORATE GOVERNANCE

Introduction, meaning – scope Nature - Issues, need, corporate governance code, transparency & disclosure, role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work, corporate scams, committees in India and abroad, corporate social responsibility. of BODs composition, Cadbury Committee - various committees - reports - Benefits and Limitations.

Learning Outcomes:

After completion of this unit student will
1. Understand corporate governance code
2. Analyze role ofauditors, board of directors and shareholders in corporate governance
3. Implementing corporatesocialresponsibility in India.

Text books.

1. Murthy CSV: Business Ethics and Corporate Governance, HPH
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH.

Reference books

1. Dr. K. Nirmala, KarunakaraReaddy : Business Ethics and Corporate Governance, HPH
2. H.R.Machiraju: Corporate Governance
3. K. Venkataramana, Corporate Governance, SHBP.
4. N.M.Khandelwal : Indian Ethos and Values for Managers

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III B.TECH–II SEM

		L	T	P	C
19A65403	**Entrepreneurship and Incubation (Humanities Elective – I)**	3	0	0	3

Course Objective:

- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of new enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
- To encourage the student in creating and designing business plans

Course Outcomes:

CO1: Define the Concepts related to the Entrepreneurship and Incubators
CO2: Understand the concept of Entrepreneurship and challenges in the world of competition.
CO3: Apply the Knowledge in generating ideas for New Ventures.
CO4: Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
CO5: Evaluate the role of central government and state government in promoting Entrepreneurship.

UNIT-I: Entrepreneurship

Introduction-Nature, meaning, significance, functions and advantages. concept, characteristics-knowledge and skills requirement - process - Factors supporting entrepreneurship - Differences between Entrepreneur and Entrepreneur - entrepreneurial mindset and personality - Recent trends.

Learning Outcomes

At the end if the Unit, the learners will be able to
1. Understand the concept of Entrepreneur and Entrepreneurship in India
2. Analyze recent trends in Entrepreneurship across the globe
3. Develop a creative mind set and personality in starting a business.

UNIT-II: Women Entrepreneurship

Introduction – Nature, meaning, significance, functions and advantages. Growth of women entrepreneurship in India. - Issues & Challenges - Entrepreneurial motivations.Entrepreneurship Development and Government. Role, of Central and State Government - incentives, subsidies and grants – Export-oriented Units - Fiscal and Tax concessions.

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Learning Outcomes
At the end of the Unit, the learners will be able to
1. Understand the role of government in promoting women entrepreneurship
2. Analyze the role of export-oriented units
3. Evaluate the tax concessions available for Women entrepreneurs

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UNIT-III:Product Development
Introduction – Nature, meaning, significance, functions and advantages. Startup Initiatives - Generating business/ Service idea – Sources and methods –Identifying opportunities - Feasibility study - Market feasibility, technical/operational feasibility, Financial feasibility. Developing business plan, Preparing project report, Presenting business plan to investors.

Learning Outcomes
At the end if the Unit, the learners will be able to
1. Analyze the sources of new methods in generating business idea
2. Evaluate market feasibility, financial feasibility and technical feasibility
3. Design and draw business plans in project preparation and prepare project reports

UNIT-IV: Startups
Introduction – Nature, meaning, significance, functions and advantages. Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence theType/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure -Value proposition

Learning Outcomes
At the end of the Unit, the learners will be able to:
1. Understand the importance of business incubation
2. Apply brilliant ideas in the process of business incubation
3. Analyze the process of business incubation/incubators.
4. Design their own business incubation/incubators as viable-business unit.

UNIT-V: Finance
Introduction – Nature, meaning, significance, functions and advantages. Sources - Long term and Short term - Institutional Finance – Commercial Banks, SFC's and NBFC's in India, Role in small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions supporting entrepreneurship development.

Learning Outcomes
At the end of the Unit, the learners will be able to
1. Understand the various sources of finance in Starting the new venture
2. Analyze the role of banks and other financial institutions in promoting entrepreneurship in India
3. Evaluate the need and importance of MSMEs in the growth of country

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Text Books

1. D F Kuratko and T V Rao, **Entrepreneurship** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2 .Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

References

1.Vasant Desai,Small Scale Industries and Entrepreneurship, Himalaya Publishing 2012.
2. Rajeev Roy Entrepreneurship, 2nd Edition, Oxford, 2012.
3.B.JanakiramandM.Rizwana‖ Entrepreneurship Development: Text & Cases, Excel Books, 2011.
4.Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

E-Resources

1. Entrepreneurship-Through-the-Lens-of-enture Capital
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3. http://nptel.ac.in/courses/122106032/Pdf/7_4.pd
4. http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

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B.Tech – III-II Sem

L	T	P	C
0	0	2	1

19A60409 **MICROPROCESSORS AND MICROCONTROLLERS LAB**

Course Objectives:

- Write ALP for arithmetic and logical operations in 8086
- Familiarize with MASM, Embedded C & Code composer studio
- Write and execute programs in 8086, 8051 and ARM Cortex M0

Course Outcomes:

- Execution of different programs for 8086, 8051 in Assembly Level Language using MASM Assembler
- Design and implement some specific real time applications.

Conduct <u>all the</u> experiments:
List of Experiments:
Intel 8086 (16 bit Micro Processor)

1. Perform simple arithmetic operations using different addressing modes.
2. Sort an array of binary numbers.
3. Code Conversion (Eg. ASCII to Packed BCD form).
4. Addition of an array of BCD numbers stored in packed form.
5. Multiplying two 3x3 matrices and print on DOS
6. Identification & displaying the activated key using DOS & BIOS function calls.

Intel 8051 (8 bit Microcontroller)

1. Detection of key closure (connected to a port line) by polling technique.
2. Delay generation using i) Nested loop & ii) Timers.
3. Counting of external event occurrence through port line

ARM Cortex M0 – NXP LPC Xpress/1115

1. Introduction to the Keil MDK-ARM tool, C and Assembly coding - Processing text in assembly language
2. Configure GPIO for Digital input and output
3. Study of mixed assembly and C programming – Calling a C function from assembly and Calling an assembly function from C

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B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

19A60410 **DIGITAL SYSTEM DESIGN THROUGH VHDL LAB**

Course Objectives:

1 To familiarize with CAD tools
2 To familiarize with design, simulation and synthesis of combinational and sequential circuits using CAD tools

Course Outcomes

Students will be able to
CO1 understand and use CAD tools for simulation and synthesis of digital systems
CO2 design and synthesize different combinational and sequential circuits
CO3 design and implement complex digital systems using CAD tools
CO4 Implement and test simple digital circuits on FPGA
CO5 write and prepare a lab report that details design procedures and experimental results.

1. Write structural and dataflow VHDL models for
    a) 4-bit ripple carry adder.
    b) 4-bit carry look ahead adder
    c) 8-bit comparator
2. Write a VHDL program in structural model for
    a) 16:1 mux realization
    b) 3:8 decoder realization through 2:4 decoder
3. Write a VHDL program in behavioral model for
    a) 16:1 mux
    b) 3:8 decoder
    c) 8:3 encoder
    d) 8 bit parity generator and checker
4. Write a VHDL program in structural and behavioral models for
    a) 8 bit asynchronous up-down counter
    b) 8 bit synchronous up-down counter
5. Write a VHDL program for 4 bit sequence detector through Mealy and Moore state machines.
6. Write a VHDL program for traffic light controller realization through state machine.
7. Write a VHDL program in behavioral model for 8 bit shift and add multiplier.
8. Write a VHDL program in structural model for 8 bit Universal Shift Reg

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B.Tech – III-II Sem

L	T	P	C
0	0	2	1

19A60411 **DIGITAL SIGNAL PROCESSING LAB**

Course Objectives:

- Students can learn the basics of using DSP chips to perform real-time digital signal processing.
- Ability to apply knowledge of mathematics, science and engineering: Construction of tools for visualizing the basic concepts of discrete signal representation such as Fourier transforms, discrete time representations.
- Students will learn numerous programming tools for design and implementations of filtering algorithms.
- Understand the concept of Multi-rate signal processing and sample rate conversion.
- Develop and Implement DSP algorithms in software using CCS with DSP floating point Processor.

Course Outcomes:

- Ability to design-test, to verify, to evaluate, and to benchmark a real-time DSP system.
- Ability to calculate discrete time domain and frequency domain of signals using discrete Fourier series and Fourier transform.
- Ability to design, using MATLAB-based filter design techniques, FIR and IIR digital filters and Determine the frequency response of filters.
- Implementation of basic signal processing algorithms such as convolution, difference equation implementation and application of them in the construction of FIR and IIR filters.
- Design DSP based real time processing systems to meet desired needs of the society.

Conduct any <u>eight</u> experiments from part-A and any <u>four</u> experiments from part-B
List of Experiments:

PART-A

The following experiments shall be conducted using MATLAB / Lab View / C Programming/ Equivalent software.

1. Generation of sinusoidal waveform / signal based on recursive difference equations.
2. Find DFT / IDFT of given discrete time signal.
3. Find frequency response of a system given in transfer function/ differential equation form.
4. Implementation of FFT of given Sequence.
5. Design and implementation of IIR filter using bilinear transformation and impulse invariant method.
6. Design and implementationof IIR Butterworth (LP/HP) filter.
7. Design and implementationof IIR Chebyshev (LP/HP) filter.
8. Design and implementation of FIR with low pass filter using any three windowing techniques. Plot its magnitude and phase responses.

9. Design and implementation of FIR filter with high passfilter using any three windowing techniques. Plot its magnitude and phase responses.
10. Design and implementation of FIR filter with band pass / band stopfilter using any three windowing techniques. Plot its magnitude and phase responses.

PART-B

The following experiments shall be conducted using (TI / Analog Devices / Motorola / Equivalent DSP processors).

11. Study the architecture of DSP chips – TMS 320C 5X/6X Instructions.
12. Find DFT / IDFT of given discrete time signal.
13. Implementation of FFT of given Sequence.
14. Design and implementationof IIR Butterworth / Chebyshev (LP/HP) filter.
15. Design and implementation of FIR with low pass / high pass filter using any three windowing techniques. Plot its magnitude and phase responses.

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III B.TECH–II SEM

		L	T	P	C
19A65404	Research Methodology	3	0	0	0

Course Objectives:

- To understand the basic concepts of research and research problem
- To make the students learn about various types of data collection and sampling design
- To enable them to know the method of statistical evaluation
- To make the students understand various testing tools in research
- To make the student learn how to write a research report

Course Outcomes:

CO1: Define the basic concepts and its methodologies
CO2: Understand the concept of sampling, research design etc.
CO3: Demonstrate the knowledge of research processes
CO4: Analyze the importance of research articles in their academic discipline
CO5: Select appropriate testing tools used in research
CO6: Design a research paper without any ethical issues

UNIT I

Introduction to Research

Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining a Research Problem – Research Design – Concepts related to Research Design – Basic Principles of Experimental Design.

Learning Outcomes:

After completion of this unit student will
1. Understand the concept of research and its process
2. Explain various types of research
3. Know the steps involved in research design
4. Understand the different research approaches

UNIT II:

Sampling Design

Steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design. Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation. Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

Learning Outcomes:

After completion of this unit student will
1. Understand the concept of sampling and sampling design
2. Explain various techniques in measurement and scaling
3. Learn various methods of data collection
4. Design survey questionnaires for different kinds of research

5. Analyze the questionnaires

UNIT III
Correlation and Regression Analysis
Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications

Learning Outcomes:
After completion of this unit student will
1. Know the association of two variables
2. Understand the importance of correlation and regression
3. Compare and contrast correlation and regression
4. Learn various types of correlation
5. Apply the knowledge of C&R Analysis to get the results

UNIT IV
Statistical Inference
Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multivariate Analysis

Learning Outcomes:
After completion of this unit student will
1. Know the statistical inference
2. Understand the hypothesis testing procedure
3. Compare and contrast Parametric and Non-parametric Tests
4. Understand the use of chi-square test in investigating the distribution of categorical variables
5. Analyze the significance of variance and covariance

UNIT V
Report Writing and Professional Ethics
Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research.

Learning Outcomes:
After completion of this unit student will
1. Learn about report writing
2. Understand how to write research paper
3. Explain various techniques of interpretation
4. Understand the importance of professional ethics in research
5. Design a scientific paper to present in the conferences/seminars

Text books:
1. Research Methodology: Methods and Techniques – C.R.Kothari, 2nd Edition, New Age International Publishers.

2. Research Methodology: A Step by Step Guide for Beginners- Ranjit Kumar, Sage Publications

References:

1. Research Methodology and Statistical Tools – P.Narayana Reddy and G.V.R.K.Acharyulu, 1st Edition,ExcelBooks,New Delhi.
2. Business Research Methods–Donald R. Cooper & Pamela S Schindler, 9/e,
3. S C Gupta, Fundamentals of Statistics,7th Edition Himalaya Publications

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B.Tech – IV-I Sem

L	T	P	C
3	0	0	3

19A70401 **MICROWAVE ENGINEERING AND OPTICAL COMMUNICATIONS**

Course Objectives:

- To understand the wave propagation in waveguides, principle of operation of optical sources, detectors, microwave active and passive devices.
- To apply the boundary conditions of the waveguides to solve for field expressions in waveguides.
- To derive the field expressions for different modes of the waveguides, and Scattering matrix for passive microwave devices.
- To differentiate Linear bean tubes and crossed field tubes in terms of operation and performance.
- To remember various types of fibers, modes, configurations and signal degradations.
- To analyze signal degradation in optical fibers and compare the performance of various optical sources and detectors.

Course Outcomes:

- Understand the wave propagation in waveguides, principle of operation of optical sources, detectors, microwave active and passive devices. Also remember various types of fibers, modes, configurations and signal degradations
- Apply the boundary conditions of the waveguides to solve for field expressions in waveguides.
- Derive the field expressions for different modes of the waveguides, and Scattering matrix for passive microwave devices.Analyze signal degradation in optical fibers and compare the performance of various optical sources and detectors
- Differentiate Linear bean tubes and crossed field tubes in terms of operation and performance.

UNIT-I

Waveguides (Microwave Transmission lines): Introduction, Rectangular waveguides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Power transmission and attenuation, Waveguide current and mode excitation, Circular waveguide – TE and TM modes, Wave propagation, waveguide resonators – problem solving.

Learning Outcomes:

After completing this Unit, students will be able to

- Know the importance of waveguides
- Derive field expressions for different modes of propagation in the waveguides.
- Understand the concept of wave propagation in the guides
- Problem solving to find the parameters like cutoff frequency, phase and group velocities etc. in waveguides

UNIT-II

Passive Microwave Devices: Introduction to scattering parameters and their properties, Terminations, Variable short circuit, Attenuators, Phase shifters, Hybrid Tees (H-plane, E-

plane, Magic Tees), Hybrid ring, Directional Couplers – Bethe hole and Two hole Couplers, Microwave propagation in Ferrites, Microwave devices employing Faraday rotation – Isolator, Circulator, Deriving Scattering matrix for Microwave passive devices.

Learning Outcomes:
After completing this Unit, students will be able to

- Understand principle of operation of all passive microwave devices
- Know the importance of Scattering parameters and their properties
- Derive the Scattering matrix for the microwave devices
- Apply the Scattering matrix to understand the working of passive devices and solve problems

UNIT-III

Microwave Amplifiers and Oscillators:
Microwave Tubes: (i) Linear Beam Tubes – Two cavity Klystron amplifier -velocity modulation, bunching process, output power, Reflex Klystron oscillator, power output and efficiency, Travelling Wave Tube (TWT) – Bunching process and amplification process (Qualitative treatment only).
(ii) Crossed Field Tubes – Magnetron oscillator, pi-mode operation, power output and efficiency, Hartree Condition, Mode jumping in Magnetron, Principle of operation of Cross Field Amplifier (CFA).
Microwave Semiconductor Devices: Gunn Oscillator – Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes, Parametric Amplifier.

Learning Outcomes:
After completing this Unit, students will be able to

- Understand principle of operation of Microwave Tubes and semiconductor devices
- Derive the expressions power output and efficiency of all microwave devices
- Differentiate Linear bean tubes and crossed field tubes in terms of operation and performance

UNIT-IV
Optical Communications:
Overview of Optical Fiber Communications, optical fibers – Structures, Optical fiber modes and configurations, Signal degradation in optical fibers – Signal attenuation, absorption, scattering losses, Bending Losses, Core and Cladding losses, Signal distortion in optical waveguides, Information capacity determination, Group delay, waveguide dispersion, Inter model dispersion.

Learning Outcomes:
After completing this Unit, students will be able to

- Remember the optical fiber types, modes, configurations, and signal degradation types
- Analyze the signal degradation in optical fibers

UNIT-V

Optical Sources and Detectors: Introduction, LEDs – structure – Light source, Quantum efficiency, Modulation of an LED, LASER diodes, Source to Fiber power launching, LASER diode to fiber coupling, LED coupling to single mode fibers, Fiber, Splicing, Optical Fiber connectors, Photo diodes – Principle of Photo diodes, Avalanche Photodiodes, Photo detector noise, detector response time, Comparison of Photo diodes.

Learning Outcomes:

After completing this Unit, students will be able to

- Understand the working principle of optical sources, detectors and power coupling
- Compare the performance of various optical source and detectors

Textbooks:

1. Samuel Y. Liao, "Microwave Devices and Circuits", PHI publications, Third Edition, 1997.
2. Gerd Keiser, "Optical Fiber Communications", McGraw Hill, Third Edition, 2000.

Reference Books:

1. Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford Publications, Third Edition, 2003.
2. R. E. Collin, "Foundations for Microwave Engineering", Wiley Student Edition, Second Edition, 2009.
3. Om. P. Gandhi, "Microwave: Engineering and Applications", Kai Fa Book Company, 1981.
4. Reich H. J., et al, "Microwave Principles", MIT Press, 1972.
5. F E Terman, "Electronic and Radio Engineering", McGraw Hill, 4th Edition, 1984.

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B.Tech – IV-I Sem

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19A70402 **VLSI DESIGN**

Course Objectives:

- To identify the design for testability methods for combinational & sequential CMOS Circuits.
- To understanding of CMOS fabrication flow, technology scaling, sheet resistance, square capacitance and propagation delays in CMOS circuits.
- To apply the design Rules and draw layout of a given logic circuit and basic circuit concepts to MOS circuits.
- To analyze the behaviour of amplifier circuits with various loads. Analyze the behaviour of static and dynamic logic circuits. Analyze the various test generation methods for static and dynamic CMOS circuits.
- To Design MOSFET based logic circuit, Amplifier circuits using MOS transistors and MOSFET based logic circuits using various logic styles like static and dynamic CMOS.

Course Outcomes:

- Identify the design for testability methods for combinational & sequential CMOS circuits. Understand CMOS fabrication flow, technology scaling, sheet resistance, and square capacitance and propagation delays in CMOS circuits.
- Apply the design Rules and draw layout of a given logic circuit and basic circuit concepts to MOS circuits.
- Analyze the behavior of amplifier circuits with various loads, static and dynamic logic circuits, various test generation methods for static and dynamic CMOS circuits.
- Design MOSFET based logic circuit, Amplifier circuits using MOS transistors and MOSFET based logic circuits using various logic styles like static and dynamic CMOS

UNIT-I

Introduction and Basic Electrical Properties of MOS Circuits: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.
MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

Learning Outcomes:
After completing this Unit, students will be able to

- Understand CMOS fabrication flow and technology scaling .
- Apply the design Rules and draw layout of a given logic circuit .

- Design MOSFET based logic circuits .

UNIT-II

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

Learning Outcomes:

After completing this Unit, students will be able to

- Apply basic circuit concepts to MOS circuits .
- Estimate the sheet resistance, square capacitance and propagation delays in CMOS circuits

UNIT-III

Basic building blocks of Analog IC design

Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

Learning Outcomes:

After completing this Unit, students will be able to

- Analyze the behavior of amplifier circuits with various loads .
- Design amplifier circuits using MOS transistors .

UNIT-IV

CMOS Combinational and sequential logic circuit design

Static CMOS Design: Complementary CMOS, Ratioed Logic, Pass-Transistor Logic, **Dynamic CMOS Design:** Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Choosing a Logic Style, Gate Design in the Ultra Deep-Submicron Era,Latch Versus Register, Latch based design, timing decimation, positive feedback, instability, Metastability, multiplexer based latches, Master-Slave Based Edge Triggered Register, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOS register. Cross coupled NAND and NOR, SR Master Slave register, Storage mechanism, pipelining

Learning Outcomes:

After completing this Unit, students will be able to

- Analyze the behaviour of static and dynamic logic circuits .
- Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS

UNIT-V

CAD Tools for Design and Simulation, Aspects of Design Tools, Test and Testability-System Partitioning, Layout and Testability, Reset/Initialization, Design for Testability,Testing

Combinational Logic, Testing Sequential Logic, Practical Design for Test (OFT) Guidelines, Scan Design Techniques, Built-In-Self-Test (BIST), Future Trends.

Learning Outcomes:

After completing this Unit, students will be able to

- Identify the design for testability methods for combinational & sequential CMOS circuits .
- Analyze the various test generation methods for static and dynamic CMOS circuits .

Textbooks:

1. Kamran Eshraghian, "Essentials of VLSI Circuits and Systems", Douglas and A. Pucknell and SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. BehzadRazavi , "Design of Analog CMOS Integrated Circuits", McGraw Hill, 2003.

Reference Books:

1. Jan M. Rabaey, "Digital Integrated Circuits", AnanthaChandrakasan and Borivoje Nikolic, Prentice-Hall of India Pvt.Ltd, 2nd edition, 2009.
2. John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley & Sons, reprint 2009.

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B.Tech – IV-I Sem **L T P C**
3 0 0 3

19A70403 **DIGITAL IMAGE PROCESSING**
Professional Elective - III

Course Objectives:

- To introduce fundamentals of Image Processing.
- To expose various intensity transformations in spatial and frequency domains.
- To impart concepts of wavelets and various coding techniques for image compression.
- To dissimilate various segmentation techniques for images.
- To teach various color models and to introduce the concepts of color image segmentation.

Course Outcomes:

- Analyze various types of images mathematically.
- Compare image enhancement methods in spatial and frequency domains.
- Demonstrate various segmentation algorithms for given image.
- Justify DCT and wavelet transform techniques for image compression.
- Describe various color models for color image processing.

UNIT-I

Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighbourhood, adjacency, connectivity, distance measures.

Learning Outcomes:

After completing this Unit, students will be able to

- Explain the basic building blocks of image processing
- Define image processing parameters such as adjacency and distance measures

UNIT-II

Image Enhancements and Filtering- Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Learning Outcomes:

After completing this Unit, students will be able to

- Compare image enhancement methods in spatial and frequency domains
- Apply frequency Domain filtering techniques for image enhancement

UNIT-III

Image Segmentation, Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.

Learning Outcomes:

After completing this Unit, students will be able to

- Describe various Image segmentation techniques
- Illustrate detection of discontinuities in an image

UNIT-IV

Wavelets and Multi-resolution image processing- Uncertainty principles of Fourier Transform, Time-frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Sub-band filter banks.
Image Compression, -Redundancy, inter-pixel and psycho-visual; Loss less compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

Learning Outcomes:
After completing this Unit, students will be able to

- Describe various transform techniques for lossy compression
- Apply various coding techniques for lossless compression

UNIT-V
Color Image Processing-Color models–RGB, YUV, HSI; Color transformations–formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Learning Outcomes:
After completing this Unit, students will be able to

- Describe various color models for color image processing
- Apply various techniques for color image smoothing, sharpening and segmentation

Textbooks

1. R.C. Gonzalez and R.E. Woods, “Digital Image Processing”, 2nd Edition, Pearson Education, 2008.
2. Anil Kumar Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 2nd edition 2004.

Reference Books:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, “Digital Image processing using MATLAB”, Tata McGraw Hill, 2010.
2. Milan Sonka, Vaclav Hlavac, Roger Boule, “Image Processing, Analysis, and Machine Vision”, 3rd Edition, Cengage Learning, 2016.
3. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image processing”, Tata McGraw Hill.
4. William K. Pratt, “Digital Image Processing”, John Wiley, 3rd Edition, 2004.

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B.Tech – IV-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A70404 **DATA SCIENCE**
Professional Elective - III

Course Objectives

- Develop practical data analysis skills, which can be applied to practical problems
- Explain how math and information sciences can contribute to building better algorithms and software.
- an overview of simple statistical models and the basics of machine learning techniques of clustering, associations, classification, regression and text analysis
- do regression, correlation and knowledge discovery of the data
- implement Data Visualization Techniques
- understanding of the basics of the ethical use of data science

Course Outcomes:

At the end of this course, learners will be able to:

- Describe what Data Science is and the skill sets needed to be a data scientist
- Describe the Data Science Process and how its components interact
- Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modelling
- Be able to translate a real-world problem into mathematical terms.
- Identify basic Feature Selection algorithms (Filters, Wrappers, Decision Trees, Random Forests) and use in applications.
- Create effective visualization of given data

UNIT-I

Introduction to Data Science:
What is Data Science?, Where do we see Data Science?, How does data science relate to other Fields? , Information vs Data, Computational Thinking, Skills for Data Science, Tool for Data Science. Issues of Ethics, Bias, Privacy in Data Science

Learning Outcomes:

- Knowledge about basics of data science and relation with other fields
- Lean skill for Data science and tools

UNIT-II

Data Types, Data Collection, Data Pre Processing, Data Analysis and Analytics, Descriptive Analytics, Diagnostic Analytics, Predictive and Perspective Analytics. Explorative Analysis, Mechanistic Analysis

Learning Outcomes:

- Knowledge about basics of data types and Pre Processing, Data Analysis and Analytics
- Lean about Descriptive Analytics, Diagnostic Analytics, Predictive and Perspective Analytics

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UNIT-III

What is Machine Learning?, Regression, Gradient Descent, Supervised Learning-Introduction, Logistic Regression,Softmax Regression, Classification with KNN, Decision Tree, Random forest, Navie Bayes, SVM, Unsupervised Learning.

Learning Outcomes:

- Knowledge about Machine Learning- Regression, Gradient Descent, Supervised Learning
- Lean about Classification with KNN, Decision Tree

UNIT-IV

Introduction to Data Collection, Surveys, Question Types, Survey Audience, Services, Analyzing Survey Data, Pros and Cons of Surveys, Interview and Focus groups, Pros and Cons of Interview and Focus groups, Log and Diary Data, User Studies in Lab and Field.

Learning Outcomes:

- Knowledge about Data Collection, Surveys, Question Types.
- Lean about Analyzing Survey Data, Pros and Cons of Surveys.

UNIT-V

Analysis and Evaluation, Jobs

Introduction to Quantitative methods, Introduction to Qualitative methods, Comparing models, Training, Testing and A/B testing, Cross-Validation, Data Science Jobs- Marketing, Data Science Jobs- Retail and Sales. Data Science Jobs – Legal, Data Science Jobs - Health and Human SLO-2 Services.

Learning Outcomes:

- Knowledge about Quantitative methods and Comparing models.
- Lean about Testing and A/B testing, Cross-Validation.
- Knowledge about Data Science Jobs

Textbooks:

1. Shah, C., “A Hands-On Introduction to Data Science”, Cambridge: Cambridge University Press. 2020
2. Rafael A. Irizarry, “Introduction to Data Science: Data Analysis and Prediction Algorithms with R”, CRC Press, 2020.

Reference Books:

1. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015.
2. Hastie,Tibshirani, R., Friedman, J., “The Elements of Statistical Learning”, 2nd Edition, Springer, 2009.
3. Murphy, “K, Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.

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B.Tech – IV-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A760405 **EMBEDDED SYSTEMS**
Professional Elective - III

Course Objectives:

- To introduce major components of an embedded system
- To expose role of firmware, operating systems in correlation with hardware systems.
- To explain interfacing of various communication and I/O devices to an embedded system
- To demonstrate implementation of embedded systems for different applications

Course Outcomes:

- Identify hardware and software components of an embedded system.
- Choose appropriate embedded system architecture for the given application.
- Discuss quality attributes and characteristics of an embedded system.
- Illustrate different Inter Process Communication (IPC) mechanisms used by tasks/process/tasks to communicate in multitasking environment.
- Design an RTOS based embedded system.

UNIT –I

Introduction to Embedded Systems: Definition of embedded system, embedded systems vs general computing systems, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, Processor and OS trends in embedded system.
Embedded hardware units and devices in a system, embedded software in a system and an overview of programming languages, skills required for an embedded system designer, examples of the embedded systems.

Learning Outcomes:

After completing this Unit, students will be able to

- Differentiate embedded system and general computing system
- Classify embedded systems based on performance, complexity and era in which they are evolved
- Discuss basic hardware and software units used in embedded systems

UNIT –II

Core of the embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, Characteristics of an embedded system, Quality attributes of embedded systems.

Learning Outcomes:

After completing this Unit, students will be able to

- Summarize different factors to be considered in the selection of memory for an embedded system

- Describe role of sensors, actuators and their interfacing with I/O subsystems
- Explain role of embedded firmware in embedded system
- Understand characteristics describing an embedded system
- Discuss important quality attributes of the embedded system for online and offline modes

UNIT- III

I/O, Communication devices and Interrupt Service Mechanism: I/O types and examples, serial communication devices, parallel device ports, wireless devices, timer and counting devices, Interrupt-driven input and output, interrupt service routine concept, interrupt sources, hardware interrupts, software interrupts, interrupt-servicing mechanism, multiple interrupts, interrupt service threads as second-level interrupt handlers, context and the periods for context switching, interrupt latency, interrupt-service deadline, interrupt service mechanism form context-saving angle, direct memory access driven I/O, Device driver programming.

Learning Outcomes:
After completing this Unit, students will be able to

- Summarize pros and cons of interrupt driven data transfer
- Discuss hardware and software interrupts with examples
- Know how interrupts can be used to minimize latency
- Differentiate ISRs & device driver functions
- Describe uses of hardware and software assigned priorities in an interrupt service mechanism

UNIT –IV
Inter-process Communication (IPC): Multiple processes in an application, multiple threads in an application, tasks, task and thread states, tasks and data, distinction between function, ISR, IST and task by their characteristics, inter-process communication and synchronization, signals, concept of semaphores, disabling and enabling functions, shared data problem, queues and mailboxes, pipe and socket functions, remote procedure call functions.

Learning Outcomes:
After completing this Unit, students will be able to

- Describe mechanism to create multiple tasks (processes & threads),control task states and allocate system resources to the tasks
- Explain IPC functions to enable communication of signals, semaphores and messages from ISRs and tasks
- Discuss IPC functions for pipes, sockets and RPCs

UNIT –V
REAL-TIME OPERATING SYSTEMS - Operating System Overview, Operating System - Functions, Types and Services of Operating Systems, Real-Time Operating System, RTOS overview, RTOS Task Scheduling, Keil RTX RTOS, RTOS on **Mbed** platform, **Mbed**RTOSAPI, Using **Mbed** RTOS API for your Project, Thread, Mutex and Semaphore.

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Learning Outcomes:

After completing this Unit, students will be able to

- Explain about operating system and RTOS
- Summarize different features of RTOS
- Build RTOS based embedded system using Keil RTX mbed platform

Textbooks:

1. Shibu K V, "Introduction to Embedded Systems", 2nd edition, McGraw Hill Education, 2017.
2. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", 3rd edition, McGraw Hill Education, 2017.

Reference Books:

1. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd edition, Pearson Education India, 2007
2. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rdEdition Cengage Learning, 2012.
3. David. E. Simon, "An Embedded Software Primer" 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.

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B.Tech – IV-I

L	T	P	C
3	0	0	3

19A70406 **INDUSTRIAL ELECTRONICS**
Open Elective-III

Course Objectives:
This course will enable students to:
- Understand the characteristics of Gas devices and thyrathon.
- Understand about the practical applications Electronics in industries
- Describe the Inverters and Industrial Timing**.**

Course Outcome:
- Understand the Gas devices and thyrathon V-I characteristics.
- Apply the Classification of Photo electronic devices and Frequecy response characteristics
- Analyze the types of Families of thyristors and Magnetic Amplifiers
- Develop the practical applications Inverters and Industrial Timing.

UNIT – I
Gas Devices:
Introduction, Ionisation in Gases, I-V relation in cold cathode Gas Tube, Glow and Arc discharges, Classifications of Gas tubes, glow discharge tubes, glow discharge tubes as source light, Voltage regulator tube, Glow discharge rectifier tube, Grid glow tube, Glow tube protective devices, Strobotron, photography flasher, thermionic gas devices – working, influence of Gas pressure on thermionic gas diode performance.
Learning Outcomes:
- Learn basic of Gas devices and V-I characteristics
- Understand various gas tubes and its working performances

UNIT – II
Thyratron : Negative Grid thyratron, Action of Grid Firing of thyratron, Firing characteristics of negative grid thyratron, construction negative grid thyratron, Positive Grid Thyratron, shield Grid thyratron, ionization and deionization times thyratrons, general theory of tubes using mercury pool cathode, mercury arc rectifier, excitron, ignition.

Learning Outcomes:
- Learn basic of Grid thyratron and Firing characteristics
- Understand about ionization and deionization times thyratrons

UNIT – III
Photo electronic devices: Classification of Photo electronic devices, Photo electric emission,Frequecy response characteristics of Photo electric emitters, significance of special sensitivity curve in Industrial applications,Photo tubes,Vaccum photo tubes,Luminous sensitivity of a photo tubes, Gas photo tubes,Photo emission multipler, choice of photo tube, light absorption and photo condition, photoconductive cells, Photo diode, Pin photo diode, avalanche photo diode, NPN photo diode, photo transistor, Miscellaneous photo transistor,

photo voltaic effect, solar cells, photo emissive electron tube, infrared emitting diode, LED, laser diodes.

Learning Outcomes:

- Learn basic of Classification of Photo electronic devices
- Understand about Photo tubes,Vaccum photo tubes,Luminous sensitivity of a photo tubes.

UNIT-IV

Thyristors: Types of thyristors, Families of thyristors, PNPN Diode and characteristics, SCR, SCS, Triac, Diac, Unijunction Transistor, delayed firing of SCR by UJT.

Magnetic Amplifiers: The saturable Reactors, Reactor saturation by direct current, self saturation rectifier, DC control of self saturated reactor, The bias winding, Feedback in magnetic amplifier, Waveshape at output voltage, Reset control, Push pull magnetic amplifier, Positive feedback causing switiching action.

Learning Outcomes:

- Learn basic of Classification of Photo electronic devices
- Understand about Photo tubes, Vaccum photo tubes, luminous sensitivity of a photo tubes.

UNIT-V

Inverters: simple inverters using thyratrons, Power inverter using thyratrons, Power inversion using mercury arc rectifier tube, single phase inverters using thyristors, ability to operate into inductive load, over current protection, output voltage control in inverter, Wavefrom control, Typical Inverter circuits, Three phase inverters.

Timer Circuits: constituents of industrial timing circuits, Timers, classification of Timers, Thermal Timers, Electro mechanical timers, Electronic Timers, classification of Electronic Timers, RC timing elements , Digital Timing Element, Time base generator, Digital counters, Transistor timer with relay load control, SCR Delay timer, IC electronic Timer.

Learning Outcomes:

- Learn basic of inverters using thyratrons
- Understand about industrial timing circuits and classification of Timers.

Textbooks:

1. G. K. Mithal, “Industrial Electronics”, Khanna Publishers, Delhi, 2000.
2. J.Gnanavadivel, R.Dhanasekaran, P.Maruthupandi, “Industrial Electronics”, Anuradha Publications, 2011.

Reference Books:

1. F. D. Petruzulla, “Industrial Electronics”, McGraw Hill, Singapore, 1996.
2. M. H. Rashid, “Power Electronics Circuits, Devices and Application”, PHI, 3rd edition, 2004.
3. G. M. Chute and R. D. Chute, “Electronics in Industry”, McGraw Hill Ltd, 1995.

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B.Tech – IV-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A70407 **MICROCONTROLLERS & APPLICATIONS**
Open Elective-III

Course Objectives:
This course will enable students to:
- Describe theArchitecture of 8051 Microcontroller and Interfacing of 8051 to external memory.
- Write 8051 Assembly level programs using 8051 instruction set.
- Describe the Interrupt system, operation of Timers/Counters and Serial port of 8051.
- Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051.

Course outcomes:
- Understand the importance of Microcontroller and Acquire the knowledge of Architecture of 8051 Microcontroller.
- Apply and Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to using 8051 I/O ports.
- Develop the 8051 Assembly level programs using 8051 instruction set.
- Design the Interrupt system, operation of Timers/Counters and Serial port of 8051.

UNIT – I
8051 Microcontroller:
Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.
Learning Outcomes:
At the end of this student, the student will be able to
- Understand the importance of Microcontroller and acquire the knowledge of Architecture of 8051 Microcontroller.
- Analyze interface required memory of RAM & ROM.

UNIT – II
Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to usethese instructions.
Learning Outcomes:
At the end of this student, the student will be able to
- Explain different types instruction set of 8051.
- Develop the 8051 Assembly level programs using 8051 instruction set.

UNIT – III
8051 Stack, Stack and Subroutine instructions. Simple Assembly language program examples to use subroutine instructions.8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin.
Learning Outcomes:
At the end of this student, the student will be able to
- Describe Stack and Subroutine of 8051.

- Design Timer /counters using of 8051.

UNIT –IV

8051 Serial Communication- Basics of Serial Data Communication, RS- 232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.**8051 Interrupts**. 8051 Assembly language programming to generate an external interrupt using a switch.

Learning Outcomes:

At the end of this student, the student will be able to

- Acquire knowledge of Serial Communication and develop serial port programming.
- Develop an ALP to generate an external interrupt using a switch.

UNIT – V

8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Interfacing with relays and opto isolators, Stepper Motor Interfacing, DC motor interfacing, PWM generation using 8051.

Learning Outcomes:

At the end of this student, the student will be able to

- Apply and Interface simple switches, simple LEDs, ADC 0804 and LCD to using 8051 I/O ports.
- Design Stepper Motor and f motor interfacing of 8051.

Textbooks:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; "The 8051 Microcontroller and Embedded Systems – using assembly and C", PHI, 2006 / Pearson, 2006.
2. Kenneth J. Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson/Cengage Learning.

Reference Books:

1. Manish K Patel, "The 8051 Microcontroller Based Embedded Systems", McGraw Hill, 2014.
2. Raj Kamal, "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.

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B.TECH IV–I SEM

		L	T	P	C
19A75401	**Management Science (Humanities Elective – II)**	3	0	0	3

Course Objectives:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training &Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes:

CO1: Define the Management, and its Functions
CO2: Understand the concepts & principles of management and designs of organization in a practical world
CO3: Apply the knowledge of Work-study principles & Quality Control techniques in industry
CO4: Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
CO5: Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.

Mapping of CO's with PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1											3		3		
CO 2											2				1
CO 3									1		2				
CO 4											3				
CO 5									1		3				

UNIT-I: **INTRODUCTION TO MANAGEMENT**

Management- Concept and meaning-Nature-Functions-Management as a Science and Art and both. Schools of Management Thought-Taylor's Scientific Theory-Henry Fayol's principles-Elton Mayo's Human relations-Systems Theory- **Organizational Designs**-Line organization-Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of Organization-Social responsibilities of Management.

Learning Outcomes: At the end if the Unit, the learners will be able to
1. Understand the concept of management and organization
2. Analyze the organization chart & structure for an enterprise.
3. Apply the concepts & principles of management in real life industry.
4. Evaluate and interpret the theories and the modern organization theory.

UNIT-II: OPERATIONS MANAGEMENT

Principles and Types of Plant Layout-Methods of Production (Job, batch and Mass Production), Work Study- Statistical Quality Control- Deming 's contribution to Quality. **Materials Management -** Objectives- Inventory-Functions - Types, Inventory Techniques-EOQ-ABC Analysis-Purchase Procedure and Stores Management-**Marketing Management** -Concept- Meaning - Nature-Functions of Marketing - Marketing Mix- Channels of Distribution -Advertisement and Sales Promotion- Marketing Strategies based on Product Life Cycle.

Learning Outcomes: At the end of the Unit, the learners will be able to
1. Understand the core concepts of Management Science and Operations Management
2. Apply the knowledge of Quality Control, Work-study principles in real life industry.
3. Analyze Marketing Mix Strategies for an enterprise
4. Evaluate Materials departments &Determine EOQ
5. Create and design advertising and sales promotion

UNIT-III: HUMAN RESOURCES MANAGEMENT (HRM)

HRM- Evolution of HRM - Definition and Meaning – Nature-Managerial and Operative functions--Job Analysis -Human Resource Planning (HRP)–Process of Recruitment&Selection - Training and Development-Performance Appraisal-Methods of Performance Appraisal – Placement-Employee Induction-Wage and Salary Administration.

Learning Outcomes: At the end if the Unit, the learners will
1. Understand the concepts of HRM in Recruitment, Selection, Training& Development
2. Apply Managerial and operative Functions
3. Analyze the need of training
4. Evaluate performance appraisal
5. Design the basic structure of salaries and wages

UNIT-IV: STRATEGIC& PROJECT MANAGEMENT

Strategy Definition& Meaning-Vision - Mission- Goals- Corporate PlanningProcess-Environmental Scanning-Steps in Strategy Formulation and Implementation-SWOT Analysis **Project Management**- Network Analysis- ProgrammeEvaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost Analysis - Project Crashing (Simple problems).

Learning Outcomes: At the end of the Unit, the learners will be able to

1. Understand Mission, Objectives, Goals & strategies for an enterprise
2. Apply SWOT Analysis to strengthen the project
3. Analyze Strategy formulation and implementation
4. Evaluate PERT and CPM Techniques
5. Creative in completing the projects within given time

UNIT -V: Contemporary Issues In Management

The concept of Management Information System (MIS)- Materials Requirement Planning (MRP)- Customer Relations Management (CRM)- Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management (SCM)- Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO) - Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

Learning Outcomes: At the end if the Unit, the learners will be able to
1. Understand modern management techniques
2. Apply Knowledge in Understanding in modern
3. Analyze CRM,MRP,TQM
4. Evaluate Six Sigma concept and SCM

Text Books:

1. A.R Aryasri, Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.

References:

1. Koontz &Weihrich, Essentials of Management, 6/e, TMH, 2005.
2. Thomas N.Duening& John M.Ivancevich, ManagementPrinciples and Guidelines,Biztantra.
3. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
4. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

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B.TECH IV–I SEM

		L	T	P	C
19A75402	**Organizational Behavior (Humanities Elective – II)**	3	0	0	3

Course Objective:

- To enable student's comprehension of organizational behaviour
- To offer knowledge to students onself-motivation, leadership and management
- To facilitate them to become powerful leaders
- To Impart knowledge about group dynamics
- To make them understand the importance of change and development

Course Outcomes: At the end of the course, students will be able to
CO1: Define the Organizational Behavior, its nature and scope.
CO2: Understand the nature and concept of Organizational behaviour
CO3: Apply theories of motivation to analyze the performance problems
CO4: Analyze the different theories of leadership
CO5: Evaluate group dynamics

Unit-I: Introduction
Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behavior –Attitude -Perception - Learning – Personality.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of Organizational Behavior
2. Contrast and compare Individual& Group Behavior and attitude
3. Evaluate personality types

Unit-II: Motivation and Leading

Theories of Motivation- Maslow'sHierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theoryof expectancy - McClelland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory – Locke's goal setting theory– Alderfer'sERG theory - Leadership–research,theories, traits - LeadersVs Managers.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of Motivation
2. Analyze the Theories of motivation
3. Explain how employees are motivated according to Maslow's Needs Hierarchy

Unit-III: Organizational Culture
Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader- Women and Corporate leadership.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of Leadership
2. Contrast and compare Trait theory and Managerial Grid
3. Distinguish the difference between Transactional and Transformational Leadership

4. Evaluate the qualities of good leaders

Unit-IV: Group Dynamics

Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behavior - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decisionmaking - Team building - Conflict in the organization– Conflict resolution

Learning Outcomes: -After completion of this unit student will

1. Understand the concept of Group Dynamics
2. Contrast and compare Group behavior and group development
3. Evaluate how to resolve conflicts in the organization

Unit-V: Organizational Change and Development

Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

Learning Outcomes: -After completion of this unit student will

1. Understand the importance of organizational change and development
2. Apply change management in the organization
3. Analyze work stress management
4. Evaluate Managerial implications of organization

Text Books:

1. Luthans, Fred, OrganisationalBehaviour, McGraw-Hill, 12 Th edition 2011 2. P Subba Rao, OrganisationalBehaviour,Himalya Publishing House 2017

References

1. McShane,Organizational Behaviour, TMH 2009
2. Nelson, OrganisationalBehaviour, Thomson, 2009.
3. Robbins, P.Stephen, Timothy A. Judge, OrganisationalBehaviour, Pearson 2009. Aswathappa, OrganisationalBehaviour,Himalaya, 2009

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B.TECH IV–I SEM

		L	T	P	C
19A75403	**Business Environment (Humanities Elective – II)**	3	0	0	3

Course Objective:

- To make the student understand about the business environment
- To enable them in knowing the importance of fiscal and monitory policy
- To facilitate them in understanding the export policy of the country
- To Impart knowledge about the functioning and role of WTO
- To Encourage the student in knowing the structure of stock markets

Course Outcome: At the end of the course, students will be able to
CO1: Define Business Environment and its Importance.
CO2: Understand various types of business environment.
CO3: Apply the knowledge of Money markets in future investment
CO4: Analyze India's Trade Policy
CO5: Evaluate fiscal and monitory policy

Unit-I: Overview of Business Environment
Introduction – meaning Nature,Scope,significance, functions and advantages. Types- Internal & External, Micro and Macro.Competitive structure of industries -Environmental analysis-advantages & limitations of environmental analysis& Characteristics of business.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of Business environment
2. Classify various types of business environment
3. Evaluate the environmental analysis in business
4. Discuss the Characteristics of Business.

Unit-II: Fiscal Policy
Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Public debt - Development activities financed by publicexpenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of public revenue and public Expenditure
2. Identify the functions of RBI and its role
3. Analyze the Monitory policy in India
4. Know the recent trends and the role of Finance Commission in the development of our country
5. Differentiate between Fiscal and Monitory Policy

Unit-III: India's Trade Policy
Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM

policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

Learning Outcomes: -After completion of this unit student will

1. Understand the role ofIndian international trade
2. Understand and explain the need for Export and EXIM Policies
3. Analyze causes for Disequilibrium and correction measure
4. Differentiate between Bilateral and Multilateral Trade Agreements

UNIT-IV: World Trade Organization

Introduction – Nature, meaning, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - Agreements in the Uruguay Round –TRIPS, TRIMS, and GATT - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

Learning Outcomes: -After completion of this unit student will

1. Understand the role of WTO in trade
2. Analyze Agreements on trade by WTO
3. Understand the Dispute Settlement Mechanism
4. Compare and contrast the Dumping and Anti-dumping Measures.

Unit-V: Money Markets and Capital Markets

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI.

Learning Outcomes: -After completion of this unit student will

1. Understand the components of Indian financial system
2. Know the structure of Money markets and Capital markets
3. Analyze the Stock Markets
4. Apply the knowledge in future investments
5. Understand the role of SEBI in investor protection.

Text Books:

1. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH2016

Reference Books:

1. K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of
India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
4. E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

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B.Tech (R19 Regulation)

B.Tech – IV-I Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

19A70408 **MICROWAVE AND OPTICAL COMMUNICATIONS LAB**

Course Outcomes:

- Understand the mode characteristics of Reflex Klystron oscillator and negative resistance characteristics of Gunn Oscillator.
- Determine the Scattering matrix of given passive device experimentally and verify the same theoretically. Also determine numerical aperture and bending losses of a given optical fiber
- Analyze the radiation characteristics to find the directivity and HPBW of a given antenna.
- Establish optical link between transmitter and receiver **experimentally** to find attenuation and signal strength of the received signal.

Note: All the experiments shall be conducted and there is no choice.

Microwave Engineering:

1. Set up the Full Microwave bench and know the importance of each block. Identify the pin configuration of Reflex Klystron with the help of its power supply cable connected from the power supply unit. Also identify the Microwave signal coupling from Klystron Oscillator to the waveguide.
2. Make use of the bench set up and conduct the experiment to find mode characteristics of Reflex Klystron: (i) Repeller voltage vs output power (ii) Repeller voltage vs Frequency.
3. Measurement of Frequency and wavelength of generated Microwave signal using Reflex Klystron oscillator.
4. Verify the negative resistance characteristics of Gunn oscillator using the Microwave bench set up with Gunn oscillator set up.
5. Find the Scattering matrix of E-plane, H-plane, and Magic Tees experimentally.
6. Make use of Microwave bench setup to find VSWR and impedance of an unknown load that is connected at the end of the bench set up. Make use of VSWR meter for the measurement of VSWR of a given load.
7. Determine directivity, insertion loss and coupling factor of a given Directional Coupler experimentally.
8. Making use of Microwave bench set up, find the radiation characteristics in both the planes and determine HPBW and directivity of a pyramidal horn antenna.

Optical Communication:

9. Conduct the experiment to draw the DC characteristics of LED and Photo diode.
10. Make use of Fiber optic kit to determine the **numerical aperture** and **bending losses** of a given optical fiber (transmission line).
11. Establish an optical link between transmitter and receiver and determine the signal strength at the receiver. Give the comments about the experiment by transmitting (i) **analog signal** (ii) **digital signal.**
12. Attenuation measurement in Fibers for various lengths.

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B.Tech – IV-I Sem **L T P C**
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VLSI DESIGN LAB

Objectives:

- To understand and develop HDL source code for the given problem/experiment
- To analyze the obtained results of the given experiment/problem
- To simulate the given circuit with suitable simulator and verify the results
- To understand how to use FPGA/CPLD hardware tools in the lab
- To design and implement the experiments using FPGA/CPLD hardware tools

Course Outcomes:

- Understand how to use FPGA/CPLD hardware tools in the lab.
- Develop HDL source code for the given problem/experiment, and simulate the given circuit with suitable simulator and verify the results.
- Analyze the obtained results of the given experiment/problem.
- Design and implement the experiments using FPGA/CPLD hardware tools.

List of Experiments:

PART (A): FPGA Level Implementation (Any Seven Experiments)

Note 1: The students need to develop VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory.

Design and Implementation of the following

1. Realization of Logic gates
2. 4-bit ripple carry and carry look ahead adder using behavioral, dataflow and structural modelling
    a) 16:1 mux through 4:1 mux
    b) 3:8 decoder realization through 2:4 decoder
3. 8:3 encoder
4. 8-bit parity generator and checker
5. Flip-Flops
6. 8 bit synchronous up-down counter
7. 4bit sequence detector through Mealy and Moore state machines.

EDA Tools/Hardware Required:

1. EDA Tool that supports FPGA Programming including Xilinx Vivado / Altera (Intel) / Cypress / Equivalent Industry Standard tool along with corresponding FPGA Hardware.
2. Desktop Computer with appropriate Operating system that supports the EDA tools.

PART (B): Back-end Level Design and Implementation (Any Five Experiments)

Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the design using Industry standard EDA Tools.

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Design and Implementation of the following

1. Universal Gates
2. an Inverter
3. Full Adder
4. Full Subtractor
5. Decoder
6. D-Flip-Flop

EDA Tools/Hardware Required:

1. Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard Software/CAD Tool.
2. Desktop Computer with appropriate Operating system that supports the EDA tools.

List of Experiments

PART (A): Any Seven Experiments

Note 1: The students need to develop VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory.

1. Realization of Logic gates
2. Design and Implementation of 4-bit ripple carry and carry look ahead adder using behavioral, dataflow and structural modelling
3. Design and Implementation of
    a. 16:1 mux through 4:1 mux
    b. 3:8 decoder realization through 2:4 decoder
4. Design and Implementation of 8:3 encoder
5. Design and Implementation of 8-bit parity generator and checker
6. Design and Implementation of different Flip-Flops
7. Design and Implementation of 8 bit synchronous up-down counter
8. Design and Implementation of 4bit sequence detector through Mealy and Moore state machines.

Equipment/Software required:

1. FPGA Programming Software like Xilinx Vivado / Altera (Intel) / Cypress / Equivalent Industry Standard Software
2. FPGA Hardware like Xilinx / Altera (Intel) / Cypress / Equivalent Industry Standard Hardware
3. Personal computer system with necessary software to run the programs and Implement.

PART (B): Any Five Experiments

Note: The students need to design the schematic diagrams using CMOS logic and to draw the layout diagrams, to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

1. Design and Implementation of Universal Gates

2. Design and Implementation of an Inverter
3. Design and Implementation of Full Adder
4. Design and Implementation of Full Subtractor
5. Design and Implementation of Decoder
6. Design and Implementation of D-Latch

Software Required:

1. Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard Software/CAD Tool.

b. Personal computer system with necessary software to run the programs and to implement.

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B.Tech – IV-II

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19A80401 **ADVANCED 3G AND 4G WIRELESS MOBILE COMMUNICATIONS**
Professional Elective - IV

Course Objectives:

- To understand the concepts of wireless communications and standards .
- To apply a wireless technique to solve engineering problem .
- To analyze working of wireless technologies .
- To evaluate a wireless technique in a given situation .
- To plan a wireless system for deployment .

Course Outcomes:

At the end of the course, the student should be able to

- Understand the concepts of wireless communications and standards .
- Apply a wireless technique to solve engineering problem .
- Analyze working of wireless technologies .
- Evaluate a wireless technique in a given situation .
- Plan a wireless system for deployment .

UNIT-I

Introduction to 3G and 4G standards.

Teletraffic Theory:

Introduction to teletraffic theory, Cellular traffic modelling and blocking probability.

Large Scale Path Loss:

Introduction to wireless propagation models, Ground reflection model, Okumura model, Hata model, Link budget analysis, Log normal shadowing.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand the concept of a standard, teletraffic and signal loss model .
- Apply a model to study the signal losses .
- Analyzethe suitability of a model to a given situation .
- Evaluate a model in a given situation .
- Plan a wireless system for deployment .

UNIT-II

Small Scale Fading and Multipath:

Fading in wireless channel, Rayleigh fading, BER in wired and wireless channels. Wireless channel and delay spread, Coherence bandwidth of wireless channel, ISI and Doppler in wireless channel, Doppler spectrum and Jake’s model.

Diversity Techniques:

Introduction to diversity techniques, MRC for multi-antenna system, BER with diversity, Spatial diversity and diversity order.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand the concept of fading and diversity .
- Apply a diversity technique to improve BER
- Compare various diversity techniques
- Evaluate channel model in a given situation

UNIT-III

Code Division Multiple Access

Introduction to CDMA, spread spectrum and LFSR. Generation and properties of PN sequences, Correlation of PN sequences and Jammer margin, CDMA advantages and RAKE receiver, Multiuser CDMA downlink,Multiuser CDMA uplink and asynchronous CDMA, CDMA near-far problem.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand the concept of PN sequence .
- Apply CDMA in a multiuser environment .
- Analyze near-far problem .
- Evaluate CDMA technique in a multiuser environment .

UNIT-IV

Multiple Input Multiple Output Systems:

Introduction to MIMO, MIMO system model, Zero-forcing receiver, MIMO MMSE receiver, Introduction to SVD, SVD based optimal MIMO transmission and capacity, OSTBCs, V-blast receiver, MIMO beam forming.

Orthogonal Frequency Division Multiplexing:

Introduction to OFDM, Multicarrier modulation, IFFT sampling for OFDM, OFDM schematic, Cyclic prefix, OFDM based parallelization, OFDM examples.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand the concept of MIMO and OFDM .
- Apply MIMO/ OFDM techniques in a given situation .
- Analyze working of MIMO/ OFDM systems .
- Evaluate aMIMO/ OFDM techniques in a given situation .

UNIT-V

MIMO-OFDM:

Introduction to MIMO-OFDM, Impact of carrier frequency offset in OFDM, PAPR in OFDM systems, Introduction to SC-FDMA.

3G and 4G Standards:
WCDMA, LTE/ LTE Advanced and WiMAX.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand 3G and 4G standards and the combined concept of MIMO-OFDM .
- Apply MIMO-OFDM techniques in a given situation .
- Analyze working of MIMO-OFDM systems .
- Evaluate a MIMO-OFDM techniques in a given situation .

Textbooks:

1. Aditya K. Jagannatham, "Principles of Modern Wireless Communications Systems – Theory and Practice", McGraw-Hill International, 2015.
2. Theodore S. Rappaport, "Wireless Communications – Principles and Practice", 2nd Edition, PHI, 2004.

Reference Books:

1. David Tse and PramodViswanath, "Fundamentals of Wireless Communications", Cambridge University Press.
2. Andrea Goldsmith, "Wireless Communications", Cambridge University Press.
3. EzioBiglieri, "MIMO Wireless Communications", Cambridge University Press.

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B.Tech – IV-II	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A80402 **INTRODUCTION TO INTERNET OF THINGS**

Professional Elective – IV

Course Objectives:

- To present interconnection and integration of the physical world and the cyber space.
- To demonstrate applications of Internet of Things
- To educate building blocks and characteristics of Internet of Things
- To introduce communication protocols used in Internet of Things
- To impart knowledge on design & develop IoT devices

Course Outcomes:

- Examine the application areas of IoT
- Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Examine communication protocols used in IoT
- Make use of python programming to implement Internet of Things
- Design IoT applications using Raspberry Pi

UNIT-I

Introduction & Concepts: Introduction to Internet of Things, physical design of IoT, logical design of IoT, IoT enabling Technologies, IoT levels.

Learning Outcomes:

At the end of the unit, student shall be able to

- Explain characteristics, protocols, functional blocks of IoT
- Explain physical and logical design of IoT
- Categorize different levels of IoT

UNIT –II

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

Learning Outcomes:

At the end of the unit, student shall be able to

- Categorize different domains where IoT can be applied
- Select physical design components for real time applications

UNIT –III

M2M & System Management with NETCONF-YANG: M2M, Difference between IOT andM2M, SDN and NFV for IOT, Software defined Networking, Network FunctionVirtualization, Need for IOT Systems Management, Simple Network Management Protocol,Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systemsmanagement with NETCONF-YANG.

Learning Outcomes:
At the end of the unit, student shall be able to

- Describe concept of M2M and differentiate it with IoT
- Explain about SDN and NFV for IoT
- Examine NETCONF and YANG modelling language for IoT

UNIT –IV
Internet of Things Systems - Logical Design using Python: Introduction, Motivation for using Python, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages of Interest for IoT.

Learning Outcomes:
At the end of the unit, student shall be able to

- Explain the data manipulation and file handling using Python
- Apply various Python packages of interest for IoT

UNIT-V
IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming with Python; Python web application framework – Django, Designing a Restful web API.

Learning Outcomes:

At the end of the unit, student shall be able to

- Discuss about Django and RESTful web API with respect to IoT
- Design IoT applications using Raspberry Pi

Textbooks:
1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013
2. Vijay Madisetti, ArshdeepBahga, "Internet of Things A Hands-On- Approach",2014.

Reference Books:
1. Matt Richardson & Shane Wallace, "Getting Started with Rasperry Pi", O'Reilly (SPD), 2014.
2. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things", 2013

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B.Tech – IV-II	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A80403 **SYSTEM VERILOG**
Professional Elective - IV

Course Objectives:

- To study fundamentals of data types in verilog programming.
- To study the various design operators, and loop concepts in verilog.
- To introduce a clocking and program blocking events and semaphores.
- To acquaint with connecting the design and testbench

Course Outcomes

- Understand the basic concepts data types, arrays in verilog programming.
- Compute the operators, fork and join and loop concepts in verilog.
- Design logic implementation for clocking and program blocking events and semaphores.
- Understand the concept of advanced OOPs concepts and threads and inter process communications.

UNIT-I

DATA TYPES: Introduction, Built-in Data Types, Fixed-Size Arrays, Dynamic Arrays, Queues,Associative Arrays, Linked Lists, Array Methods, Choosing a Storage Type, Creating New Types with typedef, Creating User-Defined Structures, Enumerated Types, Constants, Strings, Expression Width, Net Types.

Learning Outcomes

- Illustrate the Built in data types and arrays in system verilog
- Analyze and implement the methods of arrays and various typedef

UNIT-II

Operators- operands, operator types, Tasks and Functions- Differences between tasks and functions, declaration, invocation, automatic tasks and functions, **Fork and Join-** Sequential and Parallel Blocks, Block Types, Special Features of Blocks, **Loop Concepts-** While Loop, For Loop, Repeat Loop, Forever loop, Value Change Dump File.

BASIC OOP: Introduction, Think of Nouns, not Verbs, Your First Class, Where to Define a Class, OOP Terminology, Creating New Objects, Object Deallocation, Using Objects, Static Variables vs. Global Variables, Class Routines, Defining Routines Outside of the Class, Scoping Rules, Using One Class Inside Another, Understanding Dynamic Objects, Copying Objects, Public vs. Private, Straying Off Course, Building a Testbench, Inheritance encapsulation, polymorphism,

Learning Outcomes

- Learn the various different operator types and task functions
- Analyze and implement the methods of fork and join in parallel blocks
- Understand the concepts of Loops and VCD file.
- Understand the concepts of basic oops and routines used for class rules.

UNIT-III

Clocking block- Stimulus Timing, Controlling timing of synchronous signals with a clocking block, Timing problems in Verilog, Testbench – design race condition.

Program block- The program block and timing regions, Specifying delays between the design and testbench, Interface Driving and Sampling- Interface synchronization, Interface signal sample, Interface signal drive, Bidirectional signals in the interface, the clock generator.
Events- Blocking on the edge of an event, waiting for an event trigger, passing events, waiting for multiple events.
Semaphores- Semaphore operations, Semaphores with multiple keys.
Mailboxes- Mailbox in a testbench, Bounded mailboxes, Unsynchronized threads communicating with a mailbox, Synchronized threads using a mailbox and events, Synchronized threads using two mailboxes.
CONNECTING THE TESTBENCH AND DESIGN: Introduction, Separating the Testbench and Design, The Interface Construct, Stimulus Timing, Interface Driving and Sampling, Connecting It All Together, Top-Level Scope, Program – Module Interactions, SystemVerilog Assertions, The Four-Port ATM Router.

Learning Outcomes

- Learn the various clocking block, program block design conditions
- Analyze and implement the Events of edge blocking, waiting and passing events.
- Understand the concepts of semaphores and mailboxes.
- Analyze the Design testbench for the Interface Construct, Stimulus timming and top level scope of programming modules.

UNIT-IV
RANDOMIZATION: What to Randomize, Randomization in SystemVerilog, Constraint Details, Solution Probabilities, Controlling Multiple Constraint Blocks, Valid Constraints, In-line Constraints, The pre_randomize and post_randomize Functions, Constraints Tips and Techniques, Common Randomization Problems, Iterative and Array Constraints, Atomic Stimulus Generation vs. Scenario Generation, Random Control, Random Generators, Random Device Configuration, Seeds- Random Number Generation , Semi-formal Verification ,Seed Management.
Learning Outcomes

- Learn the cocept of randomize in system verilog.
- Analyze pre randomize and post randomize functions, and constranints.

UNIT-V
THREADS AND INTERPROCESS COMMUNICATION: Working with Threads, Interprocess Communication, Building a Testbench with Threads and IPC.
Advanced OOP: Sub Classes, super, casting, static Methods, Object property methods, Parameterized class, Typedef class, abstract Class, Virtual Class, Factory Patterns, Type Casting and Virtual Methods, Assertion, Composition and Alternatives, Copying an Object, Callbacks.
Learning Outcomes

- Knowledge in understanding about the threads and interprocess communication
- Analyze working with threads and testbench with IPC.

- Understand the concepts of Advanced OOP for various methods and class casting and virtual methods.

Textbooks:

1. Chris Spear, "SystemVerilog for Verification"- A Guide to Learning the Testbench Language Features, 2006 Springer Science – USA.
2. Janick Bergeron, "Writing Testbenches Using System Verilog, Features", 2006 Springer Science – USA.

Reference:

1. Janick Bergeron, Eduard Cerny, Alan Hunter, and Andy Nightingale, Verification Methodology Manual for SystemVerilog

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B.Tech –IV-II

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19A80404 **ELECTRONIC INSTRUMENTATION**
Open Elective-IV

Course Objectives:
This course will enable students to:

- To introduce various measuring instruments and their functionality
- To teach various measurement metrics for performance analysis
- To explain principles of operation and working of different electronic instruments
- To familiarize the characteristics, operations, calibrations and applications of the different oscilloscopes and signal generators.
- To provide exposure to different types of transducers

Course outcomes:

- Learn different types of errors in measurement, calibration process and standards, various methods for measurement of non-electrical quantities, Understand the different methods for measurement of various electrical quantities.
- Familiarize the dynamics of instrument systems, various passive and active transducers
- Compare the various measuring techniques for measuring voltage

UNIT – I

Measurement and Error: Definitions, Accuracy, Precision, Resolution and Significant Figures, Types of Errors, Measurement error combinations.
Ammeters: DC Ammeter, Multi-range Ammeter, The Ayrton Shunt or Universal Shunt, Requirements of Shunt, Extending of Ammeter Ranges, RF Ammeter (Thermocouple), Limitations of Thermocouple.
Voltmeters and Multi-meters: Introduction, Basic Meter as a DC Voltmeter, DC Voltmeter, Multi range Voltmeter, Extending Voltmeter Ranges, Loading, AC Voltmeter using Rectifiers. True RMS Voltmeter, Multi-meter.

Learning Outcomes:
At the end of this unit, the student will be able to

- Explain the importance of measurement system
- Examine the characteristics of different Instruments
- Illustrate different types of errors that may occur in instruments during measurements

UNIT – II

Digital Voltmeters: Introduction, RAMP technique, Dual Slope Integrating Type DVM, Integrating Type DVM, Most Commonly used principles of ADC, Successive Approximations, -Digit, Resolution and Sensitivity of Digital Meters, General Specifications of DVM,
Digital Instruments: Introduction, Digital Multi-meters, Digital Frequency Meter, Digital Measurement of Time, Universal Counter, Digital Tachometer, Digital pH Meter, Digital Phase Meter, Digital Capacitance Meter,

Learning Outcomes:
At the end of this unit, the student will be able to

- Explain working of digital measuring Instruments
- Compare the various measuring techniques for measuring voltage

UNIT – III

Oscilloscopes: Introduction, Basic principles, CRT features, Block diagram of Oscilloscope, Simple CRO, Vertical Amplifier, Horizontal Deflecting System, Sweep or Time Base Generator, Measurement of Frequency by Lissajous Method, Digital Storage Oscilloscope.

Signal Generators: Introduction, Fixed and Variable AF Oscillator, Standard Signal Generator, Laboratory Type Signal Generator, AF sine and Square Wave Generator, Function Generator,

Learning Outcomes:
At the end of this unit, the student will be able to

- Describe functions of basic building of CRO
- Measure parameters viz. Amplitude, frequency and time period using CRO
- Classify signal generators and describe its characteristics

UNIT – IV

Measuring Instruments: Field Strength Meter,Stroboscope, Phase Meter, Q Meter, Megger.

Bridges: Introduction, Wheatstone‘s bridge, Kelvin‘s Bridge; AC bridges, Capacitance Comparison Bridge, Inductance Comparison Bridge, Maxwell‘s bridge, Wien‘s bridge.

Learning Outcomes:
At the end of this unit, the student will be able to

- Describe function of various measuring Instruments.
- Describe how unknown capacitance and inductance can be measured using bridges
- Select appropriate bridge for measuring R, L and C parameters

UNIT – V

Transducers: Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, LVDT, Piezoelectric transducer, Photo cell, Photo voltaic cell, Semiconductor photo diode and transistor.

Learning Outcomes:
At the end of this unit, the student will be able to

- Explain the importance of transducer
- Illustrate different measuring techniques in transducers to measure physical quantities.
- Select the appropriate transducer for the measurement of physical parameters

Textbooks:

1. H. S. Kalsi, “Electronic Instrumentation”, McGraw Hill, 3rd Edition, 2012.
2. A. D. Helfrick and W.D. Cooper, “Modern Electronic Instrumentation and Measuring Techniques”, Pearson, 1st Edition, 2015.

Reference Books:

1. David A. Bell, “Electronic Instrumentation & Measurements”, Oxford University Press PHI 2nd Edition, 2006.
2. A. K. Sawhney, “Electronics and Electrical Measurements”, Dhanpat Rai &Sons.

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B.Tech –IV-II	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A80405 **FUNDAMENTALS OF INTEGRATED CIRCUITS APPLICATIONS**
Open Elective-IV

Course Objective

- To introduce the basic building blocks of linear & digital integrated circuits.
- To learn the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of 555 and PLL.
- To learn the theory of ADC and DAC
- To understand different families of digital integrated circuits and their characteristics.

Course Outcomes

- Understand the basic concepts of Op -AMPs, characteristics and specifications.
- Design circuits using operational amplifiers for various applications .
- Develop, apply and analyze circuits for advanced applications using Opamps, PLL, VCO and Analog multipliers.
- Understand different families of digital integrated circuits and their characteristics
- Design various and sequential circuits using digital ICs.

UNIT -I

Operational Amplifier Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 OpAmp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

Learning Outcomes:

- Understand about Operational Amplifiers and its characteristics
- Analyze the arithematics operation of Inverting, Non-Inverting differential amplifiers
- Knowledge on comparators, Schmitt tiggers, and voltage regulators.

UNIT -II

Op-Amp, IC-555 & IC 565 Applications Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave,IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

Learning Outcomes:

- Understand various IC 555 and IC565 applications.
- Analyze the Characteristics of Band pass, Band reject and All Pass Filters
- Knowledge on Triangular, Sawtooth, Square Wave, IC555 Timer in Monostable and Astable Operations.

UNIT -III

Data Converters Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

Learning Outcomes:

- Learn about various basic DAC techniques and different types .

- Analyze the DAC, R-2-R ladder DAC and inverted R-2R DAC
- Knowledge on ADC- counter type and dual slope ADC.

UNIT -IV

Digital Integrated Circuits Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

Learning Outcomes:

- Learn about various basic Digital ICs and Various Logic Families,
- Analyze the CMOS Transmission Gate and IC interfacing- TTL Driving CMOS & CMOS Driving TTL
- Knowledge on Combinational Logic ICs.

UNIT -V

Sequential Logic IC's and Memories Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Learning Outcomes:

- Learn about Sequential Logic IC's and Memories.
- Analyze the Flip-flops, Synchronous Counters, Decade Counters, Shift Registers
- Knowledge on Memories - ROM Architecture, Types of ROMS & Applications.

Textbooks:

1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 2003.
2. Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2005.

Reference Books:

1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, Second Edition, 2003.
2. James M. Fiore, "Op Amps and Linear Integrated Circuits-Concepts and Applications", Cengage Learning/ Jaico, 2009.
3. K.Lal Kishore, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 2009.
4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson, Third Edition, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Additional Courses offered by ECE department for B.Tech. (Honors) (For 20 Credits)

1. 5G Wireless Communications
2. Automotive Electronics
3. Low power VLSI Design.
4. Pattern Recognition
5. Smart Antennas
6. Digital Video Signal Processing (MOOCs)
7. MEMS & Nano Technology
8. Mini Project.

Note:
1. Out of the '7'theory courses listed above the students can opt for '5' courses
2. No. of credits for each theory courseis '3' and for mini project is '5'

Minor degree courses offered by ECE Department for (For 20 Credits)

S.No	Course Code	Circuit Branches
1	19A04M11	Probability Theory and Stochastic Processes
2	19A04M12	Analog Communications
3	19A04M13	VLSI Design
4	19A04M14	Embedded Systems
5	19A04M15	Analog Communications Lab
6	19A04M16	VLSI Design Lab
7	19A04M17	Mini Project

Minor degree courses offered by ECE Department for (For 20 Credits)

S.No	Course Code	Non-Circuit Branches
1	19A04M21	Analog Electronics
2	19A04M22	Digital Electronics
3	19A04M23	Principles of Communications
4	19A04M24	Microprocessors and Microcontrollers
5	19A04M25	Communication Lab
6	19A04M26	Electronics Lab
7	19A04M27	Mini Project

Note:
No. of credits for each theory course is '3', lab course is '1.5' and for mini project is '5'.